

FISH BONES AND SCAT PILES: OTTERS IN THE WILD

BY CAROL PETERSON

EXPERIENCES AT THE YELLOWSTONE ASSOCIATION INSTITUTE COURSE

TAUGHT BY JAMIE CRAIT

If you have time to visit Yellowstone National Park, we highly recommend taking the river otter course offered by the Yellowstone Association Institute. My husband, John Mulvihill, and I were amazed at what we experienced during the course offered June 21-22, 2009 at the Lamar Buffalo Ranch. The timing was ideal as the course coincided with the cutthroat trout spawn at Trout Lake, which is located between the northeast entrance and the Lamar Buffalo Ranch. Jamie Crait, the instructor, is a doctoral candidate of the ecology program in the Department of Zoology and Physiology at the University of Wyoming. (Please see previous articles by Jamie in the Fall 2002, 2004 and 2005 editions of *The Journal* on our website). Jamie led hikes and instructed for ten hours each day to his eleven enraptured students.



Photo © Eric Peterson

On June 20, after a ten-hour drive from Denver, Colorado through Cooke City, MT, I drove directly to the trailhead for Trout Lake. The easy hike up to the lake, 0.06 miles

with an elevation gain of 120 feet, rewarded me with the “holy grail” of river otter viewing! I watched a mother otter and her three pups, undisturbed, for over two hours, sharing the experience with only one other observer. The mother fished at the inlet and brought cutthroat trout to her pups. Two pups, we named them “the girls,” stayed close to mom, riding on her back and paying close

attention to her every move. The third pup, a park ranger, we named “Trouble,” always lagged behind, was intrigued with all that he played with, including a half-eaten fish, and often wandered off in the opposite direction from mom. I watched

(Continued on page 11)

INSIDE THIS ISSUE—THESE ARTICLES AND MORE....



Photo © David Tomecek

← **Traveling with Otters—
Meet the sea otters of
Monterey Bay Aquarium
Page 7**

**Population Survey—
Rocky Mountain National Park →
Story begins on Page 4**



Photo © David Tomecek

PRESIDENT'S MESSAGE

Welcome to the Fall-Winter 2009 issue of *The River Otter Journal*.

One aspect of The River Otter Alliance's activities in fulfillment of its mission is awarding grants—albeit small—to encourage qualified individuals to undertake research projects that increase our understanding of the biology and status of this incredible species. In the Spring issue, you read the results of such a project conducted by Kim Sager-Fradkin on the Elwha River on the Olympic Peninsula in Washington. Last summer Ken Nelson was issued a grant to study the effects of environmental enrichment on otter swimming patterns [see Otter Updates on page 3]; Ken's results will be published in the Spring-Summer 2010 edition. In September, two additional grants were awarded for studies on the Clark Fork watershed in Montana and wetland sites in the middle hills of Nepal. You will soon read the results of those projects.

In addition to the donation we received from the Rocky Mountain Ark, it is also through the generosity of a member who prefers to remain anonymous that we are able to fund such projects. We thank this member.

Much of my time is spent volunteering my lifetime accumulation of skills as a data management specialist for The Nature Conservancy (TNC). So much so, in fact, that it

has become nearly a full time job, but nevertheless, a labor of love. As with many industries that span multiple practitioners, information sharing among projects within TNC, as well as those of other conservation organizations, is often an afterthought—or not thought about at all. For years, conservation project data were maintained on desktops, either using a specialized desktop tool for conservation action planning or in other forms, but rarely shared—even among projects facing similar issues. In the summer of 2005, a small group within TNC, including myself, came together to sketch out a plan to create a centralized database of conservation projects that would enable information sharing among projects and data analysis across multiple projects worldwide. A year and a half later, the Conservation Project Database (ConPro) became a reality and users began uploading projects from their desktop tools using lexicon and taxonomies that are standardized through the IUCN. At this writing ConPro contains 1,006 projects. Earlier this year, we enabled public access to ConPro at <http://conpro.tnc.org>. Not every project's data are sufficiently complete to be publicly accessible, but among those that are, you may search on any number of criteria using the Conservation Project Search tool, including those that list otters as a focal conservation target. Ongoing, we are enlarging and improving the data structure to accommodate more project information and also enhancing the interface with a next-generation desktop tool, Miradi, that specializes in conservation action planning and measurement. Our goal is to eventually house and share project data from as many worldwide conservation

(Continued on page 3)

The River Otter Journal is a semi-annual publication of The River Otter Alliance. Look for the next edition of ***The River Otter Journal*** in Spring-Summer 2010!

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. The River Otter Alliance is a tax-exempt, non-profit organization. All efforts to our organization are on a voluntary basis by those who share a common concern for the river otter and its habitat. We welcome any interested persons to volunteer their time at any level of the organization.

River Otter Alliance Board of Directors

President – David Berg
 Vice President – Tracy Johnston
 Secretary – Judy Berg
 Treasurer – John Mulvihill

Members at Large – Glenn Chambers,
 Jo Thompson, Ph.D.

Membership/P.R. – Carol Peterson
 Editor & Layout Design – Diane Tomecek
 Rehabilitator Liaison – Lissa Margetts

Scientific Advisor – Dr. Tom Serfass



The River Otter Journal has been printed on recycled paper.

PRESIDENT'S MESSAGE (CONT'D)

(Continued from page 2)

organizations as possible through the Conservation Measures Partnership (www.conservationmeasures.org), which promotes information sharing and standardization among its member organizations.

In the meantime, my wife Judy began her final report from her mammal survey—including otters—at the Willow Creek Preserve in the West Eugene Wetlands, which should be complete early next year.

We regret to announce that Board member Dr. Merav Ben-David is stepping down to pursue other personal interests. We wish Merav well in her ongoing endeavors as a professor at the University of Wyoming and otter researcher.

We are pleased to announce that Dr. Tom Serfass has joined the Board as Scientific Advisor. Tom is Professor of Wildlife Ecology at Frostburg State University in Maryland. He has a long association with river otters, including reintroductions in Pennsylvania, New York and North Dakota. He is also currently studying African spotted-necked otters in Tanzania. Tom authored the Action Plan for the IUCN Otter Specialist Group on the North American river otter. We are honored to have Tom join our Board.

Diane has once again produced a fine edition of *The Journal*. Some of the articles you will read include a population survey for river otters in Rocky Mountain National Park, a feature on the Yellowstone Association Institute's river otter tracking course and articles on The Monterey Bay Aquarium—a wrap-up of *Wild About Otters* as well as a feature on their sea otters.

The Board wishes you all a happy Winter Solstice and holiday season.

David

Otter Updates By Diane Tomecek



A grant was awarded to Kenneth Nelson [see the President's Message on page 2] in 2008 for his project at the Seneca Park Zoo in Rochester, NY. The funded project studied the effects of environmental enrichment on stereotyped swimming patterns for a North American river otter. The provided funds were for Kenneth's enrichment items.



2009 grants were awarded to:

- Jandhiv Kafle and the Wetland Friends of Nepal for materials, presentation equipment and travel expenses for information-gathering interviews and a public relations awareness campaign of otter conservation in Nepal.
- Kerry Foresman, a Wildlife Biology professor at the University of Montana, to assist with DNA analyses of river otter hair and fecal samples, as well as investigations to assess the status of river otters in Montana.



Rebecca Nowri, a graduate student at the University of Missouri, is working on a project with the Missouri Department of Conservation [MDC]. As many of you might recall, the MDC has been collecting data for seven years on the effect of river otters on Missouri fish populations, in addition to conducting population estimates of otters. Rebecca will be conducting DNA analysis on scat collected at river otter latrine sites from eight rivers in the state.



According to Mika Yoshida of The Monterey Bay Aquarium, after the *Wild About Otters* exhibit closed in September 2009, the otters on exhibit were transferred to new homes as follows: "The two Asian [small-clawed] males we had, Tiga and Empat, have gone to England, to The Otter and Owl Sanctuary, to join other Asian small-clawed [otters] currently on exhibit there. The African [spotted-necked otters] have gone back to San Diego Zoo, where we got our original two pairs on loan—Kipenzi and Kamili, and Denny and Neema. Tiga and Empat may become part of a breeding program at The Otter and Owl Sanctuary, while some of the African [spotted-necked otters] are already on exhibit at The San Diego Zoo—Ajabu, Shani and Ziwa—who were all born at Monterey Bay Aquarium!" Please see the wrap-up story on *Wild About Otters* on Page 7.

POPULATION SURVEY FOR RIVER OTTERS IN THE ROCKY MOUNTAIN NATIONAL PARK (RMNP)

A Progress Report for 2008
National Park Service—Rocky Mountain National Park

By **Merav Ben-David, Ph.D.**
Department of Zoology and Physiology
University of Wyoming

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 (*Lontra canadensis*) 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 [the 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, population surveys in RMNP were initiated. 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.



Photo © David Tomecek

Methods

Sampling design

The riverbank was surveyed for latrine sites upstream and downstream of Timber Creek Campground. Surveys were conducted 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 eight years, in two sampling periods: spring (late April to early May) and fall (late September). Total stream length surveyed ranged from 7.5 in 2001 to 25 km in 2005, averaging 18 km (± 1.5 SE).

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. Latrine densities were then related to water flow of the Colorado River with non-linear regression (SPSS 11.5 for Windows).

Water flow was adapted from measurements at Grand County, Colorado (Hydrologic Unit Code 14010001; Latitude 40°19'33", Longitude 105°51'22" NAD27; Drainage area 138.3 km²; Gage datum 2,667 meters above sea level; http://waterdata.usgs.gov/co/nwis/monthly/?site_no=09010500), and converted to cubic meters per second (m³/s). Data on fish biomass were provided by C. Kennedy and B. Rosenlund from the US Fish and Wildlife Service, and the Colorado Fish and Wildlife Assistance Office in Estes Park, Colorado. Fish biomass was calculated based on estimates of abundance obtained from two

(Continued on page 5)

POPULATION SURVEY FOR RIVER OTTERS (CONT'D)

By Merav Ben-David, Ph.D.

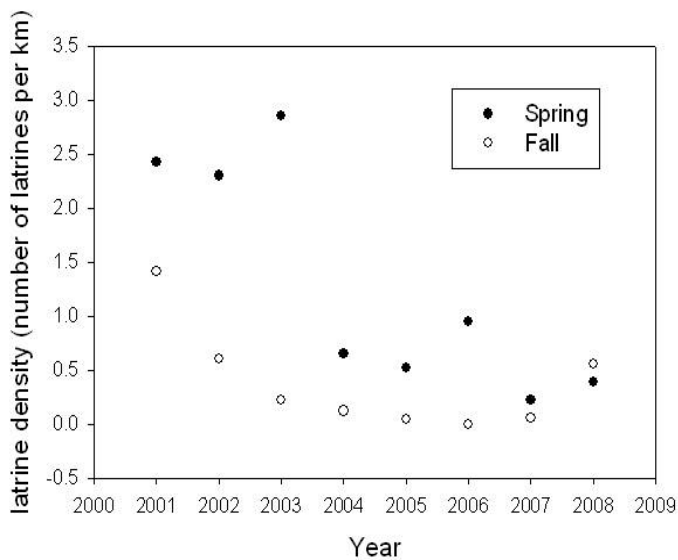


Figure 1. Number of river otter latrine sites per km of stream along the Colorado River within Rocky Mountain National Park (RMNP) in spring and fall 2001-2008.

(Continued from page 4)

electrofishing passes at Lulu City (2003, 2006, and 2008), upstream from the Red Mountain Trail bridge (2005) and upstream from the Sun Valley Ranch bridge (2004). Because otters rarely consume fish smaller than 8 cm (Kruuk 2006), only fish longer than that value were included in biomass calculations. The most common fish detected in the surveys was brook trout (*Salvelinus fontinalis*), followed by brown (*Salmo trutta*) and cutthroat trout (*Oncorhynchus clarki*). Fish surveys were conducted in early October of each year.

Results

A decline in the number of latrines per km of stream (latrine density) between spring (1.42 ± 0.44 ; mean \pm SE) and fall (0.35 ± 0.10) surveys occurred in all years (Fig. 1; paired-samples *t*-test, $n = 7$, $P = 0.008$) except in 2008, where latrine density was slightly higher in fall (Fig. 1). Similarly, there were significantly fewer feces per site in fall surveys for both old and total fecal counts (1.96 ± 1.30 ; 4.64 ± 3.15 in spring) in all years (paired-samples *t*-test, $n = 7$, $P = 0.006$), except for 2004 where counts were similar, and 2008 where fall counts were higher (Fig. 2). In spring, latrine density was higher in 2001-2003 (2.53 ± 0.05 ; mean \pm SE) compared with 2004-2008 (0.55 ± 0.03 ; *t*-test, $P < 0.001$; Fig. 1). Between 2001 and 2007, latrine density steadily declined in fall, but increased in 2008 (Fig. 1). There was a strong positive correlation between latrine density and number of feces per site in spring ($r = 0.73$, $P = 0.04$), but not for fall ($r = 0.59$, $P = 0.12$).

We found no relation between latrine density and the average stream flow in the three months preceding the survey for either spring (Fig. 3; $R^2 = 0.252$, $P = 0.205$) or fall (Fig. 3; $R^2 = 0.051$, $P = 0.592$). The same was true when considering average stream flow in the preceding month of the survey. Similarly, we found no relation between latrine density or fecal counts per site in fall and fish biomass (Fig. 4; $R^2 = 0.117$, $P = 0.574$ latrine density; $R^2 = 0.051$, $P = 0.592$ fecal counts). The latter was highly correlated with fish abundance ($r = 0.988$, $P < 0.001$). Both fish abundance and biomass were not correlated with average stream flow in the three months preceding the survey ($r = 0.07$, $P = 0.905$, and $r = 0.12$, $P = 0.844$, respectively).

Discussion

In 2008, otter activity in RMNP deviated from the pattern we observed in previous years. Unlike previous years, latrine density and total feces per site were higher in fall compared with spring. This higher activity in fall 2008 could not be explained

(Continued on page 8)

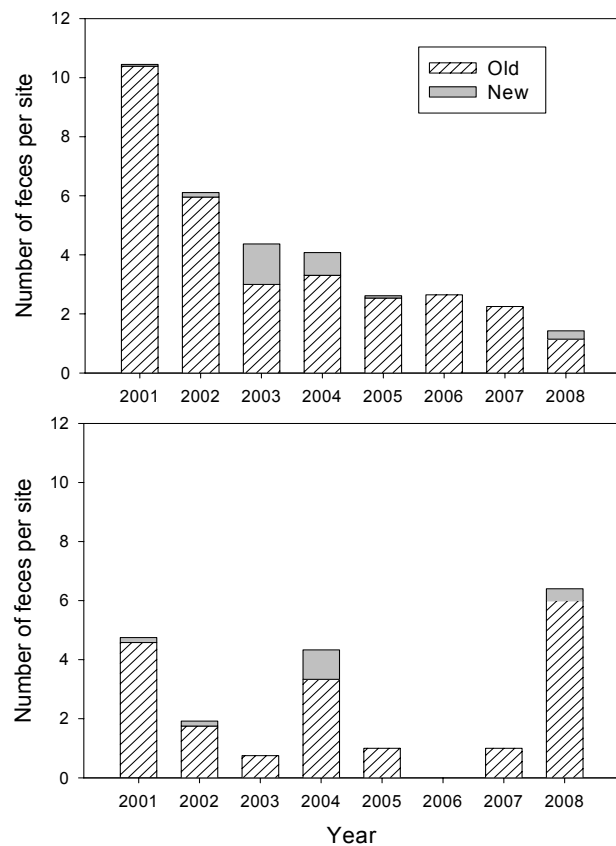


Figure 2. Number of feces per site counted at river otter activity sites in RMNP in spring (top) and fall (bottom) 2001-2008.

TRAVELING V

Behind the Scenes at the Monterey Bay Aquarium—Meet the sea otters

by Diane Tomecek



Maggie with an enrichment toy—above and below right

**Photos on pages 6 and 7 © David Tomecek
taken at The Monterey Bay Aquarium**

For anyone who loves sea otters, what could be better than a visit to Monterey, CA? You have the ability to see these endearing creatures in their natural habitat as you stroll along the waterfront of the Monterey Bay and, even better, you can befriend five others as you end your walk at the world-class Monterey Bay Aquarium [MBA]. And for otter lovers lucky enough to have visited the Aquarium within the last two years, you were delighted by river otters as well—African spotted-necked and Asian small-clawed to be precise—at the *Wild About Otters* exhibit (see page 7 for exhibition wrap-up story).

The sea otter exhibit at the Aquarium is strategically placed “front and center” so that visitors can not possibly miss it. In fact, it was right there that my husband and I began our “Behind the Scenes” tour with sea otter aquarist, Mika Yoshida. Mae, Maggie and Toola were on-exhibit that day and we were treated to quite a show during the 1:30 feeding and training session.

Both Maggie and Mae came in as pups in 2001 while Toola was a stranded adult found on Pismo Beach also in 2001. Toola, along with her aquarium sisters, Rosa and Joy, are surrogate mothers to rescued pups—combined, lovingly raising over 20 pups. Interestingly, the names of all five otters are taken directly from or derived from John Steinbeck novels.

Aquarium trainers work with the sea otters in an environmental enrichment program which is designed to mimic species specific natural behavior. The otters are given ‘enrichment’

toys (as Maggie is seen with in the photographs here) which they then use to simulate behaviors demonstrated in the wild. Trainers fill the toys with food frozen in ice and the otters are required to obtain their food as they would in the wild. They are also given objects that function as surrogate rocks to hit their toy against; again, mimicking the wild behavior of using a rock to break open hard-shelled prey.

The five sea otters that call the aquarium home (Rosa and Joy were behind the scenes that day) are given a mix of food during the three daily feedings. This mix includes squid, clam, clam tongue and shrimp, which Mika tells us is their favorite food of the daily feedings. In fact, shrimp plays a big role in the enrichment program as it is often the food suspended in the frozen ice. The otters are given a live-feed approximately three to five times per week which consists primarily of manila clams, crabs and mussels.

For visitors, the feeding and training sessions are a must. Trainers or aquarium volunteers describe the feeding and training session for the public as the otters romp and play with their toys. Maggie is quite the character as she often juggles multiple toys while trying to confiscate food from Mae and Toola.

Consider visiting the aquarium the next time you are in central California. The otters there will never disappoint!

For more information on the sea otters of Monterey Bay Aquarium, visit www.montereybayaquarium.org.



Maggie happily juggling her toys

THE MONTEREY BAY AQUARIUM'S *WILD ABOUT OTTERS* WRAPPED-UP SEPTEMBER 2009

by Diane Tomecek

Wild About Otters opened on March 31, 2007 and closed over the Otter Days weekend, held September 12-13, 2009. As total Aquarium attendance surpassed 5.19 million during the *Wild About Otters* exhibit, it is safe to say the exhibit touched the lives of multitudes of people over its two-and-a-half year life at the Aquarium.

Visitors to the exhibit witnessed the unique personalities of both African spotted-necked and Asian small-clawed otters. While seeing unusual species of otters was fascinating, it was the overall message of conservation that permeated the exhibit. In fact, Mika Yoshida, one of the staff sea otter aquarists, mentioned that surveys taken of attendees upon exiting the exhibit indicated that they felt this exhibit was extremely successful at conveying a conservation message. Visitors took home the important message that clean water is vital and that water is linked to everything.

For many, meandering through the exhibit was an education in itself as all types of river otters from Smooth-coated to Eurasian to Hairy-nosed otters were featured in display. The live enclosures of the African spotted-necked and Asian small-clawed otters were quite thrilling to young and old alike.

In discussing the two types of otters with Mika, she emphasized the uniqueness of each species. The Asian small-clawed otters are much more food oriented and are playful, often turning their food into toys. Aquarium staff keep them on strict diets, weighing the otters every other week to prevent large fluctuations in weight. Achieving the ideal weight for the otters was an evolving process and was monitored closely by an Aquarium staff veterinarian.



Neema, an African spotted-necked otter



The African spotted-necked otters had quite a bit of breeding success during their stay at the Aquarium. Neema, pictured below, was one of the successful breeders.

Aquarium staff maintained protected contact with both species of otter as they did not want to imprint the otters since all otters were returning to other facilities. This idea of protected contact became evident as Mika took me behind the scenes to help feed two of the Asian small-clawed otters, Dua and Satu. Behind the scenes, the otters come up to an assigned area in a plexiglass enclosure, reach through small holes and grab their food from the trainer. I had the privilege of feeding Dua, who, knowing I was not his usual trainer, took his food quite daintily and calmly out of my hand. Thank you, Dua, for a memory I will never forget!

In summarizing the exhibit, Mika further emphasized the conservation message while also stating that the Asian small-clawed and African spotted-necked otters were quite charming creatures. "From a trainer's point of view, they were really fun and dynamic animals to work with and the public seemed to love watching such high-energy, charismatic animals! We hope they took home some strong conservation messages and were inspired to act upon them!"

The River Otter Alliance extends its sincere appreciation to Mika Yoshida, sea otter aquarist, for the behind the scenes tour, her willingness to share her knowledge and her obvious passion for otters! Additionally, we thank Angela Hains, Associate Manager of Public Relations, for facilitating our behind the scenes tour with Mika and for additional information on the exhibit. For more information on The Monterey Bay Aquarium, please visit www.montereybayaquarium.org.

POPULATION SURVEY FOR RIVER OTTERS (CONT'D)

By Merav Ben-David, Ph.D.

(Continued from page 5)

by either stream flow or fish biomass, nor does it correspond with breeding behavior. Our spring surveys were conducted at the end of April/early May, which correspond to the initiation of mating in the region (Crait et al. 2006). Seasonal changes in latrine use related to the breeding season have been documented in other studies (Humphrey and Zinn 1982; Kruuk 1992, 1995). Although we have no data on fish biomass during spring, the observation that latrine density and fecal counts did not correspond with fish biomass in different years suggests that a relation between these variables on a seasonal basis may be tenuous. Other studies identified prey availability as one of the most important factors regulating otter behavior and habitat use (Melquist and Hornocker 1983; Kruuk et al. 1993; Reid et al. 1994; Ruiz-Olmo et al. 2001). It is important to note, that the available data on fish biomass is rather limited. In all years except 2003, fish were sampled in only one location along the Colorado River and that location varied from year to year. In 2003 when fish sampling occurred in four locations along the Colorado River, abundance and biomass varied greatly between sites. Thus, it is possible that the fish data we currently have are insufficient to explain otter behavior along the Colorado River. Our previous modeling of latrine site selection by otters in RMNP (Herreman and Ben-David 2002) demonstrated that variables associated with preferred fish habitat such as stream shading, deep pools and predominance of cobbles (Binns 1994; Grost et al. 1990; Meyer and Griffith 1997; Young et al. 1999), best separated otter latrine and random sites as well as accounted for seasonal changes in latrine use (Ben-David et al. 2003; Herreman and Ben-David 2002). Thus, future studies should concentrate on sampling fish abundance and biomass at river otter latrine sites as well as random sites along the Colorado River in spring and fall.

It is interesting that neither otter activity nor fish biomass were correlated with average stream flow in the Colorado River in the month and three months preceding the surveys. Because the region has been experiencing drought conditions since 2002, we expected a decline in water flow and thus lower fish abundance and lower otter activity. Interestingly, average water flow in the Colorado River in the preceding three months in spring only varied between $0.76 \text{ m}^3/\text{s}$ in 2006 to $0.29 \text{ m}^3/\text{s}$ in 2003 and did not show a trend that corresponds with the temporal decline of otter activity. Why we found no active otter latrines in the fall of 2006 when water flow in the river was $0.7 \text{ m}^3/\text{s}$ and fish biomass was 192 kilograms/hectare (kg/ha) is unclear.

The density of river otter latrines and fecal deposition rate are adequate census methods for determining presence and overall distribution for these mustelids (Melquist et al. 2003; Gallant et al. 2007), but may not provide accurate information on densities or behavior. Thus, to better understand the reliance of otters on fish biomass and water flow in the Colorado River, additional methods of monitoring otters, such as radiotelemetry, should be employed.

(Continued on page 9)

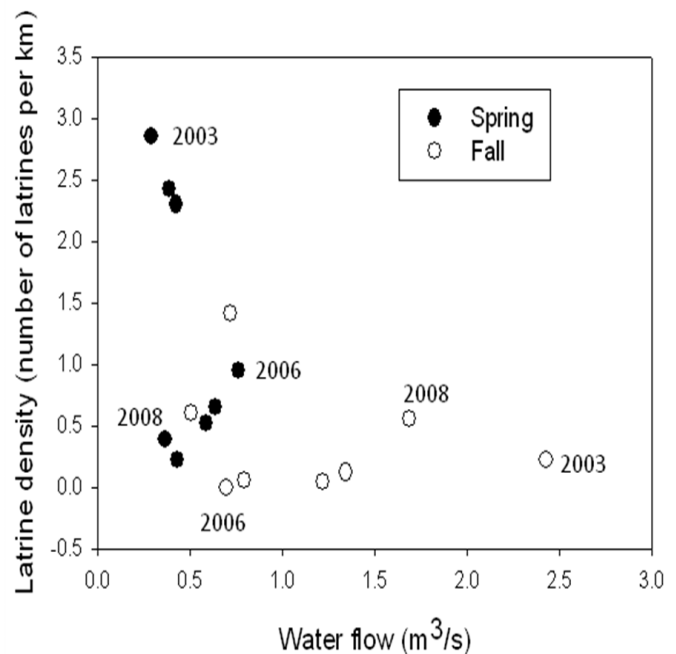


Figure 3. Latrine densities in relation to average stream flow of the Colorado River in the three months preceding the survey in RMNP spring and fall 2001-2008.

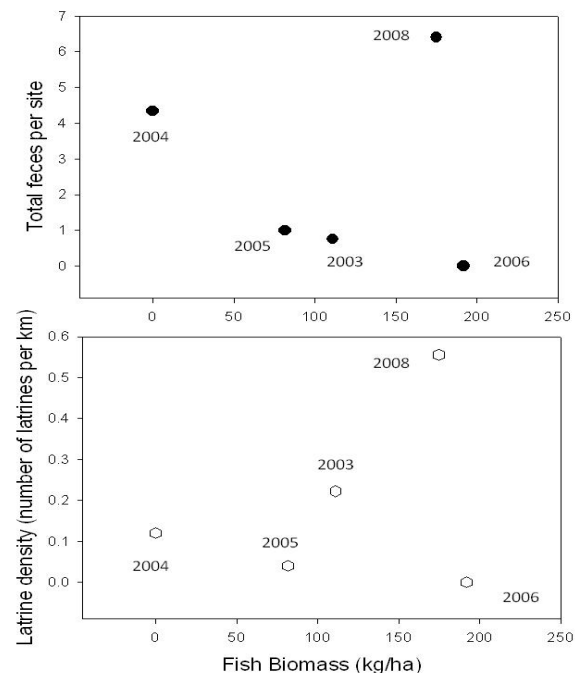


Figure 4. Latrine densities and number of feces per site in relation to fish biomass (in kg per hectare) in RMNP in fall 2001-2008.

POPULATION SURVEY FOR RIVER OTTERS (CONT'D)

By Merav Ben-David, Ph.D.

(Continued from page 8)

Unfortunately, non-invasive genetic sampling (Geurtin et al. *in prep*) 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.

ACKNOWLEDGEMENTS

We are thankful to members of the Student Chapters of the Wildlife Society at the University of Wyoming and Colorado State University for assistance in collection of data. Special thanks to K. Ott, C. Reynolds, T. Johnston and A. Flohrs for acting as group leaders. Fish data were provided by C. Kennedy and B. Rosenlund from the U. S. Fish and Wildlife Service, Colorado Fish and Wildlife Assistance Office in Estes Park, Colorado. 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 [n/k/a The Downtown Aquarium], The River Otter Alliance and the Department of Zoology and Physiology at the University of Wyoming.

LITERATURE CITED

- Beck T. D. I. 1992. Development of river otter reintroduction procedures Colorado Division of Wildlife. Denver, Colorado.
- Ben-David, M., L. K. Duffy, and R. T. Bowyer. 2001a. Biomarker responses in river otters experimentally exposed to oil contamination. *Journal of Wildlife Diseases* 37: 489-508.
- Ben-David, M., L. K. Duffy, G. M. Blundell, and R. T. Bowyer. 2001b. Natural exposure to mercury in coastal river otters: age, diet and survival. *Environmental Toxicology and Chemistry* 20: 1986-1992.
- Ben-David, M. J. K. Herreman, and J. R. Boyd. 2003. Population survey for river otters in the Rocky Mountain National Park. Progress report. U. S. National Park Service.
- Berg, J. K. 1999. River otter research project on the upper Colorado River Basin in and adjacent to Rocky Mountain National Park, Colorado. Final Report, Rocky Mountain National Park, Grand Lake, Colorado.
- Binns, N. A. 1994. Long-term responses of trout and macrohabitats to habitat management in a Wyoming headwater stream. *North American Journal of Fisheries Management* 14: 87-98.
- Blundell, G. M., M. Ben-David, P. Groves, R. T. Bowyer, and E. Geffen 2002. Characteristics of sex-biased dispersal and gene flow in coastal river otters: implications for natural recolonization of extirpated populations. *Molecular Ecology* 11: 289-303.
- CDOW 2003. Draft state of Colorado river otter recovery plan. Colorado Division of Wildlife. Denver, Colorado. 50pp.
- Clark, J. D., J. H. Jenkins, P. B. Bush, and E. B. Moser. 1981. Pollution trends in river otter in Georgia. *Proceedings of the Annual Conference of the Southeast Association of Fish and Wildlife Agencies* 35: 71-79.
- DePue, J. E. 2002a. River otter (*Lontra canadensis*) survey of the Gunnison River: Chukar Trail to Redlands Diversion Dam, Colorado. Unpublished Report. Colorado Division of Wildlife, Grand Junction, Colorado. 4pp.
- DePue, J. E. 2002b. River otter (*Lontra canadensis*) survey of the Green River, Colorado. Unpublished Report. Colorado Division of Wildlife, Grand Junction, Colorado. 4pp.
- Duffy, L. K., R. T. Bowyer, J. W. Testa, and J. B. Faro. 1994. Chronic effects of the Exxon Valdez oil spill on blood and enzyme chemistry of river otters. *Environmental Toxicology and Chemistry* 13: 643-647.
- Duffy, L. K., R. T. Bowyer, J. W. Testa, and J. B. Faro. 1996. Acute phase proteins and cytokines in Alaskan mammals as markers of chronic exposure to environmental pollutants. *American Fisheries Society Symposia* 18: 809-813.
- Gallant D., L. Vasseur, and C. Bu  r  . 2007. Unveiling the limitations of scat surveys to monitor social species: A case study on river otters. *Journal of Wildlife Management* 71: 258-265.
- Grost, R. T., W. A. Hubert, and T. A. Wesche. 1990. Redd site selection by brown trout in Douglas Creek, Wyoming. *Journal of Freshwater Ecology* 5: 363-371.
- Geurtin, D. A., M. Ben-David, A. Harestad, and J. E. Elliott. (*in prep*). Fecal DNA genotyping reveals small-scale population structure in river otters along the coast of southern Vancouver Island, British Columbia, Canada. *Journal of Animal Ecology*.
- Halbrook, R. S., A. Woolf, G. F. Bubert, Jr., S. Ross, and W. E. Braselton. 1996. Contaminant concentrations in Illinois mink and otter. *Ecotoxicology* 5: 103-114.
- Herreman J. K. and M. Ben-David. 2002. Population survey for river otters in the Rocky Mountain National Park. Progress report. U. S. National Park Service.
- Humphrey, R. and S. Zinn. 1982. Seasonal habitat use by river otters and Everglades mink in Florida. *Journal of Wildlife Management* 46: 375 - 381.
- Johnson, S. A., and K. A. Berkley. 1999. Restoring river otters in Indiana. *Wildlife Society Bulletin* 27: 419-427.
- Kruuk, H. 1992. Scent marking by otters (*Lutra lutra*): signaling the use of resources. *Behavioral Ecology* 3: 133-140.
- Kruuk, H. 1995. Wild otters: predation and populations. Academic Press, London, United Kingdom.
- Kruuk, H., D. N., Carss, J. W. H. Conroy, and L. Durbin. 1993. Otter (*Lutra lutra* L.) numbers and fish productivity in rivers in north-east Scotland. *Symposium of the zoological Society of London* 65: 171-191.
- Kruuk, H. 2006. Otters: Ecology, behavior, and conservation. Oxford University Press, Oxford, UK.
- Larivi  re, S., and L. R. Walton. 1998. *Lontra canadensis*. *Mammalian Species* 587: 1-8.
- Mack, C. M. 1985. River otter restoration in Grand County, Co. M.S. Thesis. Colorado State University, Ft. Collins, Colorado. 133pp.
- Melquist, W. E., and M. G. Hornocker. 1983. Ecology of river otters in west central Idaho. *Wildlife Monograph* 83: 1-60.
- Melquist, W.E., P. J. Polechla, Jr., and D. Towell. 2003. River otter: *Lontra canadensis*. Pages 708-734. in G. A. Feldhamer, B. C. Thompson and J. A. Chapman, editors. *Wild mammals of North America: biology, management, and conservation*. Johns Hopkins University Press, Baltimore, Maryland, USA.
- Meyer, K. A., and J. S. Griffith. 1997. Effects of cobble-boulder substrate configuration on winter residency of juvenile rainbow trout. *North American Journal of Fisheries Management* 17: 77-84.
- Raesly E. J. 2001. Progress and status of river otter reintroduction projects in the United States. *Wildlife Society Bulletin* 29: 856-862.
- Reid, D. G., T. E. Code, A. C. H. Reid, and S. M. Herrero. 1994. Spacing, movements, and habitat selection of the river otter in boreal Alberta. *Canadian Journal of Zoology* 72: 1314-1324.
- Ruiz-Olmo, J., J. M. Lopez-Martin, and S. Palozon. 2001. The influence of fish abundance on the otter (*Lutra lutra*) populations in Iberian Mediterranean habitats. *The Journal of Zoology London*. 254: 325-336.
- Serfass, T. L., R. P. Brooks, and L. M. Rymon. 1993. Evidence of long-term survival and management by translocated river otters, *Lutra canadensis*. *Canadian Field-Naturalist* 107: 59-63.
- Young, K. A., S. G. Hinch, and T.G. Northcote. 1999. Status of resident coastal cutthroat trout and their habitat twenty-five years after riparian logging. *North American Journal of Fisheries Management* 19: 901-911.



Photo    David Tomecek

VISIT TO *THE WILD CENTER* IN THE ADIRONDACKS

By Carol Peterson

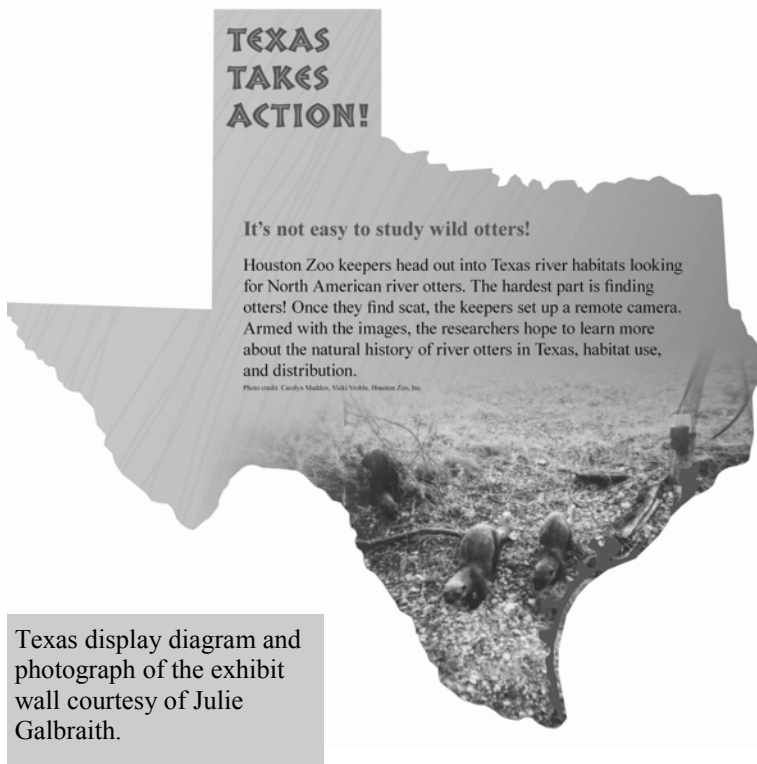
Anyone who lives near or is traveling to the Adirondacks should visit *The Wild Center*, a facility in Tupper Lake, NY “overseen by the board of trustees with the assistance of the advisory board of the Natural History Museum of the Adirondacks,” (www.wildcenter.org). There are many excellent educational exhibits, the most popular being *Otter Falls*. On a recent visit I made to the area with friends, we watched as children, young and old, witnessed the river otters entering their exhibit at 10:30 am. Museum staff set the timing—approximately thirty minutes after the museum opens—so that visitors can gather to watch the otters emerge. Additionally, these early hours at the museum are made extra special during the summer as staff conduct an otter enrichment session; for the fall and spring months staff conduct an enrichment session at 2:30 p.m. During these enrichment times, the otters participate in a fun activity while museum staff educate the public about otters and conduct question/answer sessions.

After the otters emerged, the two females playing, wrestling, twisting and rolling in the water engaged us. Squirt and Squeaker, eight and four years old

respectively, obviously enjoy each other and are the stars of *The Wild Center*. David Gross, the curator, gave us a behind the scenes tour of the river otter facilities allowing us to meet Emmett, the one year old otter that is the center’s newest arrival. He was captive-born and bottle-raised and, as such, is human imprinted. All three otters have found a happy home at *The Wild Center*. There is an indoor living river trail, detailing the oxbow marsh to the alpine summit to demonstrate healthy river ecosystems. Visitors can hike and explore the extensive trail system on the 31-acre campus accompanied by naturalist guides or on their own.

For additional information visit www.wildcenter.org. For an online talk about the river otters, visit www.wildcenter.org/cams/otters2.html. There is also a youtube video (www.youtube.com/watch?v=texVf23GkYU) showing *The Wild Center*’s otters destroying a snowman. Enjoy the otter antics!

Editor’s Note: Thank you to David Gross for hosting Carol and friends on their behind the scenes facility tour and for providing additional information on the center for this article. Additional collaborator on this story—Diane Tomecek.



Texas display diagram and photograph of the exhibit wall courtesy of Julie Galbraith.

The Texas State Aquarium made some recent renovations to their *Otter Space* exhibit. They designed a display next to their otter tank with the theme of “Wild Otters have Adaptations to be Successful.” Highlighting the difficulty of finding river otters in the wild, one panel from the display, pictured to the left, offers some information on how research is accomplished.

The Texas State Aquarium has four river otters—Gwen, Odie, Merlie and Dusty—in their rehabilitated wildlife program.



Note: This update story compiled by Diane Tomecek. Thank you to Julie Galbraith, Interpretation Manager for The Texas State Aquarium, for sharing the information.

FISH BONES AND SCAT PILES: OTTERS IN THE WILD (CONT'D)

BY CAROL PETERSON

EXPERIENCES AT THE YELLOWSTONE ASSOCIATION INSTITUTE COURSE

TAUGHT BY JAMIE CRAIT

(Continued from page 1)

the mother make a second den in the roots of the tree across the lake from the original den, pulling up grass to line the den and chortling to the pups to stay close. They chirped and played, rolling together in a ball in the water. After she tucked them safely inside, she went back to the inlet to fish for her dinner.

When the course started early the next morning, Jamie and all the participants headed for Trout Lake on learning of the river otters' presence at the lake. Fortunately, we were able to watch the active mother and pups for an hour and a half before she retired into the den. The other students and Jamie were thrilled with the sighting and the opportunity to see a beaver, several ducks and the first loon that I have seen in the park in fifteen years. On the second day, we took a bus to the east shoreline of Yellowstone Lake and set up practice hair snares for DNA analysis. We visited sites where otters had left scat and hair samples in the past and where Bob Landis photographed many of the otters in *The Otters of Yellowstone* video. Upon returning to the ranch we did sample analysis of bones, scat and hairs.

Word soon got out on the otters' location and the visitors grew in large numbers over the next several weeks. We plan on returning next year to take the course again as there is so much to learn about the elusive river otter. The 2010 Yellowstone Institute Course Catalog will be available in early 2010; please visit their website www.yellowstoneassociation.org or call 406-848-2400 for more information or to register.

Wishing you many hours of river otter viewing in the new year!



Photo © Eric Peterson



The River Otter Alliance

ENROLL NOW FOR 2010!

As a member you will be supporting research and education to help ensure the survival of *Lontra canadensis*, the North American River Otter.

You will receive *The River Otter Journal* (published semi-annually), with updates on otter-related:

Educational Programs, Environmental Issues, Research Information, River System and Population Surveys and much more!

Please Provide Mailing Address Below:

Name _____

Address _____

City/State/Zip _____

Annual Membership Dues:

- \$15 Student
- \$15 Senior
- \$25 Individual
- \$35 Family
- \$35 Organization
- \$50 Sustaining
- \$100 Sponsoring

Complete and return this form with your Membership check to:

The River Otter Alliance
6733 S. Locust Court
Centennial, CO 80112

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

6733 South Locust Court
Centennial, Colorado 80112

The River Otter Alliance

