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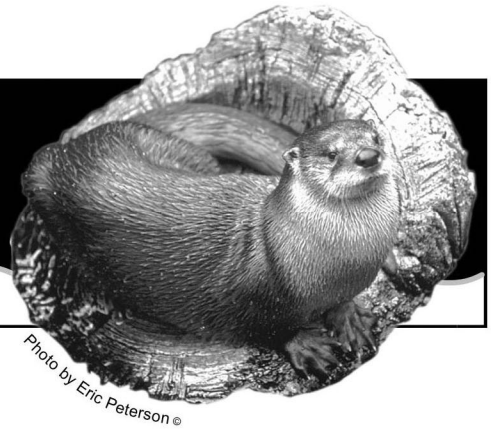

Population Survey for River Otters in the Rocky Mountain National Park

A Progress Report for 2012

National Park Service, Rocky Mountain National Park

By Merav Ben-David[1]

[1]**Department of Zoology and Physiology, University of Wyoming.**

Abstract

We conducted bi-annual population surveys of river otters (*Lontra canadensis*) in Rocky Mountain National Park (RMNP) since spring 2001 (total of 24 surveys). During these surveys, we identify latrine sites, monitor scat deposition as an index of population size, and evaluate seasonal changes in latrine use. In 2012, we surveyed 25 km of river in spring and fall. Spring latrine density was the highest recorded since 2001 and the number of feces per site was the fourth highest in the 12 years of surveys. In contrast, latrine densities and fecal deposition were lower in fall and comparable to other years. Using an equation provided by Mowry et al. (2011) relating otter density to latrine density and fecal deposition from several rivers in Missouri, we estimated that the density of otters in RMNP ranged from a low of 0.13 otters per km in spring 2007 to 0.89 in spring 2012. In fall, otter density varied from 0.02 in fall 2006 to 0.42 in fall 2001. When converted to abundance (by multiplying density by the length of river surveyed at each session), otter numbers ranged from 0 in fall 2006 to 22 in spring 2012 and averaged 5 (± 2, 95% confidence interval) across all surveys. Otter density was positively related to stream flow in the month preceding the survey. These results suggest that a limited number of individual otters occupy the Colorado River within RMNP and use of this section of river is dependent on water flow. Because climate predictions suggest that drought conditions will persist in the Rocky Mountain Region, otter monitoring should continue in the future.

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Colorado River in Rocky Mountain National Park Photo by Tracy Johnston

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THE RIVER OTTER JOURNAL

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the River Otter Alliance.

River Otter Alliance Mission

The River Otter Alliance promotes the survival of the North American River Otter (*Lontra canadensis*) through education, research and habitat protection. We support current research and reintroduction programs, monitor abundance and distribution in the United States, and educate the general public through our newsletter, THE RIVER OTTER JOURNAL, on the need to restore and sustain River Otter populations.

Our goal is to be a center of communications among wildlife biologists, environmental organizations, fishermen, and all interested parties on a national and international basis, in order to ensure the healthy future of the North American River Otter.

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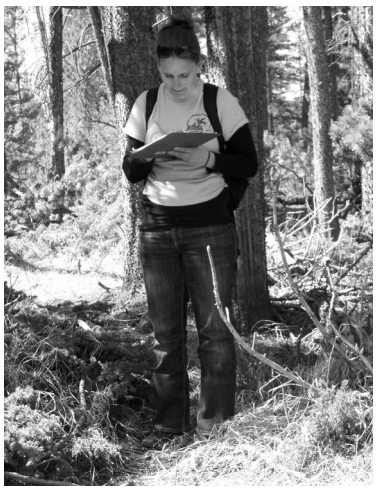
Introduction

River otters (*Lontra canadensis*) are piscivorous predators, which forage near the apex of the trophic pyramid and readily accumulate high levels of pollutants (Clark et al.1981, Halbrook et al. 1996, Duffy et al. 1994, 1996, Ben-David et al. 2001a, 2001b). Indeed, river otters in North America were reduced throughout much of their historic range by the early 1900s because of pollution, urbanization, and overharvest (Serfass et al. 1993, Larivière and Walton 1998). Recovery of river otter populations in North America was achieved mainly through reintroductions across the country (Johnson and Berkley 1999, Melquist et al. 2003, Raesly 2001).

In 1975, the Colorado Wildlife Commission designated the river otter a "state endangered species" (CDOW 2003). Reintroduction efforts were initiated shortly thereafter (Berg 1999). In total, between 114 and 122 otters were released in five locations (Colorado River in Rocky Mountain National Park (RMNP), the Cheesman Reservoir, the Dolores River, the Gunnison River, and the Piedra River; CDOW 2003). Recent surveys suggest that reintroduced otters have survived and populations have been established along several rivers and reservoirs in the state of Colorado (Beck 1992, Berg 1999, DePue 2002a, 2002b, Mack 1985).

As part of a larger study, evaluating the status of river otters in Colorado, we initiated population surveys in RMNP. The goals of the surveys were to identify river otter latrine sites along the upper reaches of the Colorado River within RMNP, monitor scat deposition as an index of population size, and evaluate seasonal changes in latrine use to determine the preferred sampling period.



Jessica Grunow Logs Site Data Photo by Tracy Johnston

Methods

Sampling design: Riverbank was surveyed for latrine sites by multiple observers from the Student Chapters of the Wildlife Society at the University of Wyoming and Colorado State University. Teams were led by experts and all participants were trained prior to the survey. Surveys were conducted over 12 years, in two sampling periods: spring (late April to early May) and fall (late September). Total stream length surveyed ranged from 7.2 km in 2010 to 25 km in 2005, averaging 16.9 km (± 1.1 SE). In 2012, 20 km were surveyed in spring and fall.

Data collection and analyses: Latrine sites of otters were identified by trails entering the water, tracks, and feces. The location of each site was determined using handheld GPS units and recorded. Each site was then characterized with respect to topography, composition of terrestrial vegetation, composition of river substrate, and presence of feces. Locations of otter latrine sites were plotted on a digital map of RMNP with ArcView 3.2 (Redlands, CA). Length of stream surveyed was calculated by measuring distances between all sample locations using ArcView. Latrine density was calculated as the number of sites per km of stream. For each survey the average number of feces per site was calculated by dividing the total count by the number of latrines.

Results

A lower density of latrines occurred in fall surveys (0.53 ± 0.15; mean ± SE) compared with spring surveys (1.58 ± 0.34) in all years (Fig. 1; paired-samples *t*-test, $n = 12$, $P = 0.01$) except in 2008, where latrine density was slightly higher in fall (Fig. 1). In 2012, latrine density was the highest recorded in the past 12 years; these values declined in fall (Fig. 1). Although there were, in general, fewer feces per site in fall surveys (2.37 ± 0.54) than spring (4.27 ± 0.86) in all years, the difference was only marginally significant (paired-samples *t*-test, $n = 12$, $P = 0.07$; Fig. 2). Over all years, otters reused 30 latrines or 8.1% (of a total of 370 described) more than once.

Mowry et al. (2011) described a relationship between latrine density and feces per site and river otter density for several rivers in Missouri from non-invasive genetic analyses of scats. Using their equation: Otter density = 0.01574 + (0.03103 x scats per latrine) + (0.18036 x latrines per km), which explained 76% of the variation in otter density, and the data described above, we estimated otter density for RMNP from 2001 and 2012. Otter density varied from 0.13 otters per km in spring 2007 to 0.89 in spring 2012 (Figure 3). In fall, otter density varied from 0.02 in fall 2006 to 0.42 in fall 2001 (Figure 3). When converted to abundance (by multiplying density by the length of river surveyed at each session), otter numbers ranged from 0 in fall 2006 to 22 in spring 2012 and averaged 5 (± 2, 95% confidence interval) across all surveys (Figure 3). Otter density was positively related to water flow in the Colorado River during the month preceding the survey (Figure 4). This relationship was largely driven by fall data and spring 2012 data.

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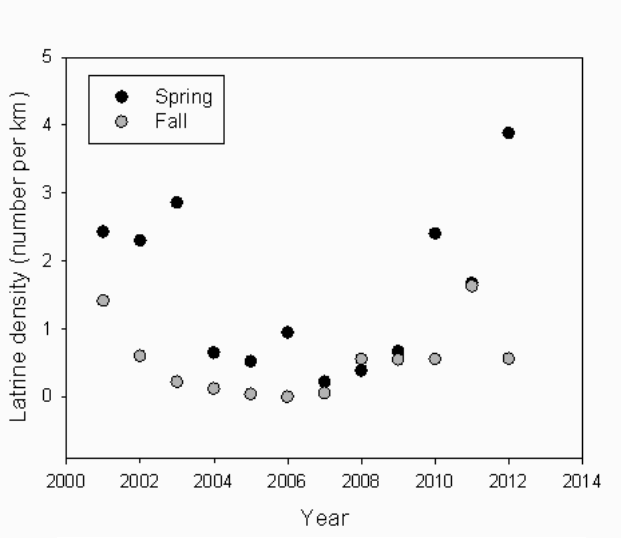

Figure 1. Number of river otter latrine sites per km of stream along the Colorado River within Rocky Mountain National Park (RMNP) in spring and fall 2001 – 2012.

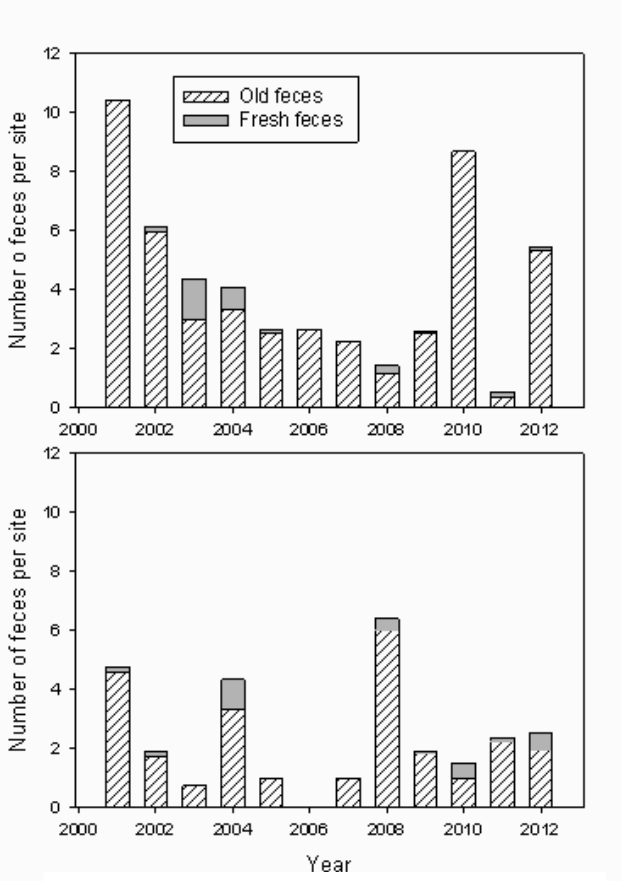

Figure 2. Number of feces per site counted at river otter activity sites in RMNP in spring (top) and fall (bottom) 2001 – 2012.

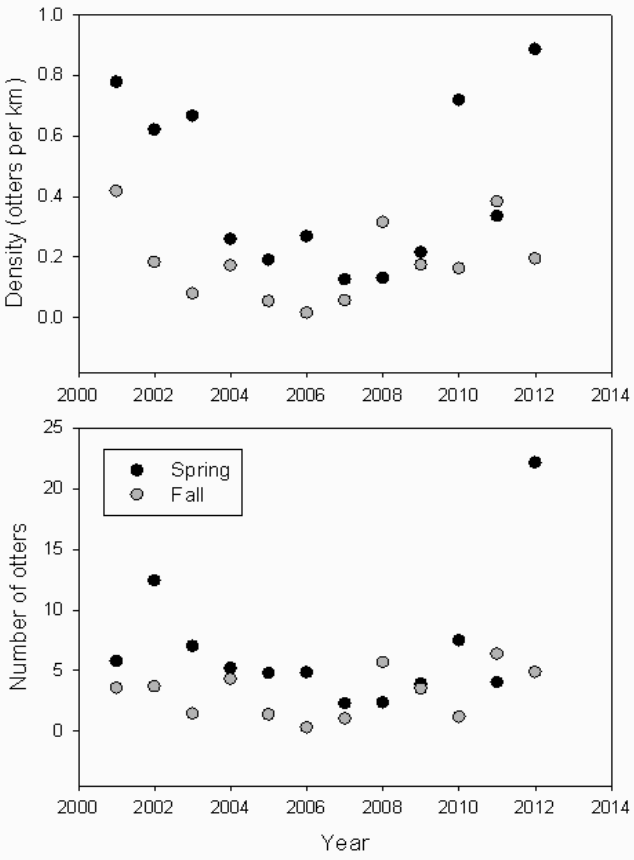

Figure 3. Estimated density of otters (number per km; top) in RMNP and abundance (bottom) in spring and fall 2001 - 2012. Density was calculated based on an equation describing the relation between latrine density and feces per site provided by Mowry et al. (2011). Abundance was calculated by multiplying density by the river kilometers surveyed at each survey.

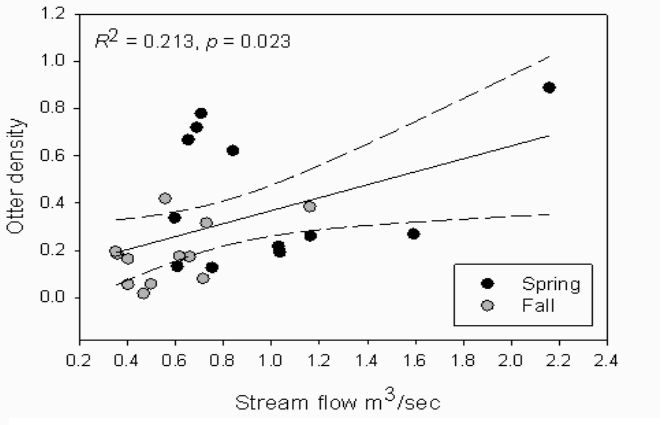

Figure 4. Number of river otter latrine sites per km of stream along the Colorado River within Rocky Mountain National Park (RMNP) in spring and fall 2001 – 2012.

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Discussion

Our monitoring efforts of river otters in RMNP have continued for 12 years, during which we have recorded a dramatic decline in indices of activity and what seems like a recovery in 2010 - 2012. Nonetheless, conversion of latrine density and fecal deposition to estimates of density and abundance based on the equations developed by Mowry et al. (2011) suggests that the changes we observed over time did not stem from large population fluctuations. Indeed, the number of otters using the Kuwanachee Valley ranges between 2 and 7 individuals with the occasional increase to between 12 and 22 individuals in spring. It is likely that our density estimates derived from an equation developed in Missouri would be somewhat biased because Missouri rivers likely support higher abundance and diversity of fishes, compared to the high elevation cold water Colorado River. Nonetheless, the density estimates we obtained from these calculations were within the range observed for river otters in several inland waters. For example, Melquist et al. (2003) report that in fresh water systems otter density ranges from 0.17 to 0.37 otters per km. Our estimates for RMNP ranged from 0.13-0.89 in spring and 0.11-0.42 in fall; values that are within or exceeding the reported range in the literature. Mowry et al. (2011) reported densities ranging from 0.12-0.51 in Missouri, similar to our calculated densities in RMNP.

These calculated densities for the Colorado River within RMNP translated into a relatively low number of individuals. This, together with our observation that the location of latrines along this watercourse is inconsistent year to year (i.e., only 8.1% of all sites reused), provides further support to the notion that otter use of this section of river is ephemeral. In other systems, river otters show high fidelity to latrines sites (Ben-David et al. 2005, Bowyer et al. 2003, Crait and Ben-David 2006, DePue and Ben-David 2010), where visitation of several generations of otters is likely facilitated through maternal instruction (Tinker et al. 2008). It is possible that use of RMNP is a result of transient otters that have no knowledge of previous sites. To better understand the reliance of otters on the upper sections of the Colorado River, additional methods of monitoring otters, such as radiotelemetry, should be employed.

Unfortunately, non-invasive genetic sampling (Guertin et al. 2012) are unlikely to be successfully employed to study river otter ecology in RMNP because few fresh feces have been collected even during years with high fecal deposition rate.
Our observation that river otter density along the Colorado River within RMNP may be related to water flow in the month preceding the survey highlights the importance of continued monitoring effects. Recent analyses of the effects of global warming on precipitation patterns in the Rocky Mountain Region suggest that the 21st century will be characterized by a mega drought (Schwalm et al. 2012). Thus, water flow in the upper reaches of the Colorado River will likely decline. Continued monitoring of river otter activity along this section of river will provide information on the responses of these piscivores to the effects of climate change.

River Otter Hiding in the Shadows
Photo by Tracy Johnston

River Otters Swimming in the Colorado River
Photo by Tim Brtis

Acknowledgments

We are thankful to members of the Student Chapter of the Wildlife Society at the University of Wyoming and Colorado State University for assistance in collection of data. Special thanks to T. Johnston who has been a consistent participant and team leader over the years. GIS coverages were obtained from R. Thomas of the RMNP GIS Program. N. P. Nibblelink assisted with GIS analyses. Rocky Mountain National Park personnel provided logistical support. Funding for the project was provided by Colorado Ocean Journey, The River Otter Alliance, and the Department of Zoology and Physiology at the University of Wyoming.

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The River Otter Alliance is a non-profit, tax-exempt group organized to promote the survival of the North American River Otter (*Lontra canadensis*) though education, research, reintroduction, and habitat protection.

All work and efforts for this organization and newsletter are on a volunteer basis by those who share a common concern for the welfare of the river otter and its habitat. We invite all interested persons to contribute their time at any level of the organization.

Otter Updates

- On December 18, 2012, the U.S. Fish and Wildlife Service signed a ruling to repeal Southern Californiaôs ñno otter zoneò policy, whereby sea otters were removed from certain lucrative fishing sites along the coast in order to protect fishing there. The government decision will promote the recovery of endangered sea otter populations by encouraging natural range expansion. Defenders of Wildlife supporters sent more than 11,600 comments to USFWS to show their support for the termination of the ñno otter zone.ò

- On January 22, 2013, the Department of National Parks, Wildlife and Plant Conservation in Thailand confiscated 11 Asian small-clawed otters at Suvarnabhumi airport. The otter is a protected species under the Wildlife Preservation and Protection Act, which prohibits unpermitted exports. The confiscated otters were redirected to the Noknam Bangpra Wildlife Breeding Centre in Chon Buri province and the Huai Ka Khaeng Wildlife Breeding Centre in Uthai Thani province.

- Also on January 22, 2013, an Alaskan man pleaded guilty to violating the Marine Mammal Protection Act through the illegal harvest and sale of 87 sea otters. Three additional Alaskans sentenced in the investigation were previously convicted of related crimes against sea otters.

- The Durham Otter Project, carried out by the Durham Biodiversity Partnership in the UK is quickly nearing completion. By the end of March, 2013, the three-year-long effort to protect the Eurasian otter via habitat restoration will have installed more than 40 artificial otter holts and nine mammal ledges, created more than half a hectare of reed bed, restored or improved nearly one kilometer of wetland ditches, and created four new off-stream pools in northeastern Great Britain.

- In December, 2012, a resident of Kinmen, Taiwan captured a photograph of an Asian small-clawed otter bounding along the Wuchiang River on the western side of the outlying island. Otters are locally endangered and have struggled to survive in Kinmen, despite efforts to conserve the species in the eastern part of the island. Recently verified to be an otter, the photo is encouraging to local conservation officials.

- The following river otter sightings were reported in Yellowstone National Park since the last newsletter:
  - ***August 29, 2012***: Participants of the Lamar Wildlife Getaway observed some otter tracks in Little America.
  - ***October 4, 2012***: Participants of the Autumn Day Hiking course spotted 3 otters while hiking along the Yellowstone River on the northern range. The otters were observed swimming and diving, then grooming one another on a rock.
  - ***December 4, 2012 and December 14, 2012***: Participants of Lamar Valley Wolf Week spotted otters swimming in the Lamar River in the middle of the Valley.
  - ***December 26, 2012***: Old Faithful Winter Expedition participants spotted a group of young otters at Chittenden Bridge and watched the siblings wrestle and play on the ice for over twenty minutes.

Tafi the Otter…
The Otter that Loves Water

By Zoe Bowers

Tafi is a river otter; Alaskaôs where sheôs from
Sheôs traveled many places, even Hawaii and Galveston
In a ship, in a plane, and by land in a car
Sheôs covered more miles than any otter, by far.

Spell her name with a big T, then a and fõ but donôt add y
Tafiôs name is different than candy, it ends with the letter i
Draw a lot of circles, and youõll see how she swims
She goes round and round so fast; her paws are like fins.

Tafi learned to swim in a bathtub, not outside in open air,
Once she got the hang of it,
she searched for water everywhere
She found some in the toilet, the sink, and shower too
Then out the door she wanderedé what was she to do?

She heard neighbor kids splashing in their little play pool
They called to Tafi, ñjoin us, but thereôs one important ruleò
The boy announced: ñNo biting allowed, but kisses are OKò
The girl giggled; the baby gurgled; ñotter come play!ò

So into the pool Tafi scampered for a day of fun
But mainly to cool off from the warm summer sun
Among their little legs she slithered like an eel
The kids had to try not to let out a squeal!

But the play pool was shallow; her tub was deep
She could swim up and down, from a diving board leap
After her pelt became soaked to the skin
Tafi waddled back home, scratched ñLet me in! Let me in!ò

She wanted her towels; they were the best
For drying her fur and lining her nest
I kneeled at the door holding towels galore
She leapt; we tumbled, and then rolled on the floor.

This was a moment to remember evermore
To put in my collection of precious otter lore.

Tafi the Otter
Photo by Jon Eric Dieges

President's Message

Dear Readers,

Welcome to the final edition of The River Otter Journal. Included are four summary reports for research projects sponsored in part by grants from the River Otter Alliance (ROA): ñDiet and Activity of River Otters (*Lontra Canadensis*) Based on Seasons and Ecosystemsò; ñEvaluating the Relationship Between River Otters and River Otter Latrinesò; ñIn Search of Otters: A Case Study at Parsa Wildlife Reserve of Nepalò; and ñPopulation Survey for River Otters in the Rocky Mountain National Park.ò Also included are some photos from wildlife rehabilitator Melanie Haire, who recently received a grant from the ROA to help purchase construction supplies for a new river otter treatment structure.

Since this is our final newsletter, we want to extend a special thank you to the persons who have allowed our group to contribute to the survival of the North American River Otter through education, research and habitat protection. First, we thank our founders, Carol Peterson, John Mulvihill, Leslie Malville, and Joe Powell who started the ROA in 1989. We especially want to thank Carol and John who have kept the group going through the years and have served on the Board of Directors since the beginning. Second, thank you also to long-time Board Members Judy Berg, David Berg and Tracy Johnston, who have served on the Board for 17 or more years in multiple positions, including President. Thanks also to our Scientific Advisors through the years: Dr. Paul Polechla, Dr. Merav Ben-David, and Dr. Tom Serfass. Also, thank you to Board Members Diane Tomecek, Glenn Chambers, Dr. Jo Thompson, Jan Reed-Smith, Melissa Margetts, and Jennifer Bohrman. Thank you to all others who have aided the group in various ways, including contributions of articles and / or photographs for our newsletter.

And finally, thank you to ***you***, our long-time members and supporters, without whom the River Otter Alliance could not have continued its mission for over 22 years.

As promised, the River Otter Alliance will continue to disburse the small amount of funds remaining in its treasury to grants related to otter research, education, reintroduction, rehabilitation and habitat protection. We will continue to post future grant summary reports received on our web site at www.otternet.com/ROA.

Sincerely,

The River Otter Alliance Board of Directors

Diet and Activity of River Otters (*Lontra canadensis*) Based on Seasons and Ecosystems

***By Hilary Cosby*[1]**
[1]Wildlife MSc Candidate, Humboldt State University, Arcata, CA

Hilary collects river otter scats at the Hookton Slough dock latrine site at the Humboldt National Wildlife Refuge in November, 2011.

Purpose and Objectives of the Project

Coastal river otters in Humboldt County, California eat a diet comprised mostly of fish, with some invertebrates and birds (Reeves 1988, Penland and Black 2009). However, no studies had examined otter diet differences or specific species of fish or birds consumed between freshwater, brackish, and marine systems. The Humboldt Bay system is unique in that it contains many examples of all three habitats with otters resident in each of them (Penland and Black 2009, Brzeski 2010). In order to assess the impact of otters on different prey populations in northern California and to help inform future management policies regarding otters, managers first need to know what species otters are consuming in different ecosystem types, and approximately how much they are taking, while accounting for possible seasonal variation in water levels and animal movements (e.g. spawning, migration, etc.).The objectives of my thesis were to 1) determine the species of fish and birds that otters are eating and in what proportions they are eaten, 2) test if otter diet is influenced by habitat (marine, brackish, or freshwater) and season, and 3) find out if otter activity is influenced by migratory fish movements (if they ñfollowò salmonids inland during the winter spawning).

Scientific Methodology

Otter scats were collected across central Humboldt County in northern coastal California. I visited previously identified and recently found latrine sites from 10 distinct locations in Humboldt County every 2 weeks from May 2011 through May 2012. I divided the year into three equal-length seasons based on the mild Pacific Northwest climate: summer (May 1-August 31), fall (September 1-December 20), and winter/spring (when salmon spawn and migrating birds pass through Humboldt; December 21-April 30). At each latrine, I collected three quarters of every scat present, smashing the remaining portions of scat into the substrate with a clean glove or bag. This allowed otter scent to remain while minimizing any potential change in marking behavior, and to prevent recounting old scats in the future. I also determined scat marking intensity as an indicator of otter activity, which is the total number of scats found at each site during each visit.

River otter scats at the Hookton Slough dock latrine site at the Humboldt National Wildlife Refuge in November, 2011.

Before diet analysis, I placed each scat in a separate nylon knee-high stocking with a unique scat ID label. I then washed the scats in a washing machine, and dried them. Undigested prey remains were examined under a dissecting scope and identified to family, genus or species using a compound microscope. To identify fish, bird, amphibian, and invertebrate taxa, I examined sagittal otoliths (fish ear bones), vertebrae, jaws, scales, feathers, and shells and compared them to general identification keys (Webb 1976, Morrow 1979, Harvey et al. 2000), bird feathers from the Humboldt State University Wildlife Museum Collection, and a fish otolith reference collection of some local species.

I compared my diet results with concurrent fish collection data (general abundances of local species) from the California Department of Fish and Game (CDFG) to see how general proportions of particular species otters are eating compared to the relative amount available according to the fish collections.

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To examine whether otters were consuming birds in proportion to availability across sites and seasons, I conducted an index count of all shorebirds and waterfowl/rallids seen within 50 m of each latrine upon arrival for scat collection. I compared these count indices to the number of otter scats that contained bird feathers from the associated sites and seasons.

To evaluate the importance of different prey items, I calculated the frequency of occurrence of all the prey found in scat. In order to examine possible prey differences between different sites and seasons, I used a combination of Principal Components Analysis (PCA), Wardôs Cluster Analysis, chi-square tests, and Fisherôs exact tests. Based on the results of the PCA and cluster analysis, I inferred environmental relationships to create groups of latrine sites containing similar diets (ñecotypesò).

Main Findings

A total of 1,411 river otter scats were collected and analyzed from May 2011-May 2012. The frequency of occurrence for all prey items was determined for the scats across 10 sites. Fish were the most common prey item at all sites, followed by crustaceans (crab [e.g. *Cancer sp.*] and crayfish [e.g. *Pacifastacus sp.*]), birds, amphibians, other items, and insects. The ñOtherò category was created for all trace, incidental, and unidentifiable prey items. For fish taxa identified in scat, three-spined sticklebacks (*Gasterosteus aculeatus*), sculpins (Cottidae), and gunnels (Pholidae) had frequencies of occurrence of at least 5%. Other fish families in the diet included gobies (Gobiidae), surfperches (Embiotocidae), salmonids (Salmonidae), flatfish (Pleuronectiformes), smelt (Osmeridae), toadfish (Batrachoididae), and eelpouts (Zoarcidae). The most common birds consumed were ducks of the genus *Anas,* and American coots (*Fulica Americana;* Figure 1).

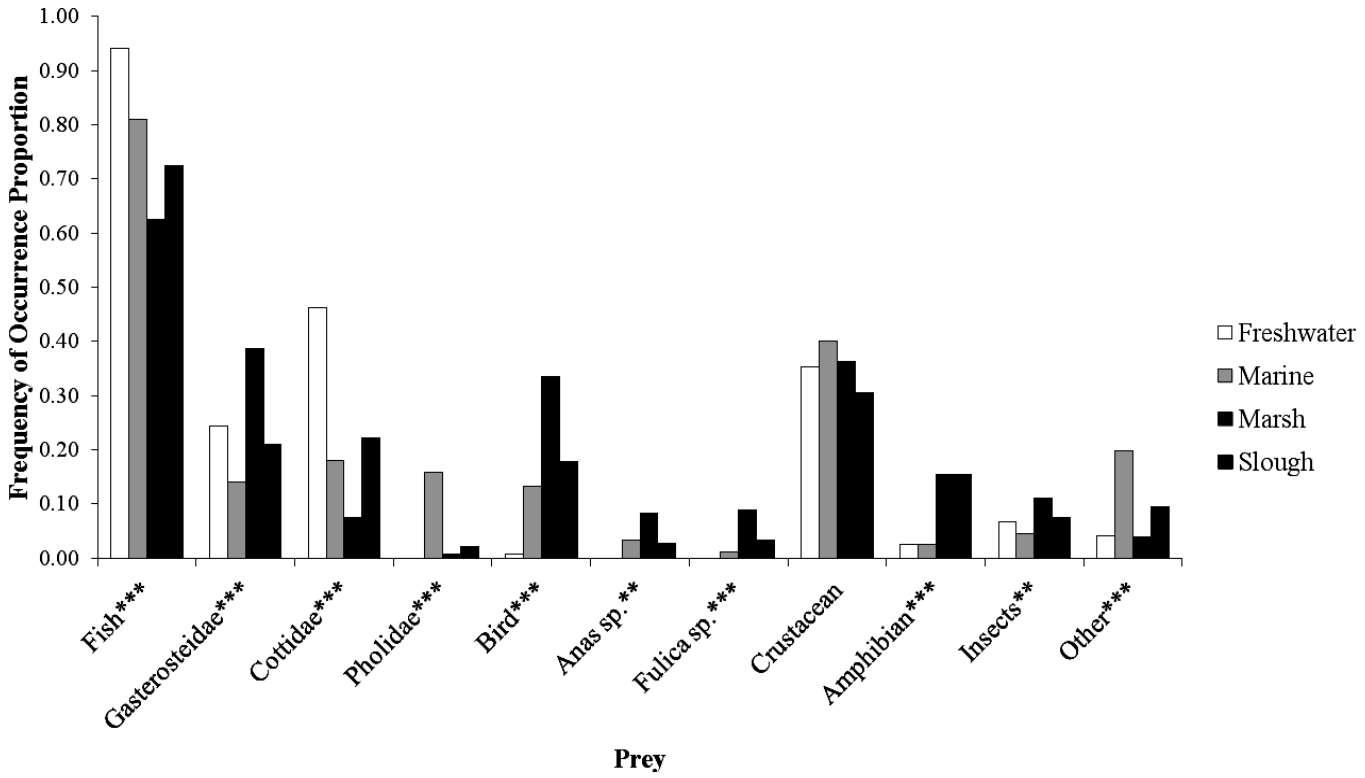

Figure 1. Prey frequency of occurrence (for prey items that comprised at least 4.5% total frequency of occurrence) for each of the four ecotypes for river otter scats collected in Humboldt County, California, 2011-2012.
(P significance levels:''< 0.0005, '**'< 0.005, '*'< 0.05).***

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Seasonal and regional diet variations in Humboldt Bay river otters are very distinct. Using Principal Components Analysis, I was able to configure a pattern of otter diets by latrine site across four different ecotype/habitat types: freshwater, marine, marsh, and slough. The ñmarshò ecotype was characterized by fewer sculpins and gunnels and a diet high in sticklebacks, birds, amphibians, and insects. The otters in the ñsloughò ecotype ate a wide variety of prey, but ate fewer fish, crustaceans, and gunnels, and more sculpins and amphibians. The ñmarineò ecotype was characterized by an otter diet high in fish, crustaceans, and gunnels. The ñfreshwaterò ecotype (one site) was characterized by very few birds and high levels of fish, particularly sculpins, but also a relatively large percentage of salmonids. These groupings probably occur as a function of foraging habitat and prey types (Figure 2). There was also significantly strong seasonal usage within and between each of the four ecotypes over the course of the year based on scat marking intensity. The highest marking activity was in the fall and lowest marking in the winter/spring. River otters often alter their spatial distribution according to the availability of certain key seasonal resources (Mason and Macdonald 1986, Reid et al. 1994, Crait and Ben-David 2006), and it appears river otters in Humboldt County are no exception.

As I hypothesized, salmon were observed in otter scat more frequently during the winter/spring spawning season than in other seasons. The increase in marking intensity at the freshwater ecotype during the winter/spring season was over double what was expected, the highest percent increase in marking intensity across all ecotypes throughout the entire year, suggesting that otters are ñfollowingò spawning salmon inland from the coast. Since I only had one freshwater site in my study, it is highly probable that there are more inland latrines not surveyed that are being used seasonally according to salmonid levels.

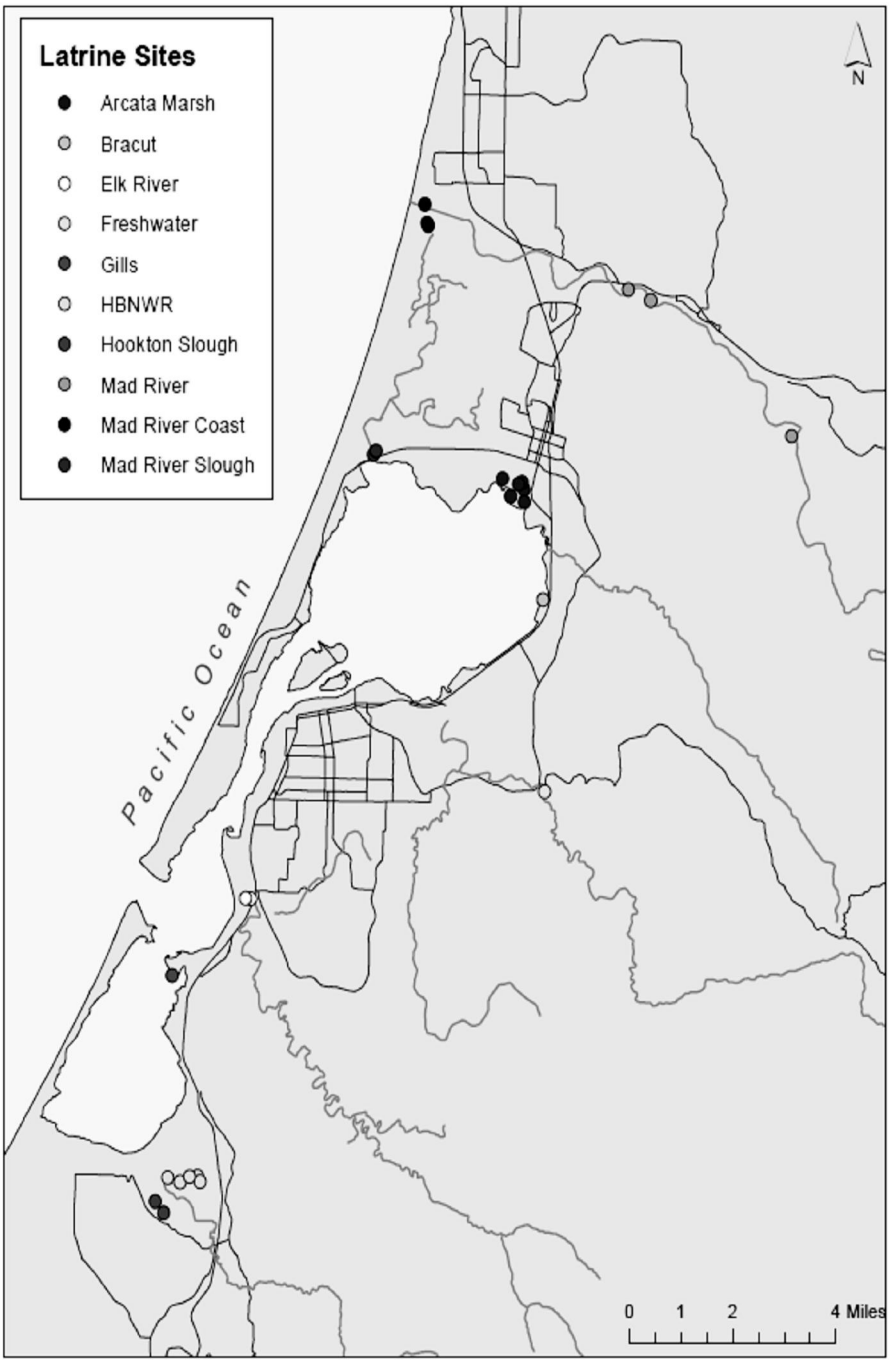

Figure 2. Ecotypes of similar latrine sites based on river otter diet differences determined by Principal Components Analysis in Humboldt County, California, 2011 – 2012.

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Fish consumed by otters differed significantly from the fish abundances CDFG seined, yet otters are still taking many of the same fish, overlapping 10 out of 13 families sampled. Sticklebacks and sculpins were both most common in otter diet and were seined in the greatest numbers. Birds formed a higher percentage (21.3%) of yearly otter diet in Humboldt County than almost any other area where they have been studied in North America (Greer 1955, Toweill 1974, Modaferri and Yocum 1980, Melquist and Hornocker 1983, Reid et al. 1994). The number of birds (waterfowl, coots, and shorebirds) counted at each ecotype did not vary from the proportions of birds found in scat at each respective ecotype. There was a dramatic increase in bird consumption during the fall and winter seasons, which is the time of year many birds are stopping-over in Humboldt Bay during migration. Otters consumed the most birds at the marsh ecotype, where my bird index counts were highest. Otters are taking advantage of the high numbers of birds (particularly coots) during the bird migration season.

Conclusions

Coastal river otters in northern California eat a wide variety of prey, with an emphasis on fish, crustaceans, birds, amphibians, and insects. They switch their eating patterns depending on location, season, and resource availability, taking advantage of natural processes like spawning and migration of a variety of prey.

Otters are aquatic keystone predators, so managing for an adequate prey base is critical for maintaining a healthy ecosystem. Though not a major contributor to otter diet around Humboldt Bay, my data suggests that otters do follow salmon during spawning season, and that salmon forms a more important part of otter diet further inland. Birds form a large part of otter diet around Humboldt Bay, and good quality bird habitat should continue to be managed for, especially during migration periods, at marsh sites.

Though time consuming, scat analysis using otoliths and other bones is a good non-invasive and relatively inexpensive way of describing otter diet. Future diet studies should focus on diet across a larger area with a greater number of inland sites, and be compared to concurrent fish availability surveys conducted at all latrine sites.

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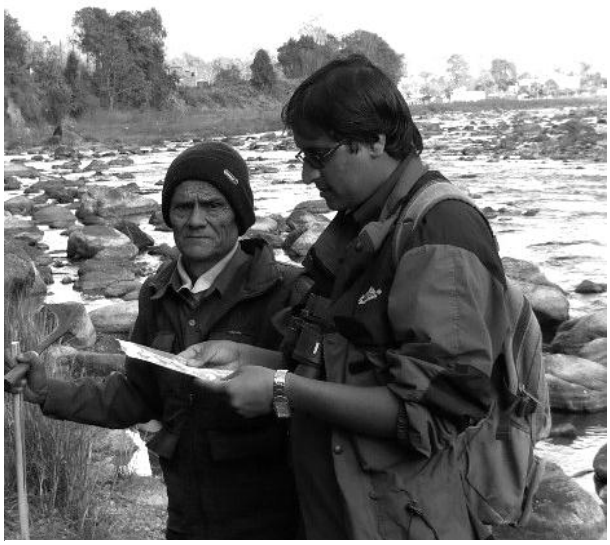
In Search of Otters: A Case Study at Parsa Wildlife Reserve of Nepal

By Gandhiv Kafle, Assistant Professor, IOF/TU, Nepal



Key Informant Interview
Photo by Gandhiv Kafle

Nepal holds three species of otters: the Eurasian otter (*Lutra lutra*), the Smooth-coated otter (*Lutrogale perspicillata*) and the Asian small-clawed otter (*Aonyx cinerea*), representing 1.6% of the mammals cited in the country. A preliminary survey was carried out in perennial water bodies in Parsa Wildlife Reserve (PWR) of Nepal in partnership with the River Otter Alliance, Chester Zoo, Sacramento Zoo, N.E.W. Zoological Society and IdeaWild. Core area of the PWR is the dry zone with no major perennial water sources. The major perennial water bodies are located in the buffer zone of the reserve ï The Rapti River. So Rapti River and its tributaries within the boundary of the PWR from Hetauda bridge up to Manahari were selected for systematic survey of the otters. However, preliminary rapid survey was conducted in dry rivers and streams for possible signs of otters in core zone of PWR with entry from Hattisar in Amlekhganj, to confirm the status of otters.

The major tools of data collection were direct observation, spraint and footprint analysis and key informant interviews with fishermen living and working in the catchment. Spraint and footprint survey was carried out along the bank of the Rapti River and its tributaries along each 600m stretch of the streams following the standard guidelines provided by Reuther et al. (2000). When sign/s of otter were recorded in 600m stretch, this section was left tagging it ópositiveô and then survey began in next 600m continuously. Spraints and footprints were searched by foot within five meters from water edge. Geographic coordinates of the otter signs were recorded using GPS instrument.

Sparsely occurred spraints of otters were observed in some locations along the surveyed riverbank and tributaries. The observed spraints were light grey, with fragments of fish, frog and crab remnants, and fragile with smell of fish scales. The opinion of the local people (the elder fishermen) who sighted otters around 30-40 years before gave important clue towards Smooth coated otter when the photographs of different species of otters were shown to them. From this, presence of Smooth Coated Otter (*Lutrogale perspicillata*) has been confirmed in Rapti River.

The study revealed that the distribution of otters along the river has diminished compared to last 30-40 years. Spraint analysis showed that the most abundant prey remains were fish bones and scales followed by crab, frog and unidentified remains.

The Karra stream adjacent below and above the Karra bridge in the buffer zone of Parsa Wildlife Reserve could possibly be used by Smooth coated otters. In Rapti River, sections from Hetauda to area in the river section under Martyr Memorial could possibly be used by Smooth coated otters. The adverse factors affecting otters in these areas include excessive sand and gravel extraction from riverbank (habitat destruction), high level of destructive fishing, human disturbance, migration, construction of roads along river banks, water pollution, drying of water sources in the context of changing climate and low level of public awareness.

Gradual sensitization and motivation of local people in the riverside towards otter conservation, and expansion of otter surveys with high scientific methods are recommended for long term benefit of otters in Rapti River of Parsa Widlife Reserve. It is also necessary to study the changing state of the habitat factors especially soil indicators to relate with the habitat suitability and current status of otters.

Otter Spraint
Photo by Gandhiv Kafle

Evaluating the Relationship between River Otters and River Otter Latrines

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Field assistant Katie Monick replaces data card in a SPYPOINT PRO-X video camera. Photo by Samantha Carpenter

Background

The Illinois Department of Natural Resources implemented a successful recovery plan for the North American river otter (*Lontra canadensis*) in Illinois between 1994 and 1997 (Bluett 2004); *L. canadensis* now occur statewide.

Latrine sites (terrestrial communication centers where river otters scent mark with scat, urine, and glandular secretions) indicate the presence of *L. canadensis*. Understanding temporal patterns and spatial variation of latrine use and scat deposition can inform river otter conservation and management decisions. In Illinois, otter latrine surveys will be conducted between August and October to determine the distribution, status, and trends of river otters (Lesmeister and Nielsen 2011).

Many aspects of latrine use by *L. canadensis* remain poorly understood, including the information that otters communicate at latrine sites (Melquist et al. 2003) and the relationship between otter activity and scat detection rates. Understanding the relationship between otter visitation rates and scat detection will help validate the use of presence-absence data from latrine surveys as a tool for population monitoring in Illinois. The goal of this study was to compare otter visitation rates and scat detection rates associated with two adjacent latrine sites in Illinois.

Methods

We selected two river otter latrine sites within the Vermillion River Conservation Opportunity Area in Fairmount, Illinois (east central Illinois). Latrine 1 was on a dam adjacent to a private fish pond; Latrine 2 was adjacent to the Salt Fork tributary of the Vermilion River. The two latrines were 34 m apart and connected by an animal made trail. We recorded otter visits to the latrines using SPYPOINTÊ PRO-X cameras. We defined an otter visit as the detection of an otter by the video camera, (i.e., four otters in one video were classified as four visits). Visitation rates were calculated as the number of otter visits recorded divided by the total working camera days in a month. Surveys for newly deposited otter scat in each latrine were conducted on a weekly to bi-weekly basis. Monthly scat detection rates were calculated as the number of surveys with new otter scat per month divided by the number of surveys conducted that month.

Results and Conclusions

Otter visitation rates to latrines: We recorded 183 otter visits to the two latrine sites between August 2011 and August 2012. Cameras operated for 192 camera days at Latrine 1 (Dam) and 188 camera days at Latrine 2 (river). Given that the two latrine sites are in close proximity and connected by an animal made trail used by river otters, we expected similar patterns of visitation rates at the both latrine sites. However, the winter months with the highest visitation rates in Latrine 1 (dam) were the months with lowest visitation rates in Latrine 2 (river) (Figure 1). Overall, visitation rates were lower at Latrine 2, peaking at 0.5 visits per camera day in March 2012 compared to 2.5 visits per camera day in December 2011 at Latrine 1.

Otter latrine surveys: In Latrine 1 (dam), monthly scat detection rates peaked from November 2011 to February 2012 (new scat was detected every survey in February 2012). In Latrine 2 (river), scat detection peaked multiple times during the year; scat detection rates in this latrine were lowest in August 2011 and highest in August 2012.

Comparison of visitation rates to scat detection rates: Preliminary analyses identified a significant relationship ($p < 0.01$, Pearsons r = 0.69) between the monthly visitation rates and monthly scat detection rates in Latrine 1, but no associations in Latrine 2.

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Even though our sample size of two latrine sites is very small, we identified seasonal variation in activity and scat deposition between latrines. Furthermore, we did not detect otter sign in Latrine 1 during August-September 2011, even though we recorded otter activity during those months and we detected otter sign in that latrine prior to August 2011. Therefore, if latrine surveys had been conducted in August 2011 and August 2012 at this site, results would have falsely suggested that a new latrine site had been established in 2012.

Future research to document the relationship between scat detection and latrine visitation rates at a larger number of latrine sites in this conservation area are required to understand the pattern of river otter activity in this corridor. Continued collection of data, an increased sample size, and broadening the geographic scale encompassed by our study would support science-informed management and conservation strategies for river otters in Illinois.

Otter Visits to Experimental Latrine Sites
Photos courtesy of Samantha Carpenter

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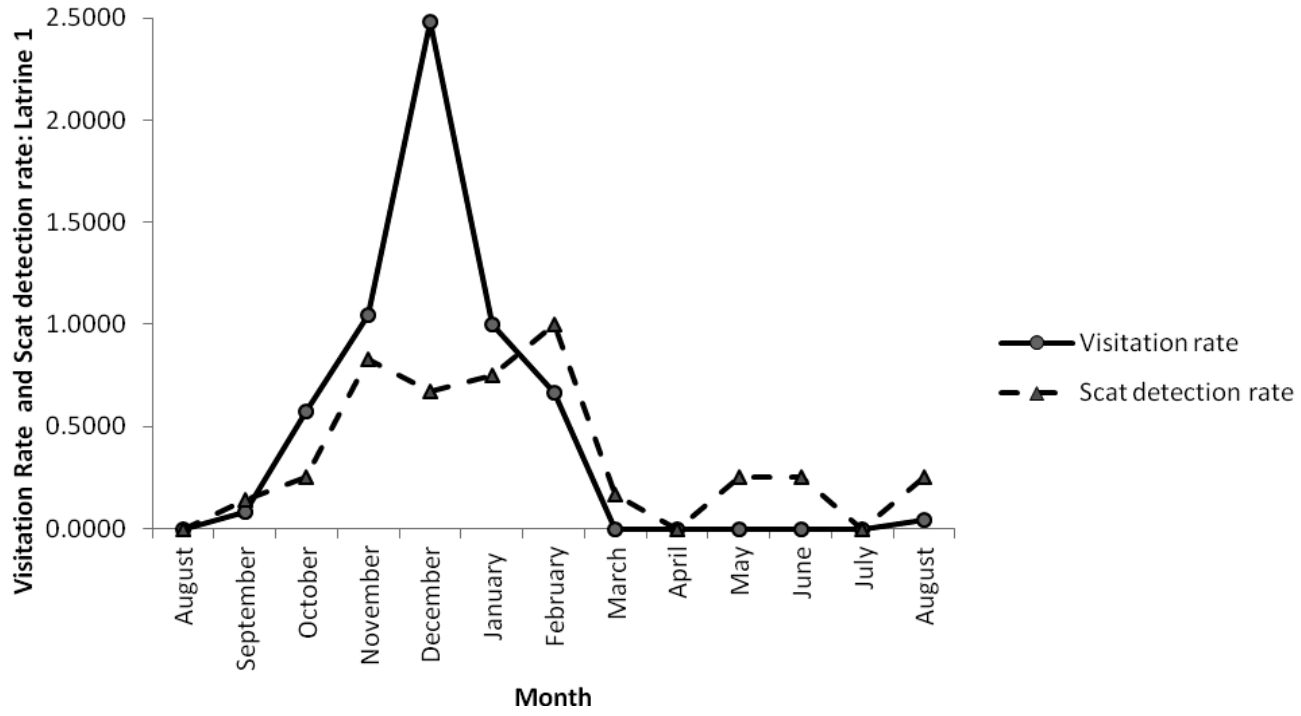
1a.



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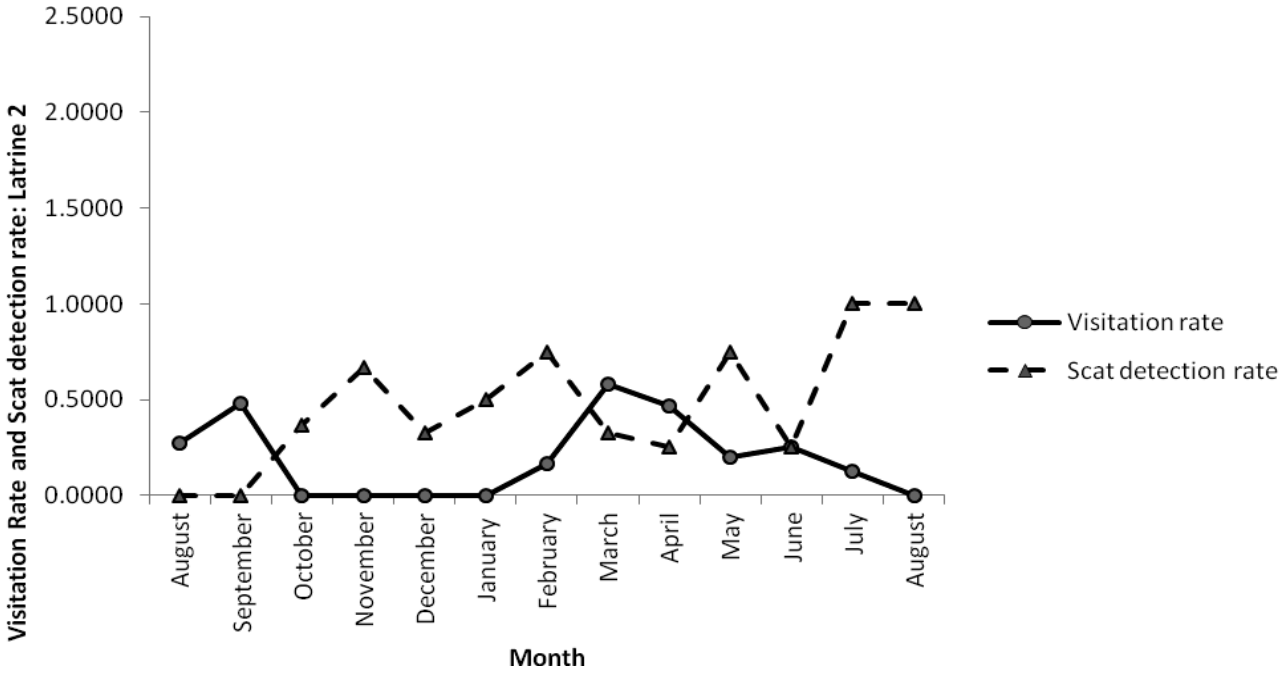

Figure 1. Visitation rates (number of otter visits per number of camera days during each month) and scat detection rates (number of surveys in which new scat was detected/total number of surveys each month) in Latrine 1(1a) and Latrine 2 (1b) from August 2011 through August 2012.

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Acknowledgements

We thank the River Otter Alliance for funding this project and the James Scholar Program, I-Stem, INHS and Animal Sciences at the University of Illinois in Urbana-Champaign for additional support. We extend our thanks to Kendall Annetti, Damian Satterthwaite-Phillips, Matthew Aardsma, Anna Bengston, and volunteers from the University of Illinois. Special thanks to Dan Newhouse from the Illinois Department of Natural Resources for his guidance on latrine site identification and to private landowners in Fairmount, Illinois for allowing us access to the study sites.

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Grants Awarded

The River Otter Alliance is pleased to announce it has awarded the following grants:

• A $1,040 grant to *Megan Isadore, River Otter Ecology Project* for game cameras and a GPS device to assist with river otter research. The *River Otter Ecology Project* (www.RiverOtterEcology.org) is a California non-profit corporation.

ñOur objective is to secure a viable future for river otters in Central California through ecological research, environmental education and strategic restoration partnerships. Through research, we will determine the conservation status and ecology of river otter populations in the San Francisco Bay Area, while also directly engaging the public in their protection through citizen science efforts, field-research opportunities, environmental education and restoration partnerships.ò

• A $200 grant to *Dr. Caroline DeLong, Rochester Institute of Technology* to construct training and testing objects used in a North American River Otter visual object recognition study to be held at Seneca Park Zoo in Rochester, New York.

ñSince there is very little known about the cognition and visual perception of North American river otters, this study will be the first to explore visual features of objects that are important to these animals (such as color, shape, size). Understanding more about visual features otters use to discriminate objects will significantly increase our knowledge of these animals, which could assist the Seneca Park Zoo in designing future enrichment opportunities as well as help in future conservation efforts.ò

• A $1,000 grant to *Elaina K. Burns, State University of New York* for materials used in ñA Non-Invasive Approach to Examine a Translocated Population of River Otter in the Finger Lakes Region of New York,ò a follow up study to monitor the success of the New York River Otter Project (NYROP).

ñBetween 1995 and 2000, the NYROP and the New York State Department of Environmental Conservation trapped and translocated approximately 300 otters from the Adirondack Park and Catskills to western New York and the Finger Lakes region (New York State Department of Environmental Conservation 2010).ò Materials purchased include QIAGEN QIAamp DNA Stool Kits, DNA genotyping gels and solutions, and lithium alkaline batteries. ñThrough sampling of otter scat and jelly, I intend to estimate river otter abundance using fecal DNA analyses and a genetic analogue of mark and recapture analysis (Brzeski 2010, Mowry et al. 2011). Scat will be collected from June to August, 2012 at identified latrines and DNA will be extracted, amplified, and genotyped at eight microsatellite loci (Mowry et al. 2011). Population size will be determined by counting the number of unique genotypes and abundance will be estimated by running closed population models (see Brzeski 2010) using PROGRAM MARK (White and Burnham 1999).ò

• A $1,000 grant to *Melanie Haire, Georgia wildlife rehabilitator and licensed veterinary technician*, for building materials to construct a replacement enclosure for the care and treatment of injured and orphaned river otters.

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ñThe new design will be safer for the rehabilitator by providing the options of empting and refilling the pool from the outside, feeding thru shoots, and shifting the animals away from the caretaker while the cage is being cleaned. It will, by the same means, be less stressful for the animals since it provides more privacy and separation from the human care taker. This visual and physical separation from the human care taker is very important for the future release success of hand reared otter pups as they need to develop a sense of independence and an appropriate fear response to approaching humans. In the past I have otters come in for rehabilitation with various health issues including contagious conditions such as coccidiosis and giardiasis. Rebuilding out of disinfectable and less permeable materials will allow for more effective cleaning and reduce recontamination possibilities. In Georgia, the need for more rehabilitators is great and I am aware of only one other licensed rehabilitator in the state currently with an appropriate set up to house otters up to release age. This new enclosure will help me provide the animals with improved quality care and may potentially increase release success by offering a more hands off rehabilitation environment.ò

Photos courtesy of Melanie Haire

Visit the River Otter Alliance online at www.otternet.com/ROA

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