



Otter Information

The Natural History of the North American River Otter (*Lontra canadensis*)

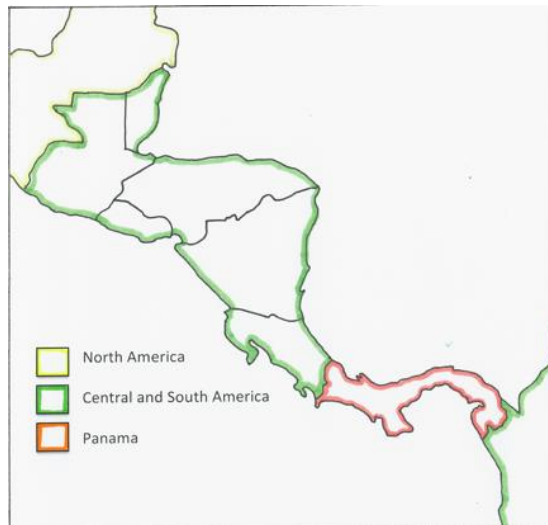
by
Victor L. Camp

A. Arrival of the otter into the New World of North America

The North American river otter originated in the Old World, more specifically from northeastern Russia. The otter crossed the Aleutian Island/Bering Strait Land Bridge when the water level in the north Pacific dropped and exposed the submerged land mass of the Aleutian Island chain between the Kamchatka Peninsula of eastern Russia and the Alaskan Peninsula. This event took place on and off between 1.8 million and 10,000 years ago. The otters then spread across North America and



The North Pacific between Siberian Russia and Alaska



Between Mexico, Central America and South America southward into Central America. Upon arrival of the river otter in southern Central America its southward migration was restricted by the lack of the Panama land bridge which currently extends from southern Costa Rica to Columbia. As the seas lowered the Isthmus of Panama was exposed and the otters continued their migration on into South America.

B. Geographic Range of the North American River Otter



The North American river otter is found throughout most of North America except for relatively dry areas in parts of southern California, Nevada, Arizona, New Mexico, Colorado and southwest Texas and the colder areas of extreme northern Canada. A recent publication described a small, relic population of the North American river otter occurring in northwestern Mexico. River otters also inhabit coastal marine waters of North America. These coastal marine otters occur along the Pacific coast from northern California to Alaska. They are also found along the entire Atlantic coast from northern Canada southward along the eastern shore of North America to the southern tip of Florida. According to the Florida Fish and Wildlife Conservation Commission (FFWCC) the river otter occurs throughout Florida, except for the Keys.

However, this stated lack of distribution of the coastal marine otter in the Florida Keys is under question by this author. Coastal marine otters extend northward in Florida, along the shores of the Gulf of Mexico, and further westward along the shores of the northern gulf states to an area ending approximately 30 miles west of Galveston, Texas.

C. Subspecies of the River Otter Genus *Lontra* in North and Central America

Genus *Lontra* changed from *Lutra* and species *longicaudis* changed from *annectens* by V.L. Camp to follow current (2021) otter taxonomy

- | | |
|--------------------------------------|---|
| 1. <i>L. canadensis brevipilosus</i> | 13. <i>L. canadensis periclyzomae</i> |
| 2. <i>L. canadensis canadensis</i> | 14. <i>L. canadensis preblei</i> |
| 3. <i>L. canadensis chimo</i> | 15. <i>L. canadensis sonora</i> |
| 4. <i>L. canadensis degener</i> | 16. <i>L. canadensis texensis</i> |
| 5. <i>L. canadensis evexa</i> | 17. <i>L. canadensis yukonensis</i> |
| 6. <i>L. canadensis extera</i> | 18. <i>L. canadensis vaga</i> |
| 7. <i>L. canadensis interior</i> | 19. <i>L. canadensis vancouverensis</i> |
| 8. <i>L. canadensis kodiakensis</i> | 20. <i>L. canadensis mira</i> |
| 9. <i>L. canadensis lataxina</i> | 21. <i>L. longicaudis annectens</i> |
| 10. <i>L. canadensis nexa</i> | 22. <i>L. longicaudis latidens</i> |
| 11. <i>L. canadensis optiva</i> | 23. <i>L. longicaudis mesopetes</i> |
| 12. <i>L. canadensis pacifica</i> | 24. <i>L. longicaudis repanda</i> |

Map Taken From: Hall, E.R. and K.R. Kelson. 1959. The Mammals of North America. The Ronald Press Company, New York. Vol. II, p. 947



D. Habitat of the North American River Otter

The primary habitat of freshwater otters is the riparian zone or riparian area. The riparian zone includes the area where the terrestrial habitat and the flowing waters of rivers or streams interface with each other. Clean, unpolluted water is prime habitat requirement for an otter population. There are numerous factors impacting otter populations and they will be explained shortly in the section entitled “North American River Otter Predators” and “Other River Otter Risk Factors”.

Typical Freshwater Habitat



Typical Coastal Marine Otter Habitat in South Florida



Mangrove trees may cover the entire shores of land masses in the brackish water estuaries of south Florida. These estuaries occur on the back or leeward shores of the barrier islands the shelter these estuaries.

E. The Diet of the North American River Otter (*Lontra canadensis*)

The North American river otter’s diet varies with the seasons and availability of prey. Fish are the most prevalent prey of the river otter followed by crayfish. The river otter also eats a wide variety of other vertebrate prey species and some invertebrate species. These include amphibians, reptiles, birds, insects, snails and clams and even some mammal species.

FISH

In the northern North American states and Canadian provinces an abundance of some fish prey may only occur during the fishes’ breeding season. During the breeding season, these fish species become concentrated in their spawning grounds and are readily accessible food for the otters. During the winter, in northern climates, the surfaces of lakes, ponds, streams, and rivers may freeze over. Consequently,

otters may become restricted to rivers and larger streams where the water continues to flow underneath the surface ice. Otters do not hibernate and must continue to feed. The lakes and ponds, being frozen over during winter, are not accessible to the otter as the otter is unable to sustain openings in the surface ice of these waters. During winter otters will move from one large stream or river to another and they continue to maintain the openings in the ice. This allows them to return to and enter the undersurface of the frozen waterway and continue feeding. The following photos of fish species are either known North American river otter prey species or are considered by this author as potential otter prey species in south Florida.

In subtropical and tropical regions of North America there are only two seasons wet and dry. During the dry season, in these climates, the water levels in impounded waters decrease and those fish species trapped in these waters become more concentrated and easier to catch. During the wet (rainy season) these impounded waters levels rise and some fish species may become more difficult to catch. Slow moving, bottom feeding and dwelling, shallow water fishes are the primary prey of the otter.

SUCKERS: Suckers are one of these types of fishes and appear to be one of the most common prey species of the otter. The sucker group is large fish group, containing 60 species and includes Buffalos, Quillbacks, Suckers, Carpsuckers, Chubsuckers, Hog Suckers, Redhorses, and Jumprocks.



White Sucker
(*Catostomus commersoni*)



Lake Chubsucker
(*Erimyzon sucetta*)

Many of these 60 species range over large areas while others have small ranges or are restricted to small and specific geographical areas.



Blue Sucker
(*Cycleptus elongates*)



Smallmouth Buffalo
(*Ictiobus bubalus*)



Black Buffalo
(*Ictiobus niger*)

MINNOWS: The minnow group is largest family of fish species with 2100 species worldwide. However, they do not occur South America, Australia, and the Antarctica. In North America minnows are the largest group of fishes with 231 species. Many of the species are small and typically referred to as minnows- as in minnows for fishing. The North American river otter eats fish species that prey on minnows and a diet analysis may indicate one or more minnow species were found in an otter's feces (scats). One must be careful not to include some minnow species as being part of the otter's diet until adequate proof is confirmed. One of the primary minnow species eaten by the North American river otter is the carp. This large slow moving, bottom feeding and dwelling, shallow water fish is exemplified by the Grass Carp shown below.



Grass Carp
(*Ctenopharyngodon idella*)

BULLHEADS, CATFISH, AND MADTOMS: Catfishes and bullheads are also a common prey of the North American river otter. This group includes five species of catfishes, six species of bullheads, and 25 species of madtoms. The madtoms are group of species unfamiliar to lay people and many vertebrate zoologists other than the ichthyologist. Madtoms look like catfishes and bullheads. All madtoms have four pairs of whiskers and many species are less than four inches long and typically have square-shaped tailfins. Four species of madtoms occur in Florida-mostly north and north central Florida. Further review of the literature may indicate madtoms are a prey species of the North American River otter.



Yellow Bullhead
(*Ameiurus natalis*)



Black Bullhead
(*Ameiurus melas*)



Brown Bullhead
(*Ameiurus nebulosus*)



Flathead Catfish
(*Polydictis olivarius*)



Channel Catfish
(*Ictalurus punctatus*)



White Catfish
(*Ameiurus catus*)



Speckled Madtom
(*Noturus leptocanthus*)



Tadpole Madtom
(*Noturus gyrinus*)

SUNFISH: Like the sucker, the bullhead and catfish group, and the carp, the sunfish group is also a prevalent prey species in the diet of the North American Otter. The Largemouth bass, a member of the sunfish group and probably the most popular freshwater sport fish in eastern North America, is also eaten by the North American river otter. Fishermen have raised issues about otter preying on the Largemouth Bass and many fishermen appear to assume otters are a threat to the Largemouth Bass sport-fishing populations. Diet analyses of otters in North America show Largemouth Bass to be an insignificant prey species of the North American river otter. It is those sunfishes that most people are aware of as sunfishes are the sunfish species preyed upon most often by the otter. The sunfish photos which follow show a variety of sunfishes which are known to be eaten or are suspected to be eaten by the otter.



Flier
(*Centrarchus macropterus*)



Green Sunfish
(*Lepomis cyanellus*)



Warmouth
(*Lepomis gulosus*)



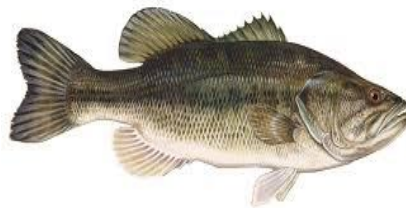
Bluegill Sunfish
(*Lepomis macrochirus*)



Pumpkinseed Sunfish
(*Lepomis gibbosus*)



Redear Sunfish
(*Lepomis microlophus*)



Largemouth Bass
(*Micropterus salmanoides*)



Otter with a Sunfish in Tennessee

PIKE: The Pickerel, Northern Pike and Muskellunge belong to the pike group of fishes.

Pickerels inhabit lakes, swamps, backwaters, and quite pools of streams in small to medium rivers and are known to be otter prey. Although found in rivers the Northern Pike and Muskellunge tend to inhabit large, clear, and well-vegetated lakes.



Redfin Pickerel
(*Esox americanus*)



Northern Pike
(*Esox lucius*)



Muskellunge
(*Esox masquinogny*)

TROUT: Trout are more readily available and consumed in the western part of North American. Trout are most commonly available and preyed upon by the otter during the breeding season when the trout are concentrated on their spawning grounds.



Brook Trout
(*Salvelinus fontinalis*)



Rainbow Trout
(*Oncorhynchus mykiss*)



Cutthroat Trout
(*Oncorhynchus clarki*)

INVASIVE FISHES: Invasive fishes, or non-native as they are sometimes called, are preyed upon by otter in south Florida. Below are pictures, taken by local photographers, of the invasive Blue Tilapia (*Oreochromis aureus*) caught by river otters in southwest Florida.



Highland Woods Golf and Country Club, Bonita Springs, Florida



Freedom Park, Naples, Florida



Blue or Nile Tilapia (*Oreochromis aureus*)

CRAYFISH AND CRABS

Next to fish crayfish is a primary freshwater food source for the North American river otter. Crabs, on the other hand, are mostly consumed by coastal marine otters. The Coastal Marine Otter Section will provide additional diet information on these salt-water-adapted North American river otters.

The following photos of crayfish and crabs are either known North American river otter prey species or are considered by this author as potential otter prey species in south Florida.



Crayfish
Generic Species



Blue Crab
(*Callinectes sapidus*)



Stone Crab
(*Menippe mercenaria*)

INSECTS

Dragonfly nymphs and some large beetles have been documented as prey of the North American river otter. However, no specific species of dragonflies or beetle have been identified. Immature dragonfly nymphs are eaten by river otters once they have crawled out of the water onto a leaf of an aquatic plant (see below). It is here, on the plant leaf, that the dragonfly stops growing and generates a hard case or chrysalis around itself.

Dragonfly Life Stages



(1) Nymph in Water



(2) This is the Life Stage
Eaten by the Otter



(3) Adult Emerging
from Chrysalis



(4) Adult

AMPHIBIANS

FROGS, TOADS, AND SALAMANDERS: Frogs, toads, and salamanders are known to be eaten by the North American river otter. Salamander presence in Florida is interesting. In Florida, 17 species of salamanders are present and all but one, the Dwarf Salamander, are restricted to northern and north central Florida. The Dwarf salamander is also present in northern and north central Florida. However, the range of this salamander extends southward through central Florida to Dade county and is the only salamander species occurring in south Florida. The following photos of amphibians are either known North American river otter prey species or are considered by this author as potential otter prey species in south Florida.

NEWTS, THE WATERDOG (MUDPUPPY), SIRENS, AND AMPHIUMAS: In addition to frogs, toads and salamanders, as potential otter prey species, four other amphibian types exist in Florida. These are the newts, the Waterdog (Mudpuppy), the sirens, and the amphiumas. Of the two species of newts present in Florida only the Central Newt is present throughout the state. There is only a single species of Waterdog (Mudpuppy) in Florida and it only occurs in the Florida Panhandle. Of the four species of sirens in Florida only the Narrow-striped Siren and the Greater Siren occur in south Florida. Two species of amphiuma live in Florida. The Two-toed Amphiuma occurs throughout Florida while the One-toed Amphiuma only exists in the Florida Panhandle.

Identifying amphibians as prey species of the North American river otter is challenging as amphibians have no scales or other distinguishing external characteristics to aid in identifying them from an otter fecal sample. To be able to identify an amphibian specimen by examination of the otter's feces, an investigator would have to have seen a specific otter eat an amphibian or would have to access to skeletal remains and or skin samples from voucher amphibian specimens. Or, the investigator would have to have access to DNA from voucher species to use as reference materials and the tools and equipment to process the DNA.

The following photos of amphibians are either known North American river otter prey species or are considered by this author as potential otter prey species in south Florida.



Bullfrog
(*Rana catesbeiana*)



Leopard Frog-Brown Phase
(*Rana sphenocephala*)



Leopard Frog-Green Phase
(*Rana sphenocephala*)



Pig Frog
(*Rana grylio*)



Southern Toad
(*Bufo terrestris*)



Eastern Spadefoot Toad
(*Scaphiopus holbrookii*)



Oak Toad
(*Bufo quercicus*)



Cane Toad
(*Bufo marinus*)



Dwarf Salamander
(*Eurycea quadrudigitata*)



Central Newt
(*Notophthalmus viridescens*)



Greater Siren
(*Siren lacertina*)



Narrow-striped Dwarf Siren
(*Pseudobranchius axanthus*)



Two-toed Amphiuma
(*Amphiuma means*)

REPTILES

Reptiles are a known prey source of the North American river otter and include the crocodilians (alligator, caimans, and the American crocodile), turtles, lizards, and snakes. Photos of turtles are shown first as these reptiles are the most prevalent reptile in the North American river otter's diet.

TURTLES: Otters prey primarily on the more aquatic, freshwater turtles. Sea turtles are assumed not to be an otter prey species but, sea turtle eggs and hatchlings are potential prey for the otter. Tortoises may not be a prey of the otter. The shell of the tortoise is very thick and heavy and would likely deter an otter.

Whether a turtle has a hard shell or a somewhat soft shell, like the Soft-shelled Turtle, the otter apparently has no problem eating turtles. Photos have been published showing turtle carapaces (upper shells) and plastrons (under shells) completely separated by otters and the contents between these two shells having been eaten by otters. To view photos and videos of otters eating turtles Google "otters eating turtles". Separating the carapace from the plastron is one way the otter can access the soft body contents between these two shell parts. A photo has been seen showing an otter that had bitten through

the side of a turtle, where the carapace and plastron are joined, and then the otter continued to bite off parts of the carapace until an opening was created that allowed the otter access to the inside of a turtle's shell. The reptiles shown in the following photos are either known North American river otter prey species or are considered by this author as potential otter prey species



Peninsula Cooter
(*Pseudemys floridana peninsularis*)



Florida Red-bellied Cooter
(*Pseudemys nelsoni*)



Red-eared Slider
(*Trachemys scripta elegans*)



Common Musk Turtle
(*Sternotherus odoratus*)



Striped Mud Turtle
(*Kinosternon bauri*)



Eastern Mud Turtle
(*Kinosternon subrubrum*)



Ornate Diamondback Terrapin
(*Malaclemys terrapin macrospilota*)



Florida Box Turtle
(*Terrapene carolina bauri*)



Florida Soft-shell Turtle
(*Apalone ferox*)

River Otters Eating a Soft-shelled Turtle
in Southwest Florida

LIZARDS: There are numerous lizard species and most are quick and fast moving and would be difficult for the otter to catch. To this author's knowledge there are no records of the North American river otter preying upon lizards. One should expect otters would feed on lizard eggs and hatchlings if they were encountered.

NO PHOTOS ARE AVAILABLE OF OTTERS PREYING ON LIZARD SPECIES

CROCODILIANS: The crocodilians include the American alligator, American crocodile, and the caimans. The alligator is distributed across Florida and the northern coastal states of the Gulf of Mexico and as far north as the Carolinas on the Atlantic coast. At present the American crocodile only occurs in south Florida. Caimans are native to South America. Due to careless pet owner releases caimans now exist as an invasive species in south Florida. Medium-sized and adult specimens of these crocodilians are too formidable for an otter. Provided the right opportunity exists the North American river otter should be expected to prey on the eggs, hatchlings, and small specimens of these crocodilians. The following photos of crocodilians are either known North American river otter prey species or are considered by this author as potential otter prey species in south Florida.



American Alligator
(*Alligator mississippiensis*)
YOUNG



American Crocodile
(*Crocodilus acutus*)
YOUNG

SNAKES: There are numerous snake species in North America as well as invasive snake species in Florida. Provided voucher specimens are available the identification of snake species from otter feces(scats) should not be difficult as snakes are covered with scales. The following photos of snakes are either known North American river otter prey species or are considered by this author as potential otter prey species in south Florida.



Eastern Garter Snake
(*Thamnophis sirtalis*)



Corn Snake
(*Pantherophis gutta*)



Salt Marsh Snake
(*Nerodia clarkii*)



Broad-banded Water Snake
(*Nerodia fasciata*)



Striped Crayfish Snake
(*Regina alleni*)



Eastern Mud Snake
(*Farancia abacura*)

BIRDS

The birds most frequently preyed upon by the North American river are aquatic birds such as aninga, cormorants, ducks and the gulls when on their nesting grounds. A wide variety of the smaller wading birds in Florida are potential prey for the otter. Some of these same wading bird species, if inhabiting other states or provinces, should also be considered potential prey for the otter. The following photos of birds are either known North American river otter prey species or are considered by this author as potential otter prey species in south Florida.



Mallard Duck
(*Anas platyrhynchos*)



Mottled Duck
(*Anas fulvigula*)



Black Duck
(*Anas rubripes*)



Anhinga
(*Anhinga anhinga*)



Double-crested Cormorant
(*Phalacrocorax auritus*)



Pied-billed Grebe
(*Podilymbus podiceps*)



Least Bittern
(*Ixobrychus exilis*)



Snowy Egret
(*Egretta thula*)



Little Blue Heron
(*Egretta caerulea*)



Tricolored Heron
(*Egretta tricolor*)



Reddish Egret
(*Egretta rufescens*)



Cattle Egret
(*Bubulcus ibis*)



Green Heron
(*Butorides virescens*)



Black-crowned Night-Heron
(*Nycticorax nycticorax*)



Yellow-crowned Night-heron
(*Nyctanassa violacea*)



Glossy Ibis
(*Plegadis falcinellus*)



White Ibis
(*Eudocimus albus*)



Clapper Rail
(*Rallus longirostris*)



Purple Gallinule
(*Porphyrio martinica*)



American Coot
(*Fulica americana*)

Limpkin
(*Aramus guarauna*)

SNAILS AND CLAMS

Snails and clams do not appear to be a notable food source for the North American river otter. Land snails are the more likely snails eaten by the otter in south Florida. The Apple snail is an invasive species and their egg masses, shells, and living specimens are quite prevalent in ponds and artificial lakes in non-gated and gated residential communities in southwest Florida. To the best of the author's knowledge clams have not been documented as a food source of otters in south Florida or the rest of North America. However, this author has observed clam shells in otter scats (spraints) on several occasions but, has yet to identify their species.



Florida Tree Snail
(*Liguus fasciatus*)



Brown Garden Snail
(*Cornu asperum*)



Apple Snail
(*Pomacea paludosa*)

MAMMALS

The young of medium size semi-aquatic mammals are the primary mammal prey of the North American river otter. Beaver and muskrat young have been documented as otter prey in states north of Florida.

Neither the beaver nor the commonly known muskrat (*Ondatra zibethicus*) occur in Florida. The young of another semi-aquatic mammal, which may be prey of the otter, is the Nutria. Nutria are invasive species and per the Florida Fish and Wildlife Conservation Commission (FFWCC) the nutria “...has been in Florida since at least 1955 and entered the state from fur farms and from releases for aquatic vegetation control.” The FFWCC also states “... the animals are consistently reported from the Tampa Bay area, Hillsborough county”.

There is another species, with a similar common name, that should not be confused with *Ondatra zibethicus* as a prey species of the otter. This is the Round-tailed Muskrat (*Neofiber alleni*). The Round-tailed Muskrat is a common species in Florida and is not documented as an otter prey species. Additional potential prey species are the Opossum and aquatic rat species. The Nine-banded armadillo (*Dasypus novemcinctus*) is likely a prey species of the North American river otter



America Beaver
(*Castor canadensis*)
YOUNG



Muskrat
(*Ondatra zibethica*)
YOUNG



Nutria (Coypu)
(*Myocaster coypus*)
YOUNG

F. North American River Otter Predators and Other River Otter Risk Factors

Otters are exposed to predators and other risk factors that compromise their populations.

PREDATORS

MOTORIZED VEHICLES: Roadway mortality from motorized vehicles is probably the most prevalent factor in reducing otter populations in southern Florida. South Florida has extensive urban residential



development. Along with high population densities high densities of motorized vehicles occur on roadways. During the time of the year when the mother otter is rearing her pups the otter family is frequently exposed to vehicular traffic mortality. It would not be uncommon for the mother and one or



more of her pups to be struck by a motorized vehicle as they cross a roadway single file and in close contact with one another together (personal observation). Probably the most significant impact on otter populations by motorized vehicles are the roadway mortalities of adult males during the south Florida November and December breeding season. This is the time of the year when seasonal residents and their motorized vehicles are present in large numbers. During the breeding season the male travels through the territories of several females and breeds with these females. Otters are induced ovulators, i.e. they must breed several times during the breeding cycle before the female can ovulate. Should the male become a roadway mortality, as he travels through the females' territories, those females will not be bred and no offspring will be born the coming year. This scenario has a very significant impact on the future of an otter population in any given region in south Florida.

BIRD AND MAMMAL PREDATORS

BIRD PREDATORS: Osprey, bald eagles, black bears, Florida panther/cougars, bobcats, coyotes, feral dogs, and wild hogs are all potential otter predators. Ospreys, bald eagles, wild hogs, black bears, and bobcats are likely to only take injured young which cannot keep up with the movements of the family unit.



Osprey

Bald Eagle

MAMMAL (*Pandion haliaetus*)

PREDATORS: Healthy (*Haliaeetus leucocephalus*)

adults
agile,

may be taken by the Florida panther or cougar as this is a large, and efficient predator and could ambush and capture an adult otter as well as its pups.



Florida Panther or Cougar
(*Puma[Felis] concolor*)

Bobcats are probably not likely to challenge, let alone, overpower an adult otter. However, a bobcat would likely prey upon an injured or sickly young otter that was unable to keep up with the family unit.



Bobcat
(*Lynx [Felis] rufus*)

The Black Bear is not a predator with the prey capture skills of the bobcat. This bear is also likely to prey upon an injured or sickly young otter that was unable to keep up with the family unit.



Black Bear
(*Ursus americanus*)

Coyotes, wolves, and feral dogs are pack animals, hunt as group, and could successfully prey on adult otters and their healthy young.



Coyote
(*Canis latrans*)



Wolf
(*Canis lupus*)



Feral Dogs
(*Canis lupus familiaris*)



Red Fox
(*Vulpes vulpes*)

Wild boar are considered by this author to be potential predators of injured or sickly young otters unable to keep up with the family unit.



Wild Boar
(*Sus scrofa*)

In northern North American the Grizzly Bear and Polar Bear have been noted as predators of the river otter.



Grizzly Bear
(*Ursus arctos*)



Polar Bear
(*Ursus maritimus*)

MARINE (coastal marine otters) spending time in the marine environment of the Pacific coast may be preyed upon by the Killer Whale or “Orca” (*Orcinus orca*). Sea otters (*Enhydra lutris*) are particularly vulnerable to predation by the Killer Whale. Sharks would also pose a predatory threat to coastal marine otters.



Killer Whale or Orca
(*Orcinus orca*)

REPTILE PREDATORS:

CROCODILLIANS: Otters are very likely familiar with the environment in which they live. In having this familiarity, they may know whether alligators and, in southeast Florida, crocodiles are present. If captured by an alligator or crocodile it likely resulted from a surprise encounter between the otter and one or the other of these two crocodilian species.



Alligator
(*Alligator mississippiensis*)



American Crocodile
(*Crocodylus acutus*)

SNAKES: Should an otter in Florida become the prey of a large invasive snake species, such as the Burmese or Ball python, this would be the result of an otter having come too close to the well-hidden python.



RISK FACTORS

POLLUTION: Otters are very susceptible to pollution. Urban or industrial discharges or agricultural runoff and sediments, oils, greases, and heavy metals are contributing pollutants to both natural and man-made lakes, and to rivers and streams, and marine environments such as estuaries. More about pollutants and their impact on river otters will be talked about shortly. Atmospheric heavy metals, Mercury in particular, poses a threat to all wildlife as it settles into the aquatic environment.

HABITAT DESTRUCTION: Habitat destruction is the second most serious risk to river otters and may occur as result of naturally occurring fires. However, the greatest amount of habitat destruction occurs from land development.

LAND DEVELOPMENT: It is not just the habitat destruction for development that poses a risk to otter populations. The primary risk in land development is what occurs after the land is developed. Developers want to profit from their investments and must present their developments in ways that enhance the esthetics required by potential buyers. Green, well maintained grass and landscape material require the application of chemicals to maximize the appearance of the buyers' investment. When properties have water features such as ponds and small lakes the property owners want the water to be clear and appear clean. Aquatic plants and algae in the body of the water is not acceptable to residents so chemicals must be applied to these waters. Pollutants, of particular concern, for otters in the subtropical and tropical environments in Florida, are the presence of herbicides, fertilizers, and pesticides applied to the environment in residential and golf communities and the landscaped grounds of businesses. These pollutants concentrate themselves in the otter's prey. The otter then feeds on these contaminated foods and the pollutants become concentrated in the otter's body. Many such communities are designed to include man-made lakes and ponds. Some man-made waters in these communities are self-contained (impounded) and have no connection with adjacent drainage-ways or to the nearby flowing waters of streams and rivers. Many residential communities have ponds and small lakes connecting to the nearby flowing waters of streams and lakes. These man-made and natural water systems are where otters feed and rear their young.

RECREATION: Recreational activities probably causes little to no disturbance to resident otter populations. In south and other parts of Florida there are many residential areas seasonally used by the owners. Within these communities a small number of individuals may be permanent residents. It is quite common for permanent and seasonal residents to have small dogs as pets. The activities of residents of many residential communities are overseen by a Home Owners' Association, These HOA's set policies on the number and size of pets that a resident may have. Walking a pet around the resident's community is a common occurrence and a form of recreation. When otters are present in communities the pets and the otters will eventually have some type of interaction. You will hear more about this when I talk about "The Do's and Don'ts of Living with Otters in South Florida" a little later.

TRAPPING: Trapping otters for their pelts is legal in Florida and requires a trapping license. It is not known to what extent trapping otters, in south Florida, has on the population in this region. Historically, otter trapping in North America was out of control to the extent that otters were trapped out in many states. In the 1980's wildlife managers in 21 different states began the long and tedious process of reintroducing otters to their respective states. Almost all otters that were collected for reintroduction came from the marshlands of southern Louisiana. The number of otters collected from Louisiana for reintroduction was approximately 3,800. There is no record, to the author's knowledge, that otters from Florida were collected for introduction in other states. The otter populations of some states were not impacted by uncontrolled trapping as severely as in other states. Within these states there were small pockets of remaining otter populations. Wildlife managers selectively collected otter from these small populations and introduced them to other areas of their states with suitable otter habitat.

INCIDENTAL TAKE: Incidental Take includes otters drowning in fishermen's nets or caught in traps set for beaver and muskrat. The impact on the otter populations where this risk factor occurs is not known nor has it been investigated.

ILLEGAL TAKE: Illegal Take includes illegal trapping and intentional killing. It is not known to what extent Illegal Take of otters in south Florida has on the population in this region. The extent of the impact of Illegal Take on river otter populations is also not known for North America.

G. Physical Characteristics

WEIGHTS AND LENGTHS: The average weight of the North American river otter is 11 to 31 pounds (5 to 14 kg). A large male may weigh more than 33 pounds (15 kg). The female is smaller than the male and has an average weight of 18 pounds (8.3 kg) while the average weight of a male is 25 pounds (11.3 kg). The length of total body alone is between 26 and 42 inches (42-66 cm) long and the length of the tail is approximately one third the body length. Therefore, the total length of the North American river otter would then be approximately 35 to 56 inches (89 to 142 cm). It has been mentioned that North American river otters reach their maximum length when they are three to four years of age. Their maximum weight might also be reached in this same time frame.

BODY CHARACTERISTICS: The body is long and cylindrical in shape and ends with a long, tapered tail. This streamlined body characteristic allows the otter to move through the water with a minimum of resistance. Otters have short legs and webbed feet. The short legs are considered by some as an impediment to the otter's mobility on land. Once you have seen numerous otters walking, loping, or running across the ground you will be convinced these short legs do not appear much of an impediment to the otter. The head is broad, flat and elongated with the brain case being at the back of the skull. This posteriorly placed braincase provides more room for the attachment of large jaw muscles to the skull and lower jaw that are necessary to help crush food and shear the meat from the prey. The eyes are small and placed anteriorly and near the top of the skull and allows the otter to view above the waterline without having to expose itself. The eyes have a clear membrane, the nictitating membrane, that sweeps across the eyeball and remains in place while the otter is swimming thus, protecting the otter's vision. Otters are said to have good vision above and below the water. The nose pad (rhinarium) is smooth and without hair. In the North American river otter, the nose pad has a small, blunt point at the rear. The

ears are small and placed high on the skull. Sight and hearing has been considered acute. The ears and the nostrils can be closed while the otter is submerged. The eyes, ears, and nostrils are all located high on the skull and allows the otter to use these three sense organs at the same time without having to expose itself. The otter is covered with a thick coat of hair composed of the long guard hairs and the extremely dense, oily hair of the underfur. This dense under hair insulates the body and in the North American river otter its density probably varies from very dense in the north to less dense in places in the south, such as Florida. Long whiskers (vibrissae) are present on the face below the corners of the nostrils and their function is sensory and are controlled by voluntary muscles. There are also long hairs around the edges of the face that are sensory in nature and are in a fixed position and cannot be moved like the whiskers. The muscular control of the whiskers aids the otter, primarily, in interpreting what is present along the bottoms and edges of the aquatic environment. It is along the bottom and these edges the otter finds its prey. The color of the otter's hair ranges from a rusty reddish-brown to brown or nearly black. Grey to tannish-grey colored hair is on the muzzle, along the sides of the head, on the throat, the chest, and continues along the underside of the otter's body where it may appear somewhat lighter in color. When the otter is wet,

and viewed when first out of the water, it is sleek in appearance and the color of their hair appears darker than when it is dry.

H. Life Span

In the wild the life span is 7-8 years while the life span of otters in captivity may be long as 15 years.

I. Reproduction

SEXUAL MATURITY: Both the female and the male North American river otter are sexually mature at approximately 2 years of age. Females may not breed when they are first mature and may not breed every year. It has been noted that even though a male is sexually mature at two years of age they may not successfully breed until they are five to seven years of age.

BREEDING PERIOD AND ACTIVITY: The North American river otter is polygamous which means they will mate with several other partners. Females are in "heat" for 42-46 days. Unless the female has been bred they will be receptive every six to seven days during the heat period. In southern Florida this author suspects otters breed in late fall shortly after the end of the rainy season. The National Weather Service in Miami has designated May 15th to October 15th as the rainy season for south Florida. Therefore It is being suggested that breeding occurs from mid or late November through December. This suggestion requires confirmation from several observers rather than a single individual having observed otters breeding in late November through early December. Breeding has been observed to occur in the water as well as on land. The male grasps the back of the female's neck when breeding and loud vocalizations have been heard by some observers. Copulation may last from 15 or so minutes to near 75 minutes and may be interrupted by periods rest. According to several authors the female may caterwaul during or shortly after copulation.

INDUCED OVULATION: Induced ovulation is the reproductive process where the female has to be bred several times before she ovulates, i.e. she is induced to ovulate. If the female does not ovulate upon intromission the male must return to breed the female on more than one occasion. The male will pass through the territories of several females and breed each of these females until they ovulate and breeding becomes successful.

DELAYED IMPLANTATION: Delayed implantation, also known as embryonic diapause, is a temporary pause of embryonic development and is part of a reproductive strategy of the North American river otter and a number of other mammal species. This reproductive strategy is most common among the closest relatives of the otters-the other mustelids. The preamble of this process begins when the cells of the fertilized egg begin to divide. As the cells divide they form a hollow, 32 cell stage called the blastula. These blastula cells cease to further divide in mammals having delayed implantation. At this stage the blastula is in the uterus and ready for implantation in the uterine wall. The hormones, controlling and preparing the uterine wall for implantation, are not activated and the uterus cannot accept implantation of the blastula. And, without implantation, the blastula remains in a state of dormancy within the uterus. For the blastula to be able to implant in the uterus some environmental cue needs to stimulate the endocrine system to prepare the uterine lining for implantation. The

primary environmental cue appears to be the increase in the lengthening of daylight at various latitudes. This author agrees the increase in daylight is the primary environmental cue in the northerly latitudes. Substantial research has been conducted to demonstrate delayed implantation occurs in North American river otters inhabiting seasonal climates. However, this should not be considered the case for the North American river otter inhabiting the latitude of southern Florida.

This author hypothesizes that delayed implantation does not occur in the North American river otter in the more southerly latitude of Florida and breeding occurring in November and December and blastula implantation, occurring in the early months of the year, can be confirmed. As otters are induced ovulators one might assume this inducement stimulates the endocrine system to prepare the uterus for implantation of the blastula shortly after it is formed. The minor increase in the length of daylight after the Winter Solstice (December 21 st) is but a few seconds a day and does not likely function as an environmental cue connected to successful reproduction of river otters in the southern latitudes of Florida. Climatic conditions of southern Florida are significantly different than north temperate North America. South Florida has only two seasons-wet and dry.

GESTATION PERIOD: There are two phases in gestation in the North American river and the other mammals exhibiting delayed implantation. In the North American river otter this is the case only, in the belief of this author, for otters of latitudes higher than south Florida. These phases are: 1.)The gestation period during which delayed implantation is occurring (DI Gestation) and 2.) The gestation period from the time of blastula implantation in the uterine wall to when birth occurs (Actual Gestation). Numerous authors have written on North American river otter gestation in northerly latitudes. These authors have basically concluded delayed implantation is a reproductive strategy for all otters in North America. However, none have investigated whether delayed implantation occurs in the southerly latitudes of Florida. In the northerly latitudes the time of successful breeding to the time of birth (Total Gestation) is believed to vary from 10 to 12 months including the Actual Gestation. The length of Actual Gestation in the North American river otter has been found by different authors to vary from 50-74 days. A

suggestion has been made that the 61-63 day Actual Gestation, cited in numerous North American river otter publications and other data bases, is the Actual Gestation of the Eurasian river otter (*Lutra lutra*).

NUMBER OF YOUNG: The number of young per litter can vary from one to as many as six. The young are born blind, without teeth, and fully furred.

SEE BELOW

J. Development of Young

DEVELOPMENT OF YOUNG: The stages of otter development identified below were contributed by the John C. Shannon. The source of the tabular formatted information shown below cannot be recalled by this author.

Age in Weeks	Pup Developmental Activity
1 st 10 weeks	Time in natal nest (den):
3-5 weeks	Eyes first open
4-6 weeks	Pups begin playing
7-8 weeks	Pups may venture out of natal den, enter water for first time and the mother begins teaching pups to swim
8-10 weeks	Swimming lessons continue
10 weeks	Mother may take pups to another den or raise the pups in the natal den
11 weeks	Mother first provides small, young fish (fry) to pups
12 weeks	Pups exhibit active fish-chasing behavior
13-14 weeks	Weaning begins and pups become more efficient in basic swimming skills
16 weeks	Pups possess a complete adult repertoire of swimming behaviors
16-18 weeks	Pups first encounter adult males
17-19 weeks	Pups catch their first fish (fry and slow-moving fish)
end of week 19	Pups can swim as proficiently as adults
>22 weeks	Pups cease nursing for "comfort"
>36 weeks	Pups proficient in aquatic hunting (after >6 months of trial-and-error learning)
37-42 wks	Pups have achieved basic self-sufficiency in food procurement
48 weeks	Pups abandoned by mother
48 weeks	Pups achieve optimal utilization of food sources and habitat

48 weeks	Pups now become independent and may be forced out of home area
48-60 weeks	Pups now independent and will be away from family unit for next 3 months
60 weeks	Age when yearlings (of both sexes) join clan [now 1 year & 8 mos. old]
The majority of this information on pup development is derived from Shannon's long-term research on northern California coastal marine river otters (see citations below). Other investigators have observed pup development activities differing from those Shannon has observed, such as pups leaving the den at 10-12 weeks, entering water at 14 weeks, and weaning occurring at 4 months of age.	

Table 1: Pup Development of the North American River Otter (*Lontra canadensis*)

Shannon, J.S. 1998a. Behavior of otters in a marine coastal habitat: Summary of a work in progress. IUCN Otter Specialist Group Bulletin. 15(2): 114-117.

Shannon, J.S. 1998b. Behavioral development of otters (*Lutra canadensis*) in a marine coastal habitat. pp. 312-315.

A NORTH AMERICA RIVER OTTER REPRODUCTION INVESTIGATION IN SOUTH FLORIDA: The undertaking of an otter reproduction investigation should include (1) Identifying when the male is first observed with the female, (2) Having a very definitive description of the male and the female (such as photos), (3) Identifying whether a female is with other otters such as pups and/or a helper, (4) Identifying whether the helper is female or male, (5) Defining when breeding season occurs, (6) Defining the date of successful breeding, (7) Investigating whether delayed implantation (DI) occurs, (8) Identifying the duration of DI, (9) Identifying when blastocysts are observed floating in the uterus, (10) Identifying when a blastocyst(s) is implanted in the uterus, and (11) When birth occurs.

K. Behavior

Some of the types of behavior one might encounter are described above in the section entitled: J. Development of Young. Other types of behavior are described below in sections entitled: L. Catching Prey, M. Social Groups, N. Territoriality, and O. Communication.

A more detailed description of river behavior is being compiled. A detailed description of a species behavior is much like an encyclopedia of behavior for that species. This "encyclopedia" is referred to as an ethogram. Once this new ethogram is compiled it will contain standardized definitions of the various otter behaviors which can be uniformly applied to all otter species investigations in the future. When this ethogram is completed you will be able to access it by clicking An Ethogram of Otter Behavior

L. Catching Prey: As stated above, in the website section entitled "The Diet of the North American River Otter (*Lontra canadensis*)", the primary prey of the North American otter is defined as the slow moving, bottom feeding and dwelling, shallow water fishes. The second most prevalent prey is various



species of crayfishes. The North American river otter's feet webbed and long tail are used to propel and direct the body forward. The otter's tail is mobile and aids in both steering and propelling the otter forward. The otter uses its highly mobile whiskers to explore the water's bottom and edges in search of prey. The use of the whiskers is particularly important when the otter is hunting in murky water. Its eyesight plays a significant role when hunting in clear water. Although having never seen an otter catch a fish this author would suspect the

fish is caught by any part of the body. The toes and the front feet are probably used to pin the prey, whether fish or crayfish, to the bottom to allow the otter to get a better bite position on the prey. It is not uncommon to see an otter swimming at the surface of the water with a fish trapped in its jaws. The otter may be seen holding a fish by the side of the fish's mouth and towing it through the water. When hunting on land prey may be captured from ambush, after a short pursuit, or through an accidental encounter. Otters can stay under water as long as four minutes and can dive to depths in excess of 65 feet. An otter can swim at a speed of between six and seven miles per hour and can swim under water for over 400 yards. Catching frogs is probably best done when frogs are in the water and are unable to jump away. The otter is likely to catch and eat tadpoles. Preying on toads must provide a challenge for the otter. The presence of toxin secreting parotid glands located behind the eyes and on the back of the head and neck and shoulder region can be problematic for the otter and other species preying on toads. This toxin is secreted as self-defense mechanism when the animal is stressed. The secretions from the parotid glands are not considered toxic to humans and pets, except in the case of Cane Toad (*Rhinella [Bufo] marina*). The toxin from the parotid gland (see image to the left) of the Cane toad can cause death in cats and dogs. Parotid glands are also found on some frogs and salamanders. Snakes in the water might not be particularly difficult to catch. Catching them on land would be a more challenging task for the otter. An otter was observed catching a snake on land by an individual whose name cannot be recalled. The snake was likely in a situation where it would be difficult to escape without being caught by the otter. The snake apparently reared its head and forepart of the body assuming the "strike" position. The otter approached the snake but, never close enough to be bitten. As the snake struck out the otter moved backward and slightly out of range. The otter continued to entice the snake to strike and the snake continued to strike at the otter until the snake expended too much energy to return to the strike position. At this time the snake's head and forepart and remainder of the body were stretched out on the ground and the snake was grabbed by the otter.

M. Social Groups

The female and her pups is the predominant social group. Another social group that occurs is the female and a "helper" and the pups and possibly a "helper" with one or more pups. The helper may be one of the female's immature male or female offspring from the previous litter or the litter before that. This author has 16 Jul 2013 photo documentation, by another party, of a group of otters with two adults and four pups. In addition, on 30 Jul 2013, this author photographed a group of otters containing one adult and two pups in the exact location as the previously mentioned location. The assumption is, the three otters seen on 30 Jul 2013 are part of the group of two adults and four pups seen on 16 Jul 2013.

This author received a body of an otter in southwest Florida (1) that was observed being killed by a motorized vehicle while crossing the road, near the front entrance of Florida Gulf Coast University, and (2) was a with a larger otter-likely a female- and her pups of the year. This otter roadway mortality occurred on 4 April 2018, was a male, and weighed 3200 grams [7 pounds] and its teeth were fully erupted, bright white with no tartar, and showed no apparent wear. This otter had a total length of 770 mm (30.3 inches) and a tail length of 280 mm (11 inches). This information confirms a young male otter could accompany an adult female and her pups. A third social group would contain the adult female and her pups and an adult male. In this latter group a helper may also be present. A fifth social group would be the bachelor group. Bachelor groups have been observed in coastal marine otter populations of western and northwestern North America as well as freshwater of North America. Seeing two or more otters together does not constitute a bachelor group. These two or more otters may be litter mates, i.e. both males and females or possibly a helper with pups from a litter the helper assisted in rearing. It has

been suggested that bachelor groups form to improve hunting, defense of territories, and improve reproductive access to females. Individuals in bachelor groups may or may not be related and the group can contain different age groups.

N. Territoriality

In freshwater systems otters are generally solitary and the solitary females are considered by some not to be territorial while others support defense of a specific territory by a female. Females having adjacent territories are believed by this author to be related and this mutual territorial defense likely minimizes intrusion of unrelated individuals and maximizes unrelated mature male breeding access to these adjacent living females. Some authors who consider the North American river otter not to be territorial suggest that unrelated individuals demonstrate mutual avoidance.

O. Communication

Communication among North American river otters is primarily via scent marking. This olfactory communication occurs in urine, the feces deposited either singly or at a group latrine, and via anal sack secretions deposited on small clumps of grass twisted together by the otter. Secondly, otter communication occurs through auditory signals. Scent marking is probably the primary means of intergroup communication. Some of the auditory signals stated in the literature include a snarling growl or hissing bark when disturbed, a high-pitched whistle when in pain, a low purring grunt when playing or travelling, an alarm call, which is an explosive snort, when startled or surprised, and a birdlike chirp used for communicating over long distances, and a low-frequency chuckling heard coming from a group of otters.

P. Additional River Otter Natural History Information

Many states have created a section on North American river otter natural history on their websites. To review this information you should enter the word "otters" immediately followed by the state's name, for example: ottersmichigan. There is great deal of information on the otters of the world on the internet. A good way to access this information is to Click www.otter-world.com.

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