From their environment to their behavior.

Lessons learned from Illinois' river otters.

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A river otter brings lunch to the latrine site

Photograph adapted from Mateus-Pinilla laboratory©

River otters are at the top of the trophic food chain, with a varied diet that, for Illinois' otters, usually includes multiple fish species, mollusks, crayfish, and amphibians—as found by Satterthwaite-Phillips and collaborators in their fatty acid analysis of otter's adipose tissue conducted in 2014 (Satterthwaite-Phillips et al. 2014). Other reports also indicate that river otters may pray on reptiles (including snakes and turtles), insects and their larvae, and occasionally other mammals and birds.

The variation in the diet of river otters makes them excellent biomonitors—organisms that accumulate in their tissues environmental contaminants—, providing quantitative information about the environment's quality in specific areas and over

time. In Illinois, another study conducted by Carpenter et al. (2014) identified organochlorine pesticides such as dieldrin and DDE (a byproduct of DDT insecticide) in river otters, even though these contaminants were banned more than 30 years ago. Like many other environmental contaminants, organochlorine pesticides are difficult to metabolize, accumulating in fatty tissues and other organs, making them toxic and lethal for humans and wildlife. Carpenter et al. (2014) demonstrate the importance of river otters as biomonitors.

To better study otters, researchers have focused on understanding the otter's biology and habitat use. It is important to understand otter data collection methods and how to compare results across studies to get the best information from the available data. However, because otters are in the water most of the time, they can be hard to monitor and observe. Some studies may use intraabdominal telemetry devices to monitor otters' activity. Other studies may analyze otter's behavior on land using camera traps and by surveying their scats. All these methods can assist with otter detection and data collection.

"Otters use latrines—recurring terrestrial sites—to excrete feces and leave scent-markers for signaling. Latrines, in turn, are used as communication stations where individuals pass information via olfactory cues (Green et al., 2015)."

Those studies that want to evaluate otters' activity without the necessity of capturing the animals and implanting an intraabdominal telemetry device can examine their activities when they come on land using camera traps and looking for scats at terrestrial sites known to be visited by otters. Otters use latrines—recurring terrestrial sites—to excrete feces and leave scent-markers for signaling. In turn, latrines are used as *communication stations* where individual otters pass information

via olfactory cues (Green et al., 2015). As such, latrines are good sites to set up camera traps to study otters. However, researchers need to evaluate if the data recorded by different methods across studies are comparable; only then can the data be extrapolated and used in analyses to make predictions that advance our knowledge of these species.

Figure 1. *River otters are visiting a latrine site. In the video, one of the otters leaves a live fish at the latrine. Interestingly, later at night, an otter can be seen picking up the fish. See the video here.*

In the manuscript, *A comparison of three methods to evaluate otter latrine activity*—a research study released online in 2018 by the Journal of Wildlife Diseases—the authors discuss the ecological monitoring of river otters in Illinois and the importance of *"understanding difficulties and similarities when comparing study results."* (Rivera et al., 2018). Researchers commonly use different visitation rates (individual, group, and scat visitation rates) to evaluate river otters' activity at latrine sites. However, a comparison of the information inferred from the data collected by trail cameras and detection of scats had not been previously assessed. In this study, the authors sought to find the best method for determining when and how often otters visit the latrines and evaluated if the visitation rates obtained from video footage (individual or group) and scats provide similar or different information (Rivera et al., 2018).

The tools used to collect these measurements included: 1) trail cameras that would record otter's visits (direct method of detection) and 2) a portable grid developed for this study using measuring tapes to help identify new scats (indirect method of detection; Figure 2). Researchers collected direct and indirect measurements during a thirteen-month field survey. They set up digital trail cameras at two locations, at a river latrine, and at a pond latrine. They replaced the memory cards once per week and visited the sites to look for scats twice per week. For scat measurement, the grid was laid out in the latrine area (Figure 2). They took photos of the scat grid, counted new droppings (scats and glandular secretions), and recorded distinctive characteristics such as size and visible pray items.

Figure 2*. By implementing methods such as The Portable Grid System used in this study, researchers will be able to compare results among studies effectively (Rivera et al., 2018).*

Otter detection methods were used to calculate three types of visitation rates. One visitation rate was based on scats detection, and two visitation rates were based on video footage (individual visitation and group visitation). The differences in visitation rates based on video footage were that group visitation counted the total number of otter recording-events (1 recording = 1 visit independently of the number of otters in the recording); While individual visitation counted the number of otters per recording (each otter was one visit; Figure 3).

Figure 3. *Visitation rates can vary depending on the way the video is analyzed. For instance, in this video, we see four otters. The group of 4 otters can be counted as one visit (1 video = 1 visit) or as 4 visits (1 visit per otter).*

The team notes that both indirect and direct detection methods are useful tools for researching otters at latrine sites. Cameras and grids are easy to take in one go and provide valuable information. However, while they provide related data points, researchers need to meticulously explain and clearly define their methodology and interpretation of the data in order to allow researchers to compare the data across studies. Even the way terminology is used needs to be standardized. For instance, the latrine's location (habitat characteristics) and the months/seasons when the latrine is used could significantly impact the interpretation of the results.

Moreover, the data obtained may differ with the method used and the month when the data is collected. For example, while otter's research in Maryland and Pennsylvania suggested that the best time to monitor river otter scats was during September and March, with the lowest being the winter months (Olson et al., 2008); in Illinois, December and January were the two highest scat detection months (Rivera et al., 2018). As it turns out, December and January are also their mating season in Illinois and perhaps the best time for studies to take place.

Thanks to the information provided by the methods commonly used to evaluate otters' activity at latrine sites, research can be carried out more economically and efficiently.

Video detection methods provide information about the most popular months when groups visit latrines and when otters are only traveling through or stopping only for a quick sniff (without leaving scats). On the other hand, during cold winter months — when cameras may fail — the indirect scat detection method would be the most reliable option, as in this study, scat detection was easy to identify in the snow and continued to provide data. Ultimately, when it comes to ecological monitoring, agreement regarding the terms used, detailed description of the data used when using terminology in a research study, and presenting detailed research protocols will improve the effectiveness in comparing results between studies across geographical locations and time.

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