the River Otter Journal

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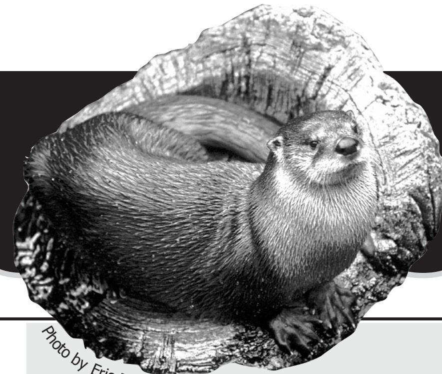

Photo by Eric Peterson©

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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 2006!

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.

Otters in the San Juan Islands, WA

Photo courtesy of Jim Wester

Adaptation to High Altitude Diving: Can River Otters Switch from Cutthroat to Lake Trout?

By Jamie Crait

Department of Zoology and Physiology, University of Wyoming

Yellowstone Lake, in Yellowstone National Park, is at the center of a potential ecological catastrophe. Nonnative lake trout, whirling disease, and extended drought conditions have contributed to a decline in the lake's native cutthroat trout population. This decline has raised concerns both for the viability of cutthroat themselves and for the many predators and scavengers that feed on them. Several of these predators also provide a route for nutrients between Yellowstone Lake and forests when they feed in the water and deposit waste in the terrestrial environment. Therefore, a loss of cutthroat trout may have propagating effects beyond Yellowstone Lake by severing this linkage between water and land.

Since 2001, we have been examining the potential impacts of a declining cutthroat trout population on river otters in Yellowstone Lake. Little information existed on this otter population prior to our study, and though we have learned a great deal about Yellowstone Lake's otters in the past four years, there is still much to be discovered. While habitat selection, seasonal activity, and nutrient transport by river otters in the Yellowstone Lake ecosystem appear similar to findings in other studies, the heavy reliance of Yellowstone Lake's otters on one trout species, cutthroat trout,

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Are There River Otters in Katmai National Park?

By Kaiti Ott
Department of Zoology and Physiology, University of Wyoming

Our team surveyed the coast of Katmai National Park (KATM) in a ground-breaking effort for river otter research in this remote and isolated park. The survey stretched from Amalik Bay to Kukak Bay along the Alaska Peninsula. The weather, boating, and bear viewing were spectacular. Otter activity, however, was not. Compared to the 428 fresh fecal samples collected during 10 days in Kenai Fjords National Park (KFNP), Katmai yielded a scant 63 samples (several of which were questionably fresh, but the researchers were getting desperate for positive otter sign) over the same period of time.

We conducted the survey in the same manner as the KFNP survey in 2004. Otter latrines were identified by surveying the coast from skiffs, looking for key habitat features (large old-growth trees, high canopy cover, etc.) which typify otter latrine sites. Perhaps one of the problems in KATM, was that there were no large old-growth trees anywhere. All coniferous vegetation was wiped out in the 1912 eruption of Novarupta volcano (which created the Valley of 10,000 Smokes), less than 50 miles to the west. The eruption destroyed existing vegetation and blanketed the entire region in ash. Some places on the island of Kodiak, 100 miles distant, were buried in two feet of ash. Subsequently, nearly all of the modern vegetation in KATM consists of alders and grasses/sedges. Also, the vast majority of coastal substrate appears to be ash, which gives the ocean waters a beautiful blue appearance, but may not provide good habitat for the fishes on which otters feed. This could be one possible explanation for the general lack of otter abundance we observed in KATM.

Human and otter tracks on an ash covered beach in Katmai National Park

Another possible deterrent to otter activity could be the high number of brown bears (Ursus arctos) and their activity. The Katmai region boasts one of the world's greatest densities of brown bears. The beaches are littered with their spoor, and the alder thickets are interwoven with their trails. We noted an apparent reluctance of otters (and at times, researchers) to enter the vegetation and venture too far from the safety of the water. In fact, Dr. Ben-David documented a possible predatory interaction between a brown bear and an otter. One morning, she followed the tracks of several otters as they played and galumphed along a sandy beach. Suddenly, the otter tracks made a hasty beeline for the water, to be followed by an equally hurried set of bear tracks on top of those left by the otter, mere seconds before.

We suspect that the level of bear activity and/or lasting effects of the 1912 eruption, may be contributing to the low levels of otter activity we observed in KATM. Unfortunately, in order to substantiate the latter claim, we would need at least some information on otter abundance prior to the 1912 eruption, which to the best of our knowledge does not exist. These theories seem at least plausible, although we may never know for sure. We do know, however that our research team will not be returning for a second survey of KATM. Due to the low level of otter activity, our resources would be better put to use elsewhere. Lake Clark National Park and Preserve, another pioneering research effort, may well be in the cards for next year.

We leave you with a poem written by a professional National Park Service employee during the KFNP survey (To the tune of "Blowing in the Wind").

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Photo by Nathan Varley

BEHIND THE OTTERS

By Mike Tetreau, Kenai Fjords National Park, June 2005

To the melody of "Blowing in the Wind" by Bob Dylan

How many feces must one woman collect
To get some DNA to compare?
How many follicles must one man obtain
From snares that are designed to pull hair?
And how many scats must one person sprinkle
To see how many poops are really there?
The answer, I'm told, is glittering like gold
The answer is glittering like gold.

How many otters inhabit this coast
Transporting nutrients from the sea?
How many latrines must one otter have
To leave all its poop and its pee?
And how many "jellies" must one otter drop
To leave researchers beaming with glee?
The answer, my chum,
comes from an otter's bum
The answer comes from an otter's bum.

Adaptation to High Altitude Diving: Can River Otters Switch from Cutthroat to Lake Trout?

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is fairly unique. Not surprisingly, otters do feed on other prey in Yellowstone Lake; however, the lake's otters are adapted to feeding on abundant, fat, and easy-to-catch cutthroat trout – qualities not shared by most alternative prey. Perhaps ironically, the only other fat, energy-rich replacement fish prey for otters in Yellowstone Lake is nonnative lake trout. Unfortunately for otters, lake trout inhabit much deeper water than cutthroat trout, and catching them requires extended and energetically-demanding dives. Because Yellowstone Lake is located at over 2,400 m (nearly 8,000 feet) elevation, otters would have to possess special adaptations for diving at high altitude to feed on lake trout. This year we began a project investigating whether river otters in Yellowstone Lake have special adaptations to high altitude diving by comparing the diving physiology of otters captured in Yellowstone Lake to those captured at sea level.

In June, we initiated the high-altitude component of our study in Yellowstone. Here, one female and four male otters were live-trapped on Yellowstone Lake. These animals were all caught within a week, which represents fairly high trapping success for river otters. This may reflect the fact that otters have not been legally trapped in Yellowstone National Park for over a century and that these otters were not wary of traps. Otters were caught with leg-hold traps and anesthetized with Telazol. Blood samples, estimates of body condition, and body measurements were obtained from all five animals. All otters recovered from the anesthetic and were successfully released at the site of capture. We also observed the presence of un-trapped otters during three capture events. These un-trapped otters swam along the shoreline, apparently staying with the trapped otter, and did not flee until we darted the captured individual. It should be noted that Yellowstone National Park personnel provided a great deal of logistical support during this phase of the study.

For our sea level otter population, we moved the study to the San Juan Islands in the state of Washington. Here we were joined by Dr. Joe Gaydos of the University of California-Davis, who has been trapping river otters in the San Juans for disease screening. Trapping was conducted from late July to early August. Because Dr. Gaydos was already familiar with good trapping locations, we were able to quickly capture four females and two male otters. All otters were captured and processed using identical methods to those in Yellowstone. In the San Juans, we caught two very young otters, one female that weighed only 4.5 Kg (10 pounds) and an even tinier male that we released without anesthetizing. In addition, one older female otter was caught twice within two days. As in Yellowstone, all of the otters captured in Washington appeared healthy and were released in good condition. We would like to give special thanks to Kathy and Ron McDowell for providing generous accommodations during our research in the San Juan Islands.

Data collected this summer will be used to compare oxygen dissociation curves and differences in hemoglobin and hematocrit between the sea level and high altitude otter populations. Data on diving physiology of river otters will eventually be combined with other findings from our Yellowstone otter study to construct a bioenergetics model for river otters in Yellowstone Lake. Using this approach, we hope ultimately to be able to predict what impact further declines of cutthroat trout may have on the river otter population in Yellowstone Lake.

Estimating the Abundance of River Otters in Kenai Fjords National Park: An Update

By Kaiti Ott, John DePue, and Merav Ben-David, Department of Zoology and Physiology, University of Wyoming

Mike Tetreau demonstrating the use of hair snares

To determine the status of coastal river otters *(Lontra canadensis)* in Kenai Fjords National Park (KFNP), we conducted a survey in the summer of 2004. Following our successful 2004 survey, we returned this past summer, 2005, to KFNP for another survey. As in 2004, the 2005 survey was a collaborative effort between the Alaska Department of Fish and Game, the National Park Service, the U.S. Forest Service, and the University of Wyoming. In 2005, we were able to return to latrine sites we previously located in 2004. During the initial visit at each latrine site, we counted all feces, collected fresh feces, and marked all feces with glitter. We then returned to each latrine site the next day and again counted and collected the new deposits. We used a similar design during the survey of Prince William Sound (PWS) in 2004. There were two advantages for using this approach. First, by having a reliable count of new feces we will be able to develop an index of abundance. Second, by visiting each site twice we are hoping to increase our "recapture" rates of individual animals.

We are using data obtained from fecal DNA analysis to gain a better understanding of river otter populations in these areas. Fecal DNA analysis can be used to estimate river otter populations by genotyping individual samples and identifying individuals through their unique DNA "fingerprints." For example, our analyses of feces collected in KFNP in 2004 resulted in complete DNA microsatellite profiles of 63 samples. These samples represented 56 unique individuals. Of those, five animals were identified twice and one individual three times. This translates to about a 10% recapture rate which is insufficient for a reliable population estimate. So, by visiting each site twice we are hoping to increase our "recapture" rates.

In addition to estimating populations from fecal DNA analysis, we can make inferences about the behaviors of the animals on the landscape, which are incredibly exciting. For example, once an individual is genotyped, his or her movements can be tracked simply by mapping the occurrence of the same fingerprint at other latrine sites along the coast. In effect, we can get an idea of an individual's home range or dispersal patterns. To ensure we are tracking the same individual, we calculated that the probability of incorrectly identifying two otters as having the same genetic fingerprint for the samples in 2004 is 1:2,000,000. Thus, although the 2004 data are preliminary in nature, we are confident that our results will provide useful information to managers.

The survey this year was again a major success. The weather was gorgeous, the otters cooperative (providing 428 fresh fecal samples in 10 days), and the crew enthusiastic and hard-working. We directly observed fewer river otters this year, only 19 animals. In one case, we observed 16 animals swimming and feeding along the shore. Although we have no way of knowing for certain, it appears that we encountered a meeting of two groups. All animals were highly excited and ran up to several latrines depositing fresh feces. We heard several contact calls and a few growls while the animals were out of site in the vegetation. After about 45 minutes, 5 animals swam north and 11 swam south.

To supplement our fecal DNA samples and to test new techniques for non-invasive sampling of tissues, we also collected hair samples from river otters. Hair samples were collected with a modified snare developed by John DePue. Hair snares were placed on well worn otter trails to snag a few hair follicles from the otters. The success of the hair snare is very exciting because it will allow us to use multiple non-invasive methods to track the behavior and status of otters in different habitats. While results of DNA analysis from the feces and hairs we collected this year are still pending, it will be interesting to compare the two sampling techniques, and especially to determine whether we can detect the same individual with these two different sampling schemes.

With 2004 data analysis wrapping up, and 2005 data just beginning, we look forward to another field season in summer 2006. Stay tuned for more exciting news from the Alaska coastal river otter front!

Otter Champion Corner

By Jan Reed-Smith

Hélène with a tame smooth coated otter in India

Thirteen species of otters found around the world; small, secretive, generally hard to see.

Typically there are over 100 people studying otter species every year. Some of these are graduate students who will go on to other topics, others are people who do this work out of curiosity, a commitment to wildlife and conservation, and a passion for otters. Many of these people may be unfamiliar to River Otter Alliance members, so we would like to introduce them to you.

Hélène Jacques is first a veterinarian in France. Second, she is an international otter advocate and conservationist. It is difficult to know where to find her these days as she is serving as an IUCN/SSC Otter Specialist Group representative in the west African French speaking countries and conducting research on the giant otter in French Guyana.

In both roles, Hélène has contributed significantly to our understanding of public perception and environmental issues facing two highly endangered otter species (Congo clawless and giant otters).

President's Message

Dear Readers,

Welcome to the Fall 2005 edition of The River Otter Journal.

In this issue, we have another article by Claudio Delgado–Rodríguez on the marine otter. This one discusses preliminary results from a population density and habitat characteristic study in central-south Chile. We also have several articles from University of Wyoming graduate students on their current river otter research: Jamie Crait questions if river otters can adapt to high altitude diving to reach lake trout in Yellowstone Lake, as their preferred prey-species, the cutthroat trout, declines in numbers; and Kaiti Ott discusses river otter diet and population abundance in Alaska's Kenai Fjords and Katmai National Parks. In addition, Jan Reed-Smith introduces us to Hélène Jacques, an international otter advocate and conservationist in the Otter Champion Corner. Otter Updates provides information on the recent listing of the northern sea otter as a federally Threatened species, the status of New Orleans' zoo and aquarium, and where to submit comments on the southern California sea otter relocation plan. There is also a review of Bob Landis' latest film about river otters at Yellowstone Lake.

As 2005 nears its end, please don't forget your annual dues contribution to the River Otter Alliance. We are a 501(c)3 non-profit, volunteer organization dedicated to providing educational information on the thirteen species of otters around the world.

We hope you enjoy the newsletter.

--Tracy Johnston, *ROA President and Newsletter Editor*

Photo by Nathan Varley

Otter Updates

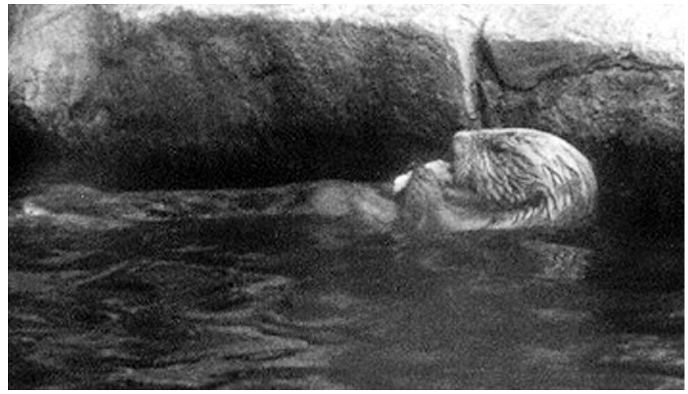
By Tracy Johnston

Audubon Nature Institute President Ron Forman personally fed the sea otters at New Orleans' Audubon Aquarium of the Americas after Hurricane Katrina devastated the area. Although the physical structure of the aquarium survived relatively unscathed, most all of the facility's 10,000 fish, which represented over 530 species, were lost when the aquarium's life support systems failed despite the efforts of many dedicated staff members, police officers and National Guardsmen who remained on site to care for the exhibit collections. Even though the aquarium had plenty of fresh water and food, its backup generators eventually failed in the aftermath of the hurricane and all fish, with the exception of eight large tarpons, died due to rising water temperatures and lack of oxygen. Two sea otters, 19 penguins, as well as macaws, raptors, leafy and weedy sea dragons, a large white alligator, an electric eel, and Midas, a 250 lb. green sea turtle all survived. Power has been restored to the aquarium and some of the survivors remain at the facility, while others are being temporarily housed at facilities around the United States. The sea otters and penguins are currently residing at California's Monterey Bay Aquarium.

New Orleans' Audubon Zoo faired better than the aquarium, however a pair of river otters were among the few casualties. The zoo was well prepared for the storm, having stockpiled fuel, food and other supplies, but is also fortunate to be located on the highest ground in the city. Both the Aquarium of the Americas and the Audubon Zoo may remain closed to the public for up to one year.

The distinct population segment of the northern sea otter (*Enhydra lutris kenyoni*) found in southwest Alaska was designated as a nationally threatened species by the U.S. Fish and Wildlife Service on August 9, 2005 under the Endangered Species Act. This ruling only affects the population segment of sea otters found in the Aleutian Islands, Alaska Peninsula coast, and Kodiak Archipelago, which once contained more than half the world's sea otter population. This population segment has undergone a 55%-67% overall population decline since the mid-1980s, and over a 90% decline in some areas within the same time period. The Fish and Wildlife Service cited a published study theorizing that the Bering Sea ecosystem has undergone significant changes and killer whales (*Orcinus orca*) have turned to sea otters as a food source as the populations of their preferred prey species of harbor seals and Steller sea lions have decreased. Estes *et al.* 1998. Although this theory does account for some of the northern sea otters' population decline, scientists remain puzzled as to why the entire population has decreased so rapidly.

Southern sea otters (*Enhydra lutris nereis*), which occur in coastal southern California, have been a nationally threatened species since January 14, 1977.



Sea Otter
Photo by Chris Wittenbrink

The U.S. Fish and Wildlife Service is accepting comments through January 5, 2006 on whether they should terminate the sea otter translocation program and eliminate the "no otter management zone" which would allow sea otters to reside where they wish in Southern California waters.

Although southern sea otters had been a federally endangered species for ten years, the U.S. Fish and Wildlife Service banned sea otters from California waters south of Point Conception near Santa Barbara in 1987, with the exception of San Nicholas Island, in an effort to appease fishermen who felt the otters threatened their sea urchin and lobster fishing. The relocation program, which cost several million dollars before it was terminated in 1993, has not worked, as sea otters continue to turn up in forbidden waters. Fishermen want the existing policy enforced. Comments can be mailed to:

Field Supervisor
U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003–7726

Population Density and Habitat Characteristics of the Marine Otter *(Lontra felina)* in the Central-South of Chile, Preliminary Results

Claudio Delgado – Rodríguez, Ricardo Alvarez Pacheco and Ana María Pfeifer Vargas

Programa de Investigación Conservación Marina

Email: investigacion@conservacionmarina.cl

Chiloe Island Habitat

ABSTRACT

The Marine otter, (Lontra felina), belongs to the mustelid family and lives exclusively in marine habitats along the Pacific coast, from Peru to Hornos Cape, particularly in exposed rocky shores. Although previous studies on the L felina species have been done, the current knowledge about population distribution and habitat requirements for the central-south of Chile is still scarce and incomplete. This study was developed to contribute to the knowledge about density, distribution, and habitat requirements of the marine otter. It was carried out along approximately 500 km of coastal environment of central-south of Chile including the Chiloé Island. Observations were conducted from June 2004 to April 2005. Results suggest that otter density varies from 1 to 5 individuals per lineal kilometre (indv./km) and mean density is around 2 indv./km. Apparently, the current otter population in the assessed area could be less than what was generally believed, especially for Chiloé Island.

INTRODUCTION

The marine otter, also known as Chungungo *(Lontra felina)*, belongs to the mustelid family and lives exclusively in marine habitats, particularly in exposed rocky shores (Castilla & Bahamondes, 1979). The population of *L. felina* is distributed along the Pacific coast, including parts of the Peruvian shoreline (6º S) and the entire Chilean coast reaching the 56ºS parallel in Cabo de Hornos (Redford & Eisenberg, 1992; Larivière, 1998).

Before the past century, otters flourished all along the Chilean coast (Housse, 1953). However, beginning in the year 1900, the otter population was strongly diminished by illegal hunting, especially between 1910 and 1954 when nearly 38,000 otter skins were exported from Chile. Although, at present, illegal hunting is diminishing, the serious population decline produced during the first half of the past century adversely altered the otter's geographic distribution and population density. Today the otter population in Chile is considered patched and fragmented. Despite a Chilean law that gave marine otters legal protection in 1929, at present marine otters are still under threat, mainly due to habitat destruction, water pollution, poorly regulated conventional tourism, and illegal hunting; the last of which occurs primarily in the channels and fjords zone at the 43º 40' S parallel. The other threats are related to the progressive use of the seashore, not only through conventional tourism, but also by the building of infrastructure such as hotels and yachting marinas that are environmentally inappropriate for the otters and their habitat. Each one of these problems contributes to the fragmentation of the population and increases the rate at which the marine otter nears extinction. In fact, the marine otter is currently considered in danger of extinction by the Red Data Book (Hilton-Taylor 2000), the Red Book of the Chilean Vertebrate (Glade 1993), and also in the Appendix I of CITES.

Although previous research on this species has been done, current knowledge of *L. felina* is still scarce and incomplete. Almost all past studies were conducted to assess diet and behavior (Castilla y Bahamondes 1979, Castilla 1982, Cabello 1985, Ostfeld et al. 1989, Sielfeld 1990a, Rozzy y Torres-Mura 1990, Ebensperger y Castilla 1991, Medina 1995a y 1995b, Alvarez 2001, Barthled 2001, Medina et al. 2004, Delgado 2001, Delgado 2005,), but no long-term research has been directed at assessing the population's density and dis-

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Population Density and Habitat Characteristics of the Marine Otter

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tribution along their habitat area. Therefore, little is known about the location of the fragmented population patches, the population density, or the actual conservation status. This is particularly true in southern Chile where significant otter populations are suspected to still exist and have not yet been well evaluated (Sielfeld & Castilla 1999, Sielfeld 1992).

This study corresponds to the first phase of long-term research for marine otter conservation, which is aimed to obtain key information and to assess basic aspects to design a future marine otter conservation plan, which includes the identification and promotion of coastal protected areas for marine otters and nested biodiversity conservation.

METHODS

Study Site

Surveys of marine otter habitat were carried out all along the coastline of the 10th region of Chile, which is located from 39°15'S / 71°45'W to 43°40'S / 74°15W. In this administrative region, two marine ecoregions were identified and described by Sullivan and Bustamante (1999): the Araucana Marine Ecoregion, which is located from 33º26' to 41ºS, and the Chiloense Marine Ecoregion, located from 41º to 71ºS. The coastal topography is mainly represented by rocky shores as well as varied sizes and types of sandy beaches. Rocky shores usually have a strong exposition to wind and waves and are characterized by the presence of cliffs, boulders, and funnels between large rocks. In the Chiloé Island, the western coast is similarly exposed, however the eastern coast is shaped by numerous small islands, fjords and channels. The coastal area in the upper tidal level is formed by terrestrial vegetation, which is in almost all cases dominated by native shrubs where the main species are *Fascicularia bicolor*, *Chusquea quila, Greigia sphacelata* and *Gunnera chilensis*. In the intertidal zone, the main species of macro algae are *Durvillea antartica, Lessonia nigrescens, Macrocystis pyrifera, ulva lactuca* and *Mazaella laminaroides*.

The total length of the study area is approximately 500 km. Given the study area's extreme length and size, it is possible to divide it into two distinct zones: the Continental zone and Chiloé Island zone (Figure 1). In general, it is possible to access almost at all the survey transects, pre-selected by photographic analysis, by a four-wheel drive vehicle. However, in the southern part of Chiloé Island, no roads for any vehicles exist. Therefore, this part is still not evaluated and the unique way to access that zone must be by horseback or on foot.

Density Population Assessment

Density population was assessed by means of census based on direct observation. Each census was made by three observers located in advantages points along the 1 km line transect. Observers record the presence of otters and their activities during five continuous hours. The observations were conducted simultaneously by the observers carrying out a visual scanning during two minutes by each eight minutes. For each scan, observers recorded in a reference map the otter position in the transect portion under observation. It is important to maintain the synchronicity of each visual scanner in order to avoid double-counting. This method is an adaptation of previous research developed in the rocky environments (Barthled 2001, Delgado 2001, Medina *et al* 2004, Delgado *et al.* 2005). However, in this study the observers used two-way radios to stay on

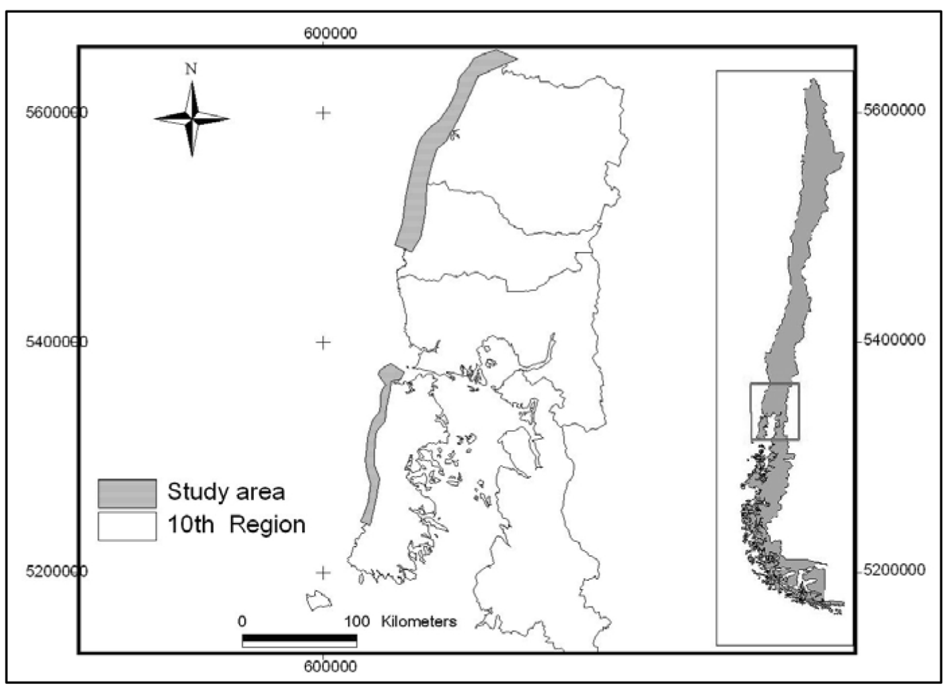

Figure 1. Study Area. Chiloé Islad is located in the south west.

Adult Male Marine Otter

in permanent communication. This constant communication helped the observers correct multiple sightings of individual otters and to distinguish sighting locations, thereby diminishing a double-counting bias. All the observations were made with the aid of 10x50 power view binoculars and 15-60x60 zoom spotting scope.

Habitat Assessment

In order to assess the otter habitats, both physical and biological attributes were recorded, as follows: *Rock size;* divided into four categories based on rock diameter: Small (size between 1 to 50 cm), Medium (size between 50 to 150 cm), Large (size between 150 to 450 cm), and Very Large (more than 450 cm), *Width;* corresponds to the distance from the tide-line to the coastal vegetation, which was divided into four categories: *class 1* (between 0 to 10 meters), *class 2* (between 10 to 20 meters), *class 3* (between 20 to 40 meters), and *class 4* (more than 40 meters), *Coastal vegetation*; corresponds to the vascular and non-vascular vegetation associated with the coastal shrubs (both the structure and the dominant species were recorded.); and *Inter-tidal vegetation;* corresponds to the dominant macro algae species placed in the inter-tidal zone.

RESULTS

Density Population

Otter density varies from 1 to 5 individuals per lineal kilometre (ind/km). The average density for the 24 line transects surveyed was 2 ind/km (*mean:* 2 ± 1.48). The higher density (5 ind/km) was recorded in line transect 10, which corresponds to the coastline of the Valdivian Coastal Reserve, a private coastal reserve in the continental zone. The lower density (1 ind/km) was observed in transects located at the northern zone of the study area (Queule), and the other two correspond to sites located in Chiloé Island. The density of the otter population was higher in the continental zone (*mean*: 2,5 ± 1,566) than Chiloé Island (*mean*: 1,4 ± 1,17), however, further analysis shows no statistical difference (t: 1,49; p> 0,01).

Habitat Characteristics

Rock Size

In the 24 transects surveyed, we observed a variety of rocks that fit all proposed categories. However, from the four categories, the higher proportion of rocks were found to be large (38%) or very large (39.6%) (Kruskal-Wallis test, H = 18.030 *Df*: 3 p <0.001).

We recorded a similar distribution across all rock size classifications for each surveyed transect between the continental zone and Chiloé Island. Although data shows that the frequency of small and medium rocks was higher in continental zone, there is no statistically significant difference (*Small*: H=0, 86; p=0.354 and *Medium*: H=0,135; p= 0,714). Additionally, there is no significant difference in very large rocks between the Island and the continental zone (H= 0.521; p= 0.470)(Figure 3).

Width of Coast

The most frequently observed width of coast were class 1 and 2. (H= 34.732 *Df*: 3 p <0.001). Class 4 was recorded only in one site at Chiloé Island and corresponded to a huge, sandy beach at the central zone of the Island (Cucao beach). Therefore, according to the obtained data, otters appear to be using rocky coasts between 0 and 20 meters (Figure 4).

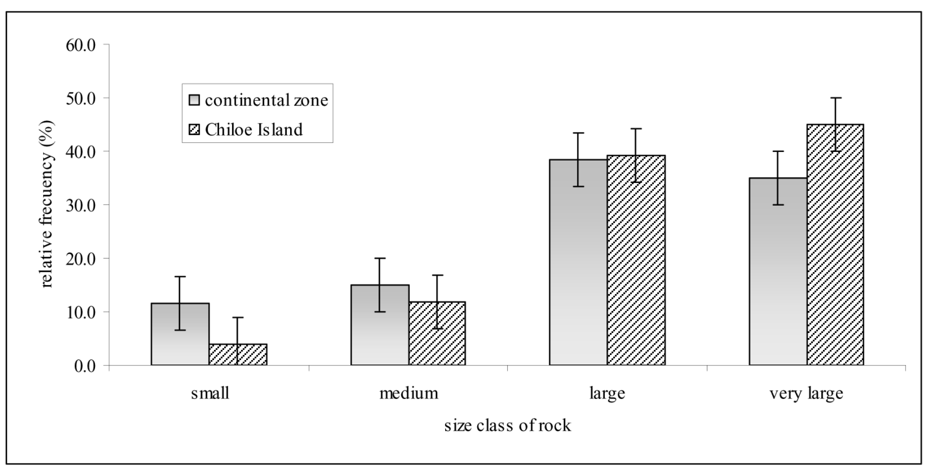

Figure 3. Frequency of rock size class observed in transects surveyed at Continental Zone (n=14) and Chiloé Island (n=10).

Although class 1 and 2 were the most frequently observed classification of coast width, a comparison in class frequency between the continental zone and Chiloé Island demonstrates that class 1 was more recurrent at Chiloé Island, but no significant difference was observed (H=2.629; P = 0.105). Class 2 was observed with high-

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er frequency in the continental zone (P=0,011). Similarly, class 3 was higher in Chiloé Island, but no significant difference was observed (P = 0.296) (Figure 5).

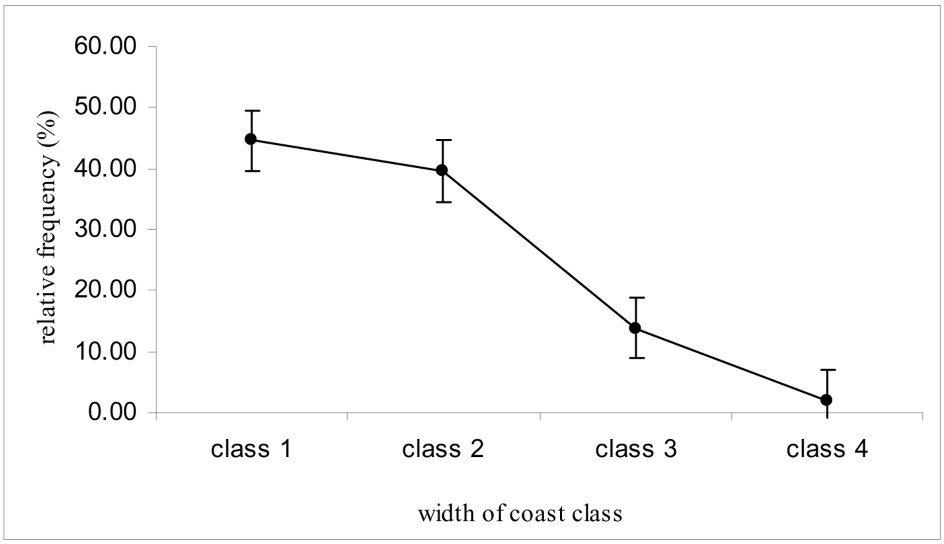

Figure 4. Global frequency of width classifications observed in transects surveyed at continental zone and Chiloé Island (n=24)

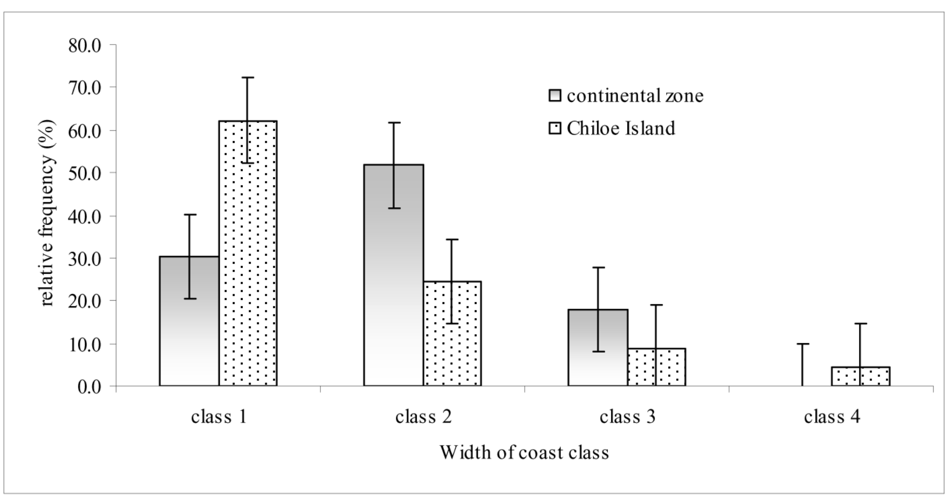

Figure 5. Frequency of width of coast classifications observed in transects surveyed at Continental Zone (n=14) and Chiloé Island (n=10).

Structure and Composition of Terrestrial Vegetation

Data recorded shows the occurrence of five different types of structure, terrestrial vegetation adjacent to the coastline in the surveyed sites: scrubs, renoval[1], grassland, dune vegetation, and plantations. Additionally, we classified as no vegetation all sites where absolutely no type of vegetation was observed. Across all sites surveyed, the main vegetation structure was scrubs (90%), which were composed primarily of native species, especially at Chiloé Island. The second most frequently observed vegetation corresponded to grassland (5%), composed primarily of non-native species (Figure 6).

Species composition of the terrestrial vegetation was composed of ten species from which 8 are native species and the other 2 are exotic species (Table 2). The most frequent species for the whole study area were Poe (*Fascicularia bicolor*) (27%), Quila (*Chusquea quila*) 19 (%), and Nalca (*Gunnera chilensis*) (15, 91%), however Nalca was recorded only at Chiloé Island (Figure 7).

Intertidal Vegetation Composition

Intertidal vegetation is defined as macroalgae observed between the lower and higher tide lines. Results are based on direct observation of the presence and the dominance (and co-dominance) of each recorded species, but no quantitative assessment was done. However, we believe that this approach was appropriate to obtain a general characterization of the habitat attributes. From the 24 sites surveyed, we recorded six dominant species: *Ulva lactuca, Gigartina sp. Mazaella laminaroides, Durvilleaea antarctica, Lessonia nigrencens*, and *Macrocystis pyrifera*. Considering global frequencies, *D. antarctica* was the most frequently recorded species (48.3%) along the whole study area.

The data demonstrates a similar pattern of observed species frequencies distribution between the continental zone and Chiloé island, although *D. antartica, U. lactuca, M. laminarioides* and *L. nigrecens*

[1] Renoval, correspond to a vegetational structure where young trees are dominant.

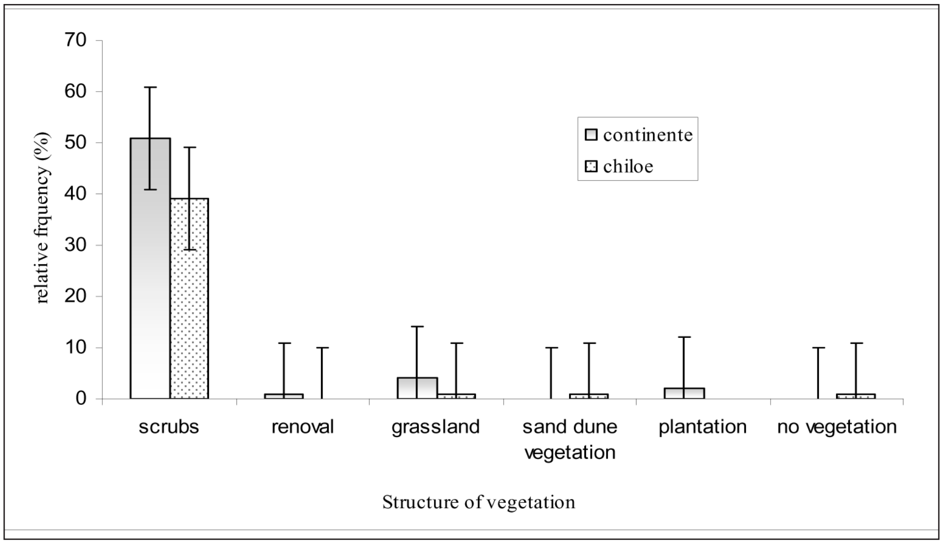

Figure 6. Structural classification of terrestrial vegetation observed adjacent to the coastline in Continental Zone and Chiloé Island.

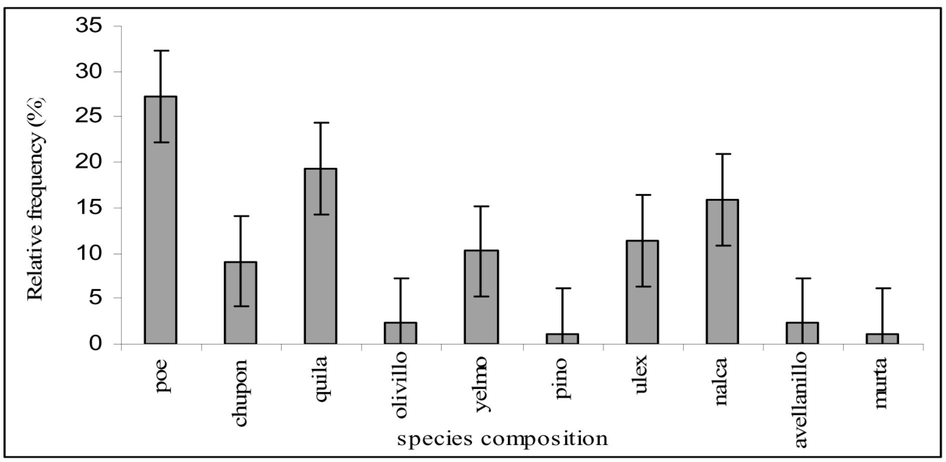

Figure 7. Global composition and relative frequency (%) of the terrestrial vegetation species observed adjacent to the coastline in the study area.

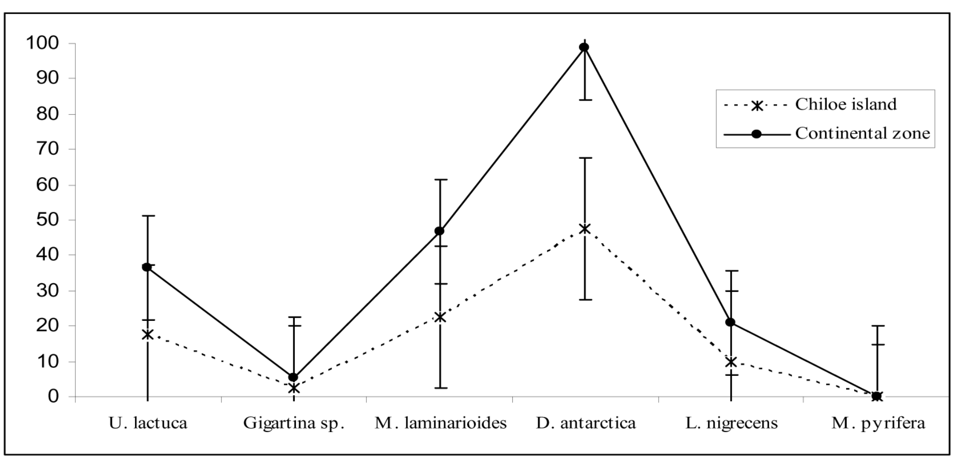

Figure 8. Frequencies of macro-algae species composition observed between continental zone and Chiloé Island.

were observed with higher frequency on the continental zone, no significant differences were observed (F= 0,111 p:0,746) (Figure 8).

DISCUSSION

Population Distribution and Density of Marine Otter Population

Although, based on this preliminary information, it is still difficult to compare our results with previous studies. However, we now have good insight about the distribution of the otter population in part of the central south of Chile and we can confirm the presence of the otter in the northern area of Chiloé National Park where Cabello (1983, 1985) recorded the higher population density of otters along the entire Chilean coast. Another important record is the evidence of the marine otter using very quiet zones, with lower wave energy, such as in Ancud Bay on Chiloé Island. This observation is in contrast with the majority of publications that suggest that otters only use very exposed zones with higher wave energy, heavy sea activity, and strong winds (Castilla 1982, Ostfeld *et al* 1989, Sielfeld y Castilla 1999). Therefore, we suggest that, at least for Chiloe Island, otters can use very calm waters, implying that their population distribution is not restricted to only very exposed zones, as was described by the aforementioned authors. Although Rozzy and Torres Mura (1990) described the potential use of sandy beach environments on remote islands located in the south of Chiloé Island, based on the presence of *Emerita analoga* found in the stomach of a single dead otter, several publications suggest that marine otters do not use sandy beaches for feeding (Castilla y Bahamondes, 1979, Castilla 1982, Cabello, 1985, Ostfeld et al. 1989, Sielfeld 1990a, Sielfeld, 1990a Torres-Mura, 1990, Ebensperger y Castilla, 1991, Medina, 1995a y 1995b, Delgado 2001, Álvarez 2001). In this study, no observation of otters continuously using sandy beaches was done. However, we recorded feeding activities on the edges between rocky and sandy environments. Yet, more than 90% of the observed otters were recorded in rocky environments and the other 10%

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Population Density and Habitat Characteristics of the Marine Otter

continued from page 11

Marine Otter Family

were observed in so-called edge environments. Additionally, all the places where no otter was recorded corresponded to environments dominated by sandy beaches. This information allows us to restrict the sandy beaches area (larger than 2 km) in our future estimation of the overall population in the whole study area. This restriction will diminish the potential to overestimate the otter population.

Information obtained in this study regarding the density of the otter population is very important because it was the first attempt to assess the marine otter population density in such a large area and allows us to have a wide perspective about the current status of the otter. Values for population densities obtained in this study from Chiloé Island show significant differences to those published by Cabello (1977, 1983) for the Chiloé Island, which reported a density of 10 ind/km in the northern zone of the island, which represented the highest value observed along the entire Chilean coast, and consequently this suggested that the greater otter population along the Chilean coast exists on the island. However, in this study surveying the same sites studied by Cabello (1977, 1983), we recorded a density of only 1.5 ind/km. This difference between both studies could be explained by the use of different methodological approaches, by the different seasons, or by adverse human impacts during the last two decades. However, we are more inclined toward the first explanation, because, at least during our surveys in the area, we observed no interruption by humans and access to the site was not easily available to the general public. Moreover, we suspect that previous studies have overestimated the population density in this area due to the significant double-counting of individuals because of the applied methodology.

Our results are more similar to studies carried out on the small islands in the south of Chiloé, where a mean density of 3.6 ind/km was recorded (Rozzy and Torres-Mura 1990). Additionally, our results align with the observed densities along the coastline of northern Chile, where densities of 2.5 ind/km were recorded in Los Molles between 1976 and 1977, a density of 1.25 indv/km recorded in the same place in 1980, and densities of 1.5 ind/km in Punta Lobos and 1.25 ind/ km in Chañaral in 1981 (Castilla 1982).

Although our results are preliminary, they allow us to suggest that the otter population in the assessed area could be less than what was generally believed, especially for Chiloé Island. These results will assist us to develop a better approach for a future conservation action plan for marine otter population and their environment.

Habitat Characteristics

According to the obtained results, otters are more frequently found in habitats with a high proportion of large (150 to 450 cm) and very large rocks (more than 450 cm). Although small and medium rocks are also present in otter habitats, these were observed in lower proportion. This trend was observed both in the continental zone and on Chiloé Island. Therefore, this suggests that the marine otter could have a preference for environments with heterogeneous rock sizes, but with a higher proportion of large rocks, which produce the better availability of funnels, channels, and caves that otters need for daily terrestrial activities (such as hunt prey, rest, sleep, and mate). This is in agreement with existing publications that describe otters using rocky environments with the presence of natural galleries commonly used as ways to access water and to establish dens (Castilla y Bahamondes 1979, Rozzi and Torres-Mura 1990, Ebensperger y Castilla 1992, Sielfield and Castilla 1999, Alvarez 2001).

Our results are in agreement with earlier studies that reveal otters use no more than 30 meters in-land (Castilla 1982). Regarding the structure and composition of the terrestrial vegetation, we observed a high frequency of shrubs composed primarily of native species, which is similar with reports by Sielfeld and Castilla (1999). Although we are unable to establish a relation between otter presence or density and the occurrence of native species, we observed more otters in locations with native vegetation. However, we do not know if this is because native shrubs offer a more suitable terrestrial habitat or because a non-native matrix (pines or eucalyptus plantations) could be affecting the otter population by inadvertently changing the ecology of the landscape (i.e., by water pollution or the increase of terrestrial sediments from non-native plant use that could affect the ecology of prey species).

The species composition of inter-tidal vegetation was very similar with that recorded by different authors (Castilla y Bahamondes 1979, Rozzi and Torres-Mura 1990, Ebensperger y Castilla 1992, Sielfield and Castilla 1999, Alvarez 2001). Similarly to the terrestrial vegetation, we cannot demonstrate if the algae association, described previously, has any relation to otter density values. However, we observed a high frequency of *Durvilleaea antarctica* both on Chiloé Island and in the continental zone. This species of algae could offer good hiding and hunting opportunities and also because prey species are commonly nested to a brown algae systems. However, more efforts are evidently needed to fully assess these probable relations.

PROJECT'S NEXT STEPS

The next phase will involve the assessment of remote places both in the continental zone and on Chiloé Island. Based on obtained information, we will start the first phase of a process about coastal conservation initiatives involving government organizations and other non-governmental institutions related with wildlife issues, in order to discuss alternative designs and propose coastal protected areas in the central-south of Chile. At the same time, the next phase will continue with a public awareness campaign, but this time focused more on stakeholders. At this moment, we are pursuing new financial support for the future phases of the project, a key component to accomplishing this long-term project and promote the conservation of this endangered otter species.

ACKNOWLEDGEMENTS

We would like to thank the Padi Foundation and Project Aware for funding the major part of this project phase and to the International Otter Survival Fund, especially to Mrs. Grace Yoxon to consider supporting part of this study. Special thanks to Mr. Francisco Solis, Project Coordinator for The Nature Conservancy, to Mr. David Tecklin, Valdivian Rainforest Ecoregión Program Coordinator for the World Wildlife Fund for permitting us complete access to the Valdivian Coastal Reserve and for providing facilities during our fieldwork in the Reserve. We appreciate the advice, comments and support of Dr. Jaime Rau, from the IBAM Program of the Universidad de los Lagos. Special thanks to Site Manager Mr. Alfredo Almonacid and all the Valdivian Coastal Reserve staff for their logistical support during the surveys carried out in the Reserve and Carol Bushar for the help with the english version review.

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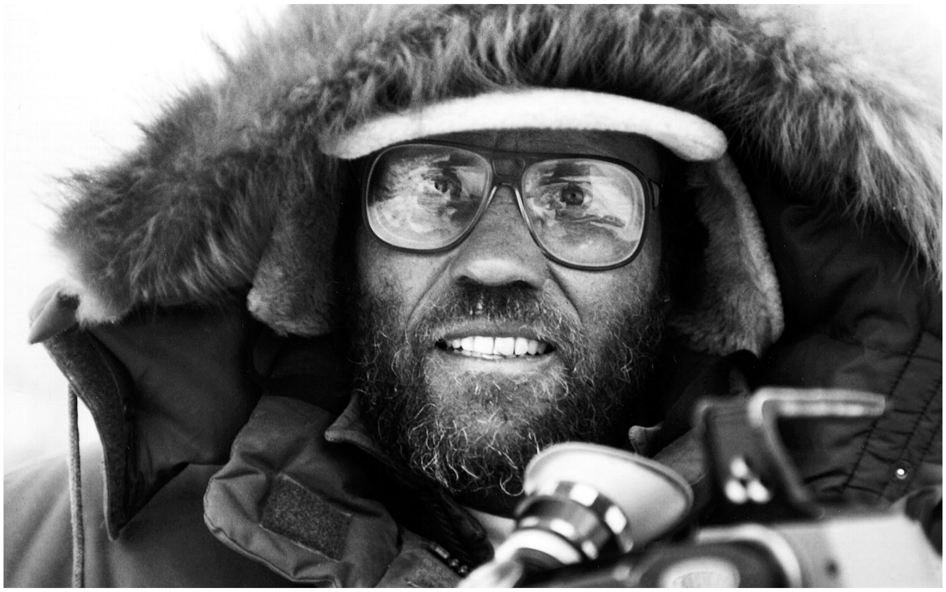
Seasons of the Otter – A Film Review

By Tracy Johnston



Bob Landis
Photo by William Campbell

***Seasons of the Otter, A Yellowstone Lake Story,* the latest film from Emmy award-winning cinematographer Bob Landis, has just been released.** The film is a wonderful mix of wild otters and other animals at home in their natural environment. Through the daily lives of the otters, the beauty and plight of Yellowstone Lake is shared with film viewers. Yellowstone Lake is a beautiful and very unique ecosystem. As the largest freshwater lake in the United States above 7,000 feet, it reaches depths of 400 feet, covers 136 square miles, and has 110 miles of shoreline. The lake lies in a collapsed volcano (or caldera) and is the result of the largest hydrothermal explosion presently known to man. Hot air and gasses continue to bubble up from the earth's core, bringing algae to the surface where cutthroat trout feed on it and unique underwater spires, like coral reefs, rise from the lake's bottom and continue for hundreds of yards in a row.

Despite the beautiful backdrop to the otters' story, the film explores a serious threat to the Yellowstone Lake ecosystem. Over 30 different species of birds and mammals, including the river otter, depend on the limited Yellowstone Lake cutthroat trout as a food source. A growing threat to this food source are illegally introduced non-native lake trout which are consuming the cutthroats in record numbers and have negatively affected the lake's ecological balance. Unlike the cutthroat, the lake trout live at depths too deep to serve as a food source for predators such as birds that typically prey on the cutthroat trout. This reduction in available cutthroat trout for dependent species is at the center of the current threat to Yellowstone Lake.

Interesting bonus features include:

- John Varley, the National Parks Service's Director of Yellowstone Center for Resources, explains the history and unique and changing ecosystem of Yellowstone Lake;
- Dave Lovalvo of Eastern Oceanics shows the submersible remote operated vehicle (ROV) used for filming and underwater sampling, as well as some unique features of Yellowstone Lake, including the underwater geothermal spires rising up to 22 feet, which remained undiscovered until 1996;

Photo by Nathan Varley

- Jamie Crait, University of Wyoming graduate student (See *Adaptation to High Altitude Diving: Can River Otters Switch from Cutthroat to Lake Trout?* article in this newsletter), explains his studies on the possible negative impacts non-native lake trout have had on the river otter population and the Yellowstone Lake ecosystem; and,

- Dr. Tom Serfass of Frostberg State University discusses unique shoreline features otters favor for latrine sites, prey-base differences between eastern U.S. otters versus Yellowstone otters, and the promise of DNA research to assess river otter populations.

Yellowstone River Otters
Photo by Nathan Varley

Wildlife enthusiasts and those interested in Yellowstone Lake's unique ecology will enjoy the spectacular photography and interesting history in the film, and it's a definite must-see for otter lovers. Seasons of the Otter is available in VHS or DVD format. To order, contact:

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P.O. Box 1087
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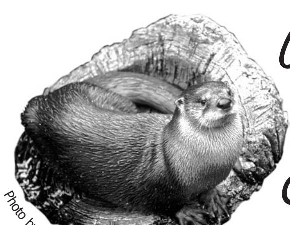

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All work and efforts for this organization and newsletter are on a volunteer basis by those who share a common concern for the welfare of the river otter and its habitat. We invite all interested persons to contribute their time at any level of the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

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