



# Sea otter

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The **sea otter** (*Enhydra lutris*) is a marine mammal native to the coasts of the northern and eastern North Pacific Ocean. Adult sea otters typically weigh between 14 and 45 kg (31 and 99 lb), making them the heaviest members of the weasel family, but among the smallest marine mammals. Unlike most marine mammals, the sea otter's primary form of insulation is an exceptionally thick coat of fur, the densest in the animal kingdom. Although it can walk on land, the sea otter lives mostly in the ocean.

The sea otter inhabits offshore environments, where it dives to the sea floor to forage. It preys mostly on marine invertebrates such as sea urchins, various molluscs and crustaceans, and some species of fish. Its foraging and eating habits are noteworthy in several respects. First, its use of rocks to dislodge prey and to open shells makes it one of the few mammal species to use tools. In most of its range, it is a keystone species, controlling sea urchin populations which would otherwise inflict extensive damage to kelp forest ecosystems. Its diet includes prey species that are also valued by humans as food, leading to conflicts between sea otters and fisheries.

Sea otters, whose numbers were once estimated at 150,000–300,000, were hunted extensively for their fur between 1741 and 1911, and the world population fell to 1,000–2,000 individuals living in a fraction of their historic range.<sup>[2]</sup> A subsequent international ban on hunting, conservation efforts, and reintroduction programs into previously populated areas have contributed to numbers rebounding, and the species now occupies about two-thirds of its former range. The recovery of the sea otter is considered an important success in marine conservation, although populations in the Aleutian Islands and California have recently declined or have plateaued at depressed levels. For these reasons, the sea otter remains classified as an endangered species.

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## Sea otter



Wrapped around kelp in Morro Bay, California.

### Conservation status



Endangered (IUCN 3.1)<sup>[1]</sup>

### Scientific classification

Kingdom:	Animalia
Phylum:	Chordata
Subphylum:	Vertebrata
Class:	Mammalia
Order:	Carnivora
Family:	Mustelidae
Subfamily:	Lutrinae
Genus:	<i><b>Enhydra</b></i>
	Fleming, 1828
Species:	<i><b>E. lutris</b></i>

### Binomial name

***Enhydra lutris***

(Linnaeus, 1758)



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Range

## Taxonomy

The first scientific description of the sea otter is contained in the field notes of Georg Steller from 1751, and the species was described by Linnaeus in his *Systema Naturae* of 1758.<sup>[4]</sup> Originally named *Lutra marina*, it underwent numerous name changes before being accepted as *Enhydra lutris* in 1922.<sup>[5]</sup> The generic name *Enhydra*, derives from the Ancient Greek *en/ev* "in" and *hydra/ύδρα* "water",<sup>[6]</sup> meaning "in the water", and the Latin word *lutris*, meaning "otter".<sup>[7]</sup>

The sea otter was formerly sometimes referred to as the "sea beaver",<sup>[8]</sup> being the marine fur-bearer similar in commercial value to the terrestrial beaver. Rodents (of which the beaver is one) are not closely related to otters, which are carnivores. It is not to be confused with the marine otter, a rare otter species native to the southern west coast of South America. A number of other otter species, while predominantly living in fresh water, are commonly found in marine coastal habitats. The extinct sea mink of northeast North America is another mustelid that had adapted to a marine environment.

## Evolution



Mother sea otter with rare twin pups, Morro Bay, California. Sea otter twin births are rare, and the high demands on the mother usually result in one pup being abandoned.<sup>[3]</sup>

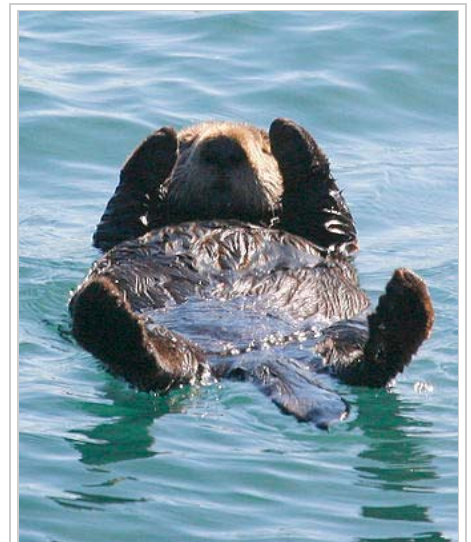
The sea otter is the heaviest (the giant otter is longer, but significantly slimmer) member of the family Mustelidae,<sup>[9]</sup> a diverse group that includes the 13 otter species and terrestrial animals such as weasels, badgers, and minks. It is unique among the mustelids in not making dens or burrows, in having no functional anal scent glands,<sup>[10]</sup> and in being able to live its entire life without leaving the water.<sup>[11]</sup> The only member of the genus *Enhydra*, the sea otter is so different from other mustelid species that, as recently as 1982, some scientists believed it was more closely related to the earless seals.<sup>[12]</sup> Genetic analysis indicates the sea otter and its closest extant relatives, which include the African speckle-throated otter, European otter, African clawless otter and oriental small-clawed otter, shared an ancestor approximately 5 million years ago (Mya).<sup>[13]</sup>

Fossil evidence indicates the *Enhydra* lineage became isolated in the North Pacific approximately 2 Mya, giving rise to the now-extinct *Enhydra macrodonta* and the modern sea otter, *Enhydra lutris*.<sup>[5]</sup> The sea otter evolved initially in northern Hokkaidō and Russia, and then spread east to the Aleutian Islands, mainland Alaska, and down the North American coast.<sup>[14]</sup> In comparison to cetaceans, sirenians, and pinnipeds, which entered the water approximately 50, 40, and 20 Mya, respectively, the sea otter is a relative newcomer to a marine existence.<sup>[15]</sup> In some respects, though, the sea otter is more fully adapted to water than pinnipeds, which must haul out on land or ice to give birth.<sup>[16]</sup>



One related species has been described, *Enhydra reevei*, from the Pleistocene of East Anglia. The holotype, a lower carnassial, was in the Norwich Castle Museum but seems to be lost. Only one more specimen, an extremely worn lower carnassial, is known.<sup>[17]</sup>

## Subspecies

The three recognized subspecies, which vary in body size and in some skull and dental characteristics, are:<sup>[9][18]</sup>



Sea otter in Morro Bay, California

Subspecies	Trinomial authority	Common names	Description	Range	Synonyms
<p><i>E. l. lutris</i></p> <p>(Nominate subspecies)</p>	Linnaeus, 1758	<p><b>Common sea otter</b><sup>[19]</sup></p> <p><b>Asian sea otter</b><sup>[19]</sup></p> <p><b>Commander sea otter</b><sup>[20]</sup></p> <p><b>Kuril sea otter</b><sup>[20]</sup></p>	The largest subspecies, with a wide skull and short nasal bones <sup>[19]</sup>	Kuril Islands to the Commander Islands in the western Pacific Ocean <sup>[9]</sup>	<p><i>gracilis</i> (Bechstein, 1800)</p> <p><i>kamtschatica</i> (Dybowski, 1922)</p> <p><i>marina</i> (Erxleben, 1777)</p> <p><i>orientalis</i> (Oken, 1816)</p> <p><i>stelleri</i> (Lesson, 1827)</p>
<p><i>E. l. nereis</i></p> 	Merriam, 1904	<p><b>Southern sea otter</b><sup>[19]</sup></p> <p><b>California sea otter</b><sup>[19]</sup></p>	Has a narrower skull with a long rostrum and small teeth <sup>[19]</sup>	Coast of central California <sup>[9]</sup>	
<p><i>E. l. kenyoni</i><sup>[21]</sup></p> 	Wilson, 1991	<b>Northern sea otter</b>		Alaska and the Pacific west coast from the Aleutian islands to British Columbia, Washington, and northern Oregon, <sup>[19]</sup> after being extirpated from southern British Columbia due to overhunting, it has since been reintroduced off Vancouver Island and the Olympic	

Subspecies	Trinomial authority	Common names	Description	Range	Synonyms
				Peninsula. <sup>[9]</sup>	

The reintroduction effort off the Oregon coast was not successful. However, reintroductions in 1969 and 1970 off the Washington coast were very successful and sea otters have been expanding their range since. They have now entered the Strait of Juan de Fuca and can be found almost as far east as Pillar Point. Individuals have even been seen in the San Juan Islands and northern Puget Sound.

## Physical characteristics

The sea otter is one of the smallest marine mammal species, but it is the heaviest mustelid.<sup>[11]</sup> Male sea otters usually weigh 22 to 45 kg (49 to 99 lb) and are 1.2 to 1.5 m (3 ft 11 in to 4 ft 11 in) in length, though specimens to 54 kg (119 lb) have been recorded.<sup>[22]</sup> Females are smaller, weighing 14 to 33 kg (31 to 73 lb) and measuring 1.0 to 1.4 m (3 ft 3 in to 4 ft 7 in) in length.<sup>[23]</sup> Its baculum (penis bone) is, for the male otter's size, very large, massive and bent upwards, measuring 150 mm (5.9 in) in length and 15 mm (0.59 in) at the base.<sup>[24]</sup>

Unlike most other marine mammals, the sea otter has no blubber and relies on its exceptionally thick fur to keep warm.<sup>[25]</sup> With up to 150,000 strands of hair per square centimeter (nearly one million per sq in), its fur is the densest of any animal.<sup>[26]</sup> The fur consists of long, waterproof guard hairs and short underfur; the guard hairs keep the dense underfur layer dry. Cold water is thus kept completely away from the skin and heat loss is limited.<sup>[23]</sup> The fur is thick year-round, as it is shed and replaced gradually rather than in a distinct molting season.<sup>[27]</sup> As the ability of the guard hairs to repel water depends on utmost cleanliness, the sea otter has the ability to reach and groom the fur on any part of its body, taking advantage of its loose skin and an unusually supple skeleton.<sup>[28]</sup> The coloration of the pelage is usually deep brown with silver-gray speckles, but it can range from yellowish or grayish brown to almost black.<sup>[29]</sup> In adults, the head, throat, and chest are lighter in color than the rest of the body.<sup>[29]</sup>

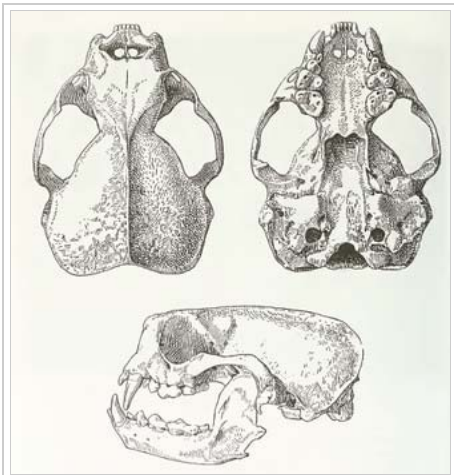


A sea otter's thick fur makes its body appear much plumper on land than in the water

The sea otter displays numerous adaptations to its marine environment. The nostrils and small ears can close.<sup>[30]</sup> The hind feet, which provide most of its propulsion in swimming, are long, broadly flattened, and fully webbed.<sup>[31]</sup> The fifth digit on each hind foot is longest, facilitating swimming while on its back, but making walking difficult.<sup>[32]</sup> The tail is fairly short, thick, slightly flattened, and muscular. The front paws are short with retractable claws, with tough pads on the palms that enable gripping slippery prey.<sup>[33]</sup> The bones show osteosclerosis, increasing their density to reduce buoyancy.<sup>[34]</sup>

The sea otter propels itself underwater by moving the rear end of its body, including its tail and hind feet, up and down,<sup>[31]</sup> and is capable of speeds of up to 9 km/h (5.6 mph).<sup>[9]</sup> When underwater, its body is long and streamlined, with the short forelimbs pressed closely against the chest.<sup>[35]</sup> When at the surface, it usually floats on its back and moves by sculling its feet and tail from side to side.<sup>[36]</sup> At rest, all four limbs can be folded onto the torso to conserve heat, whereas on particularly hot days, the hind feet may be held underwater for cooling.<sup>[37]</sup> The sea otter's body is highly buoyant because of its large lung capacity – about 2.5 times greater than that of similar-sized land mammals<sup>[38]</sup> – and the air trapped in its fur. The sea otter walks with a clumsy, rolling gait on land, and can run in a bounding motion.<sup>[32]</sup>

Long, highly sensitive whiskers and front paws help the sea otter find prey by touch when waters are dark or murky.<sup>[11]</sup> Researchers have noted when they approach in plain view, sea otters react more rapidly when the



Skull, as illustrated by N. N. Kondakov

wind is blowing towards the animals, indicating the sense of smell is more important than sight as a warning sense.<sup>[39]</sup> Other observations indicate the sea otter's sense of sight is useful above and below the water, although not as good as that of seals.<sup>[40]</sup> Its hearing is neither particularly acute nor poor.<sup>[41]</sup>

An adult's 32 teeth, particularly the molars, are flattened and rounded, designed to crush rather than cut food.<sup>[42]</sup> Seals and sea otters are the only carnivores with two pairs of lower incisor teeth rather than three;<sup>[43]</sup> the adult dental formula is  $\frac{3.1.3.1}{2.1.3.2}$  <sup>[44]</sup>

The sea otter has a metabolic rate two or three times that of comparatively sized terrestrial mammals. It must eat an estimated 25 to 38% of its own body weight in food each day to burn the calories necessary to counteract the loss of heat due to the cold water environment.<sup>[45][46]</sup> Its digestive efficiency is estimated at 80 to

85%,<sup>[47]</sup> and food is digested and passed in as little as three hours.<sup>[25]</sup> Most of its need for water is met through food, although, in contrast to most other marine mammals, it also drinks seawater. Its relatively large kidneys enable it to derive fresh water from sea water and excrete concentrated urine.<sup>[48]</sup>

A sea otter has two types of fur, the underfur and the guard hair. The shape of these different hair fibers connect to trap air between them. This allows them to maintain their body heat without the blubber other sea mammals use. <sup>[49]</sup>

## Behavior

The sea otter is diurnal. It has a period of foraging and eating in the morning, starting about an hour before sunrise, then rests or sleeps in mid-day.<sup>[50]</sup> Foraging resumes for a few hours in the afternoon and subsides before sunset, and a third foraging period may occur around midnight.<sup>[50]</sup> Females with pups appear to be more inclined to feed at night.<sup>[50]</sup> Observations of the amount of time a sea otter must spend each day foraging range from 24 to 60%, apparently depending on the availability of food in the area.<sup>[51]</sup>

Sea otters spend much of their time grooming, which consists of cleaning the fur, untangling knots, removing loose fur, rubbing the fur to squeeze out water and introduce air, and blowing air into the fur. To casual observers, it appears as if the animals are scratching, but they are not known to have lice or other parasites in the fur.<sup>[52]</sup> When eating, sea otters roll in the water frequently, apparently to wash food scraps from their fur.<sup>[53]</sup>

## Foraging

The sea otter hunts in short dives, often to the sea floor. Although it can hold its breath for up to five minutes,<sup>[30]</sup> its dives typically last about one minute and no more than four.<sup>[23]</sup> It is the only marine animal capable of lifting and turning over rocks, which it often does with its front paws when searching for prey.<sup>[53]</sup> The sea otter may also pluck snails and other organisms from kelp and dig deep into underwater mud for clams.<sup>[53]</sup> It is the only marine mammal that catches fish with its forepaws rather than with its teeth.<sup>[25]</sup>



Sensitive vibrissae and forepaws enable sea otters to find prey using their sense of touch

Under each foreleg, the sea otter has a loose pouch of skin that extends across the chest. In this pouch (preferentially the left one), the animal stores collected food to bring to the surface. This pouch also holds a rock, unique to the otter, that is used to break open shellfish and clams.<sup>[54]</sup> There, the sea otter eats while floating on its back, using its forepaws to tear food apart and bring it to its mouth. It can chew and swallow small mussels with their shells, whereas large mussel shells may be twisted apart.<sup>[55]</sup> It uses its lower incisor teeth to access the meat in shellfish.<sup>[56]</sup> To eat large sea urchins, which are mostly covered with spines, the sea otter bites through the underside where the spines are shortest, and licks the soft contents out of the urchin's shell.<sup>[55]</sup>

The sea otter's use of rocks when hunting and feeding makes it one of the few mammal species to use tools.<sup>[57]</sup> To open hard shells, it may pound its prey with both paws against a rock on its chest. To pry an abalone off its rock, it hammers the abalone shell using a large stone, with observed rates of 45 blows in 15 seconds.<sup>[23]</sup> Releasing an abalone, which can cling to rock with a force equal to 4,000 times its own body weight, requires multiple dives.<sup>[23]</sup>

## Social structure



Sleeping sea otters holding paws, photographed at the Vancouver Aquarium, Vancouver, British Columbia, Canada.<sup>[58]</sup> Note the high buoyancy of the animals' bodies.

Although each adult and independent juvenile forages alone, sea otters tend to rest together in single-sex groups called rafts. A raft typically contains 10 to 100 animals, with male rafts being larger than female ones.<sup>[59]</sup> The largest raft ever seen contained over 2000 sea otters. To keep from drifting out to sea when resting and eating, sea otters may wrap themselves in kelp.<sup>[60]</sup>

A male sea otter is most likely to mate if he maintains a breeding territory in an area that is also favored by females.<sup>[61]</sup> As autumn is the peak breeding season in most areas, males typically defend their territory only from spring to autumn.<sup>[61]</sup> During this time, males patrol the boundaries of their territories to exclude other males,<sup>[61]</sup> although

actual fighting is rare.<sup>[59]</sup> Adult females move freely between male territories, where they outnumber adult males by an average of five to one.<sup>[61]</sup> Males that do not have territories tend to congregate in large, male-only groups,<sup>[61]</sup> and swim through female areas when searching for a mate.<sup>[62]</sup>

The species exhibits a variety of vocal behaviors. The cry of a pup is often compared to that of a seagull.<sup>[63]</sup> Females coo when they are apparently content; males may grunt instead.<sup>[64]</sup> Distressed or frightened adults may whistle, hiss, or in extreme circumstances, scream.<sup>[63]</sup>

Although sea otters can be playful and sociable, they are not considered to be truly social animals.<sup>[65]</sup> They spend much time alone, and each adult can meet its own needs in terms of hunting, grooming, and defense.<sup>[65]</sup>

## Reproduction and lifecycle

Sea otters are polygynous: males have multiple female partners. However, temporary pair-bonding occurs for a few days between a female in estrus and her mate.<sup>[53]</sup> Mating takes place in the water and can be rough, the male biting the female on the muzzle – which often leaves scars on the nose – and sometimes holding her head under water.<sup>[9][66]</sup>

Births occur year-round, with peaks between May and June in northern populations and between January and March in southern populations.<sup>[67]</sup> Gestation appears to vary from four to twelve months, as the species is capable of delayed implantation followed by four months of pregnancy.<sup>[67]</sup> In California, sea otters usually

breed every year, about twice as often as those in Alaska.<sup>[68]</sup>

Birth usually takes place in the water and typically produces a single pup weighing 1.4 to 2.3 kg (3 to 5 lb).<sup>[69]</sup> Twins occur in 2% of births; however, usually only one pup survives.<sup>[9]</sup> At birth, the eyes are open, ten teeth are visible, and the pup has a thick coat of baby fur.<sup>[70]</sup> Mothers have been observed to lick and fluff a newborn for hours; after grooming, the pup's fur retains so much air, the pup floats like a cork and cannot dive.<sup>[71]</sup> The fluffy baby fur is replaced by adult fur after about 13 weeks.<sup>[4]</sup>



During mating, the male bites the nose of the female, often bloodying and scarring it



A mother floats with her pup on her chest. Georg Steller wrote, "They embrace their young with an affection that is scarcely credible."<sup>[72]</sup>

Nursing lasts six to eight months in Californian populations and four to twelve months in Alaska, with the

mother beginning to offer bits of prey at one to two months.<sup>[73]</sup> The milk from a sea otter's two abdominal nipples is rich in fat and more similar to the milk of other marine mammals than to that of other mustelids.<sup>[74]</sup> A pup, with guidance from its mother, practices swimming and diving for several weeks before it is able to reach the sea floor. Initially, the objects it retrieves are of little food value, such as brightly colored starfish and pebbles.<sup>[54]</sup> Juveniles are typically independent at six to eight months, but a mother may be forced to abandon a pup if she cannot find enough food for it,<sup>[75]</sup> at the other extreme, a pup may nurse until it is almost adult size.<sup>[69]</sup> Pup

mortality is high, particularly during an individual's first winter – by one estimate, only 25% of pups survive their first year.<sup>[75]</sup> Pups born to experienced mothers have the highest survival rates.<sup>[76]</sup>

Females perform all tasks of feeding and raising offspring, and have occasionally been observed caring for orphaned pups.<sup>[77]</sup> Much has been written about the level of devotion of sea otter mothers for their pups – a mother gives her infant almost constant attention, cradling it on her chest away from the cold water and attentively grooming its fur.<sup>[78]</sup> When foraging, she leaves her pup floating on the water, sometimes wrapped in kelp to keep it from floating away;<sup>[79]</sup> if the pup is not sleeping, it cries loudly until she returns.<sup>[80]</sup> Mothers have been known to carry their pups for days after the pups' deaths.<sup>[72]</sup>

Females become sexually mature at around three or four years of age and males at around five; however, males often do not successfully breed until a few years later.<sup>[81]</sup> A captive male sired offspring at age 19.<sup>[69]</sup> In the wild, sea otters live to a maximum age of 23 years,<sup>[23]</sup> with average lifespans of 10–15 years for males and 15–20 years for females.<sup>[82]</sup> Several captive individuals have lived past 20 years, and a female at the Seattle Aquarium died at the age of 28 years.<sup>[83]</sup> Sea otters in the wild often develop worn teeth, which may account for their apparently shorter lifespans.<sup>[84]</sup>

There are several documented cases in which male sea otters have forcibly copulated with juvenile Harbor Seals, sometimes resulting in death.<sup>[85]</sup>

The forced copulation does not stop with the baby Harbor Seals, however, as there are documented cases of sea otters raping other animals as well. For instance, a sea otter named "Whiskers" was observed nefariously luring a Husky, "Tuk", into the water, killing it, and raping its dead body.<sup>[86]</sup>

## Population and distribution



Sea otters live in coastal waters 15 to 23 meters (50 to 75 ft) deep,<sup>[87]</sup> and usually stay within a kilometer ( $\frac{2}{3}$  mi) of the shore.<sup>[88]</sup> They are found most often in areas with protection from the most severe ocean winds, such as rocky coastlines, thick kelp forests, and barrier reefs.<sup>[89]</sup> Although they are most strongly associated with rocky substrates, sea otters can also live in areas where the sea floor consists primarily of mud, sand, or silt.<sup>[90]</sup> Their northern range is limited by ice, as sea otters can survive amidst drift ice but not land-fast ice.<sup>[91]</sup> Individuals generally occupy a home range a few kilometers long, and remain there year-round.<sup>[92]</sup>



Sea otter floating in Morro Bay, California

The sea otter population is thought to have once been 150,000 to 300,000,<sup>[8]</sup> stretching in an arc across the North Pacific from northern Japan to the central Baja California Peninsula in Mexico. The fur trade that began in the 1740s reduced the sea otter's numbers to an estimated 1,000 to 2,000 members in 13 colonies. In about two-thirds of its former range, the species is at varying levels of recovery, with high population densities in some areas and threatened populations in others. Sea otters currently have stable populations in parts of the Russian east coast, Alaska, British Columbia, Washington, and California, with reports of recolonizations in Mexico and Japan.<sup>[93]</sup> Population estimates made between 2004 and 2007 give a worldwide total of approximately 107,000 sea otters.<sup>[4][94][95][96][97]</sup>

## Russia

Currently, the most stable and secure part of the sea otter's range is Russia.<sup>[98]</sup> Before the 19th century, around 20,000 to 25,000 sea otters lived near the Kuril Islands, with more near Kamchatka and the Commander Islands. After the years of the Great Hunt, the population in these areas, currently part of Russia, was only 750.<sup>[94]</sup> By 2004, sea otters had repopulated all of their former habitat in these areas, with an estimated total population of about 27,000. Of these, about 19,000 are at the Kurils, 2,000 to 3,500 at Kamchatka and another 5,000 to 5,500 at the Commander Islands.<sup>[94]</sup> Growth has slowed slightly, suggesting the numbers are reaching carrying capacity.<sup>[94]</sup>



Sea Otter, Kenai Fjords National Park, Alaska

## Alaska

Alaska is the heartland of the sea otter's range. In 1973, the population in Alaska was estimated at between 100,000 and 125,000 animals.<sup>[99]</sup> By 2006, though, the Alaska population had fallen to an estimated 73,000 animals.<sup>[95]</sup> A massive decline in sea otter populations in the Aleutian Islands accounts for most of the change; the cause of this decline is not known, although orca predation is suspected.<sup>[100]</sup> The sea otter population in Prince William Sound was also hit hard by the Exxon Valdez oil spill, which killed thousands of sea otters in 1989.<sup>[53]</sup>

## British Columbia

Along the North American coast south of Alaska, the sea otter's range is discontinuous. A remnant population survived off Vancouver Island into the 20th century, but it died out despite the 1911 international protection treaty, with the last sea otter taken near Kyuquot in 1929. From 1969 to 1972, 89 sea otters were flown or shipped from Alaska to the west coast of Vancouver Island.

This population expanded to over 3,200 in 2004, and their range on the island's west coast expanded from Cape Scott in the north to Barkley Sound to the south.<sup>[101]</sup> In 1989, a separate colony was discovered in the central British Columbia coast. It is not known if this colony, which numbered about 300 animals in 2004,

was founded by transplanted otters or by survivors of the fur trade.<sup>[96]</sup>

The status of the sea otters has improved since 2004 with a report of 4,700 in 2008 that improved their status to "special concern" in Canada.<sup>[102]</sup> They currently occupy much of the exposed west coast of Vancouver Island and parts of the central mainland BC coast.<sup>[103]</sup>

## Washington

In 1969 and 1970, 59 sea otters were translocated from Amchitka Island to Washington. Annual surveys between 2000 and 2004 have recorded between 504 and 743 individuals, and their range is in the Olympic Peninsula from just south of Destruction Island to Pillar Point.<sup>[4]</sup> In Washington, sea otters are found almost exclusively on the outer coasts. They can swim as close as six feet off shore along the Olympic coast. Reported sightings of sea otters in the San Juan Islands and Puget Sound almost always turn out to be North American river otters, which are commonly seen along the seashore. However, biologists have confirmed isolated sightings of sea otters in these areas since the mid-1990s.<sup>[4]</sup>



John Webber's *Sea Otter*, circa 1788

## California



Sea otter nursing pup. California has almost 3,000 sea otters, descendants of about 50 individuals discovered in 1938.

The 2013 United States Geological Survey (USGS) found 2,941 California sea otters, a slight increase from 2012 but a portion of the increase is artificial because the count includes, for the first time, the San Nicolas Island population which has recovered to 59 individuals.<sup>[104]</sup> The California sea otter census in 2012 was 2,792, down from the peak spring 2007 census of 3,026 sea otters, but up from the recent low of 2,711 in 2010.<sup>[97][105][106]</sup> The historic population is estimated at 16,000 before the fur trade began. California's sea otters are the descendants of a single colony of about 50 southern sea otters discovered near Bixby Bridge in Big Sur in 1938.<sup>[107]</sup> Their principal range has gradually expanded and extends from Pigeon Point in San Mateo County to Santa Barbara County.<sup>[106]</sup> In the late 1980s, the U.S. Fish and Wildlife Service (USFWS)

relocated about 140 Californian sea otters to San Nicolas Island in southern California, in the hope of establishing a reserve population should the mainland be struck by an oil spill. To the surprise of biologists, the San Nicolas sea otters mostly swam back to the mainland.<sup>[108]</sup> By 2005, only 30 sea otters remained at San Nicolas,<sup>[109]</sup> although they were slowly increasing as they thrived on the abundant prey around the island.<sup>[108]</sup> The plan that authorized the translocation program had predicted the carrying capacity would be reached within five to 10 years. However, as of 2012 the San Nicolas Island population had increased only to about 50 individuals.<sup>[110]</sup>

When the FWS implemented the translocation program, it also attempted to implement "zonal management" of the Californian population. To manage the competition between sea otters and fisheries, it declared an "otter-free zone" stretching from Point Conception to the Mexican border. In this zone, only San Nicolas Island was designated as sea otter habitat, and sea otters found elsewhere in the area were supposed to be captured and relocated. These plans were abandoned after many translocated otters died and also as it proved impractical to capture the hundreds of otters which ignored regulations and swam into the zone.<sup>[111]</sup> However, after engaging in a period of public commentary in 2005, the Fish and Wildlife Service failed to release a formal decision on the issue.<sup>[109]</sup> Then, in response to lawsuits filed by the Santa Barbara-based Environmental Defense Center and the Otter Project, on December 19, 2012 the USFWS declared that the "no otter zone" experiment was a failure, and will protect the otters re-colonizing the coast south of Point Conception as threatened species.<sup>[112]</sup>

Sea otters were once numerous in San Francisco Bay.<sup>[113]</sup> Historical records revealed the Russian-American Company sneaked Aleuts into San Francisco Bay multiple times, despite the Spanish capturing or shooting them while hunting sea otters in the estuaries of San Jose, San Mateo, San Bruno and around Angel Island.<sup>[114]</sup> The founder of Fort Ross, Ivan Kuskov, finding otters scarce on his second voyage to Bodega Bay in 1812, sent a party of Aleuts to San Francisco Bay, where they met another Russian party and an American party, and caught 1,160 sea otters in three months.<sup>[115]</sup> By 1817, sea otters in the area were practically eliminated and the Russians sought permission from the Spanish and the Mexican governments to hunt further and further south of San Francisco.<sup>[116]</sup> Remnant sea otter populations may have survived in the bay until 1840, when the Rancho Punta de Quentin was granted to Captain John B. R. Cooper, a sea captain from Boston, by Mexican Governor Juan Bautista Alvarado along with a license to hunt sea otters, reportedly then prevalent at the mouth of Corte Madera Creek.<sup>[117]</sup>

Although the southern sea otter's range has continuously expanded from the remnant population of about 50 individuals in Big Sur since protection in 1911, however from 2007 to 2010, the otter population and its range contracted and since 2010 are only slowly recovering.<sup>[104][118]</sup> As of spring 2010, the northern boundary has moved from about Tunitas Creek to a point 2 km southeast of Pigeon Point, and the southern boundary has moved from approximately Coal Oil Point to Gaviota State Park.<sup>[119]</sup> Recently, a toxin called microcystin, produced by a type of cyanobacteria (*Microcystis*), seems to be concentrated in the shellfish the otters eat, poisoning them. Cyanobacteria are found in stagnant freshwater enriched with nitrogen and phosphorus from septic tank and agricultural fertilizer runoff, and may be flushed into the ocean when streamflows are high in the rainy season.<sup>[120][121]</sup> A record number of sea otter carcasses were found on California's coastline in 2010, with increased shark attacks an increasing component of the mortality.<sup>[122]</sup> Great white sharks (*Carcharodon carcharias*) do not consume relatively fat-poor sea otters but shark-bitten carcasses have increased from 8% in the 1980s to 15% in the 1990s and to 30% in 2010 and 2011.<sup>[123]</sup>

Otters were observed twice in Southern California in 2011, once near Laguna Beach and once at Zuniga Point Jetty, near San Diego. These are the first documented sightings of otters this far south in 30 years.<sup>[124]</sup>

## Oregon

The last native sea otter in Oregon was probably shot and killed in 1906. In 1970 and 1971, a total of 95 sea otters were transplanted from Amchitka Island, Alaska to the Southern Oregon coast. However, this translocation effort failed and otters soon again disappeared from the state.<sup>[125]</sup>

In 2004, a lone male sea otter took up residence at Simpson Reef off of Cape Arago for six months. This male is thought to have originated from a colony in Washington, but disappeared after a coastal storm.<sup>[126]</sup>

The most recent sighting of a sea otter off the Oregon coast took place on 18 February 2009, in Depoe Bay, Oregon. The lone male sea otter could have traveled from either California or Washington.<sup>[127]</sup>

## Ecology

### Diet

Sea otters consume over 100 different prey species.<sup>[128]</sup> In most of its range, the sea otter's diet consists almost exclusively of marine invertebrates, including sea urchins, a variety of bivalves such as clams and mussels, abalone, other mollusks, crustaceans, and snails.<sup>[128]</sup> Its prey ranges in size from tiny limpets and crabs to giant octopuses.<sup>[128]</sup> Where prey such as sea urchins, clams, and abalone are present in a range of sizes, sea otters tend to select larger items over smaller ones of similar type.<sup>[128]</sup> In California, they have been noted to ignore Pismo clams smaller than 3 inches (7 cm) across.<sup>[129]</sup>

In a few northern areas, fish are also eaten. In studies performed at Amchitka Island in the 1960s, where the sea otter population was at carrying capacity, 50% of food found in sea otter stomachs was fish.<sup>[130]</sup> The fish species were usually bottom-dwelling and sedentary or sluggish forms, such as *Hemilepidotus hemilepidotus* and family Tetraodontidae.<sup>[130]</sup> However, south of Alaska on the North American coast, fish are a negligible or extremely minor part of the sea otter's diet.<sup>[4][131]</sup> Contrary to popular depictions, sea otters rarely eat starfish, and any kelp that is consumed apparently passes through the sea otter's system undigested.<sup>[132]</sup>

The individuals within a particular area often differ in their foraging methods and prey types, and tend to follow the same patterns as their mothers.<sup>[133]</sup> The diet of local populations also changes over time, as sea otters can significantly deplete populations of highly preferred prey such as large sea urchins, and prey availability is also affected by other factors such as fishing by humans.<sup>[4]</sup> Sea otters can thoroughly remove abalone from an area except for specimens in deep rock crevices,<sup>[134]</sup> however, they never completely wipe out a prey species from an area.<sup>[135]</sup> A 2007 Californian study demonstrated, in areas where food was relatively scarce, a wider variety of prey was consumed. Surprisingly, though, the diets of individuals were more specialized in these areas than in areas where food was plentiful.<sup>[108]</sup>



Sea otters keep kelp forests healthy by eating animals that graze on kelp

## As a keystone species

Sea otters are a classic example of a keystone species; their presence affects the ecosystem more profoundly than their size and numbers would suggest. They keep the population of certain benthic (sea floor) herbivores, particularly sea urchins, in check. Sea urchins graze on the lower stems of kelp, causing the kelp to drift away and die. Loss of the habitat and nutrients provided by kelp forests leads to profound cascade effects on the marine ecosystem. North Pacific areas that do not have sea otters often turn into urchin barrens, with abundant sea urchins and no kelp forest.<sup>[9]</sup>



Remote areas of coastline, such as this area in California, sheltered the few remaining colonies of sea otters that survived the fur trade

Reintroduction of sea otters to British Columbia has led to a dramatic improvement in the health of coastal ecosystems,<sup>[136]</sup> and similar changes have been observed as sea otter populations recovered in the Aleutian and Commander Islands and the Big Sur coast of California<sup>[137]</sup> However, some kelp forest ecosystems in California have also thrived without sea otters, with sea urchin populations apparently controlled by other factors.<sup>[137]</sup> The role of sea otters in maintaining kelp forests has been observed to be more important in areas of open coast than in more protected bays and estuaries.<sup>[137]</sup>

In addition to promoting growth of kelp forests, sea otters can also have a profound effect in rocky areas that tend to be dominated by mussel beds. They remove mussels from rocks, liberating space for competitive species and thereby increasing the diversity of species in the area.<sup>[137]</sup>

## Predators

Predation of sea otters does occur, although it is not common. Many predators find the otter, with their pungent scent glands, distasteful. Young predators may kill an otter and not eat it. Leading mammalian predators of this species include killer whales and sea lions; bald eagles also prey on pups by snatching them

from the water surface.<sup>[57]</sup> On land, young sea otters may face attack from bears and coyotes. In California, bites from sharks, particularly great white sharks, have been estimated to cause 10% of sea otter deaths and are one of the reasons the population has not expanded further north.<sup>[138]</sup> The great white shark is believed to be their primary predator, and dead sea otters have been found with injuries from shark bites, although there is no evidence that sharks actually eat them.<sup>[138]</sup> An exhibit at the San Diego Natural History Museum states that cat feces from urban runoff carry *Toxoplasma gondii* parasites to the ocean and kill sea otters.<sup>[139]</sup>

## Relationship with humans

### Fur trade

Sea otters have the thickest fur of any mammal. Their beautiful fur is a main target for many hunters. Archaeological evidence indicates that for thousands of years, indigenous peoples have hunted sea otters for food and fur.<sup>[8]</sup> Large-scale hunting, part of the Maritime Fur Trade, which would eventually kill approximately one million sea otters, began in the 18th century when hunters and traders began to arrive from all over the world to meet foreign demand for otter pelts, which were one of the world's most valuable types of fur.<sup>[8]</sup>

In the early 18th century, Russians began to hunt sea otters in the Kuril Islands<sup>[8]</sup> and sold them to the Chinese at Kyakhta. Russia was also exploring the far northern Pacific at this time, and sent Vitus Bering to map the Arctic coast and find routes from Siberia to North America.<sup>[140]</sup> In 1741, on his second North Pacific voyage, Bering was shipwrecked off Bering Island in the Commander Islands, where he and many of his crew died.<sup>[140]</sup> The surviving crew members, which included naturalist Georg Steller, discovered sea otters on the beaches of the island and spent the winter hunting sea otters and gambling with otter pelts.<sup>[140]</sup> They returned to Siberia, having killed nearly 1,000 sea otters, and were able to command high prices for the pelts.<sup>[140]</sup> Thus began what is sometimes called the "Great Hunt", which would continue for another hundred years. The Russians found the sea otter far more valuable than the sable skins that had driven and paid for most of their expansion across Siberia. If the sea otter pelts brought back by Bering's survivors had been sold at Kyakhta prices they would have paid for one tenth the cost of Bering's expedition.<sup>[141]</sup> In 1775 at Okhotsk, sea otter pelts were worth 50–80 rubles as opposed to 2.5 rubles for sable.



Aleut men in Unalaska in 1896 used waterproof kayak gear and garments to hunt sea otters



Pelt sales (in thousands) in the London fur market – the drop beginning in the 1880s reflects dwindling sea otter populations.<sup>[142]</sup>

Russian fur-hunting expeditions soon depleted the sea otter populations in the Commander Islands, and by 1745, they began to move on to the Aleutian Islands. The Russians initially traded with the Aleuts inhabitants of these islands for otter pelts, but later enslaved the Aleuts, taking women and children hostage and torturing and killing Aleut men to force them to hunt. Many Aleuts were either murdered by the Russians or died from diseases the hunters had introduced.<sup>[143]</sup> The Aleut population was reduced, by the Russians' own estimate, from 20,000 to 2,000.<sup>[144]</sup> By the 1760s, the Russians had reached Alaska. In 1799, Emperor Paul I consolidated the rival fur-hunting companies into the Russian-American Company, granting it an imperial charter and protection, and a monopoly over trade rights and territorial acquisition. Under Aleksandr I, the administration of the merchant-controlled company was transferred to

the Imperial Navy, largely due to the alarming reports by naval officers of native abuse; in 1818, the indigenous peoples of Alaska were granted civil rights equivalent to a townsman status in the Russian

Empire.<sup>[145]</sup>

Other nations joined in the hunt in the south. Along the coasts of what is now Mexico and California, Spanish explorers bought sea otter pelts from Native Americans and sold them in Asia.<sup>[143]</sup> In 1778, British explorer Captain James Cook reached Vancouver Island and bought sea otter furs from the First Nations people.<sup>[146]</sup> When Cook's ship later stopped at a Chinese port, the pelts rapidly sold at high prices, and were soon known as "soft gold". As word spread, people from all over Europe and North America began to arrive in the Pacific Northwest to trade for sea otter furs.<sup>[146]</sup>

Russian hunting expanded to the south, initiated by American ship captains, who subcontracted Russian supervisors and Aleut hunters <sup>[147]</sup> in what are now Washington, Oregon, and California. Between 1803 and 1846, 72 American ships were involved in the otter hunt in California, harvesting an estimated 40,000 skins and tails, compared to only 13 ships of the Russian-American Company, which reported 5,696 otter skins taken between 1806 and 1846.<sup>[148]</sup> In 1812, the Russians founded an agricultural settlement at what is now Fort Ross in northern California, as their southern headquarters.<sup>[146]</sup> Eventually, sea otter populations became so depleted, commercial hunting was no longer viable. It had stopped the Aleutian Islands, by 1808, as a conservation measure imposed by the Russian-American Company.<sup>[149]</sup> Further restrictions were ordered by the Company in 1834.<sup>[149]</sup> When Russia sold Alaska to the United States in 1867, the Alaska population had recovered to over 100,000, but Americans resumed hunting and quickly extirpated the sea otter again.<sup>[150]</sup> Prices rose as the species became rare. During the 1880s, a pelt brought \$105 to \$165 in the London market, but by 1903, a pelt could be worth as much as \$1,125.<sup>[69]</sup> In 1911, Russia, Japan, Great Britain (for Canada) and the United States signed the Treaty for the Preservation and Protection of Fur Seals, imposing a moratorium on the harvesting of sea otters.<sup>[151]</sup> So few remained, perhaps only 1,000–2,000 individuals in the wild, that many believed the species would become extinct.<sup>[4]</sup>

## Recovery and conservation

During the 20th century, sea otter numbers rebounded in about two-thirds of their historic range, a recovery that is considered one of the greatest successes in marine conservation.<sup>[152]</sup> However, the IUCN still lists the sea otter as an endangered species, and describes the significant threats to sea otters as oil pollution, predation by killer whales, poaching, and conflicts with fisheries – sea otters can drown if entangled in fishing gear.<sup>[1]</sup> The hunting of sea otters is no longer legal except for limited harvests by indigenous peoples in the United States.<sup>[153]</sup> Poaching was a serious concern in the Russian Far East immediately after the collapse of the Soviet Union in 1991; however, it has declined significantly with stricter law enforcement and better economic conditions.<sup>[98]</sup>



In the wake of the Exxon Valdez oil spill, heavy sheens of oil covered large areas of Prince William Sound

The most significant threat to sea otters is oil spills.<sup>[57]</sup> They are particularly vulnerable, as they rely on their fur to keep warm. When their fur is soaked with oil, it loses its ability to retain air, and the animals can quickly die from hypothermia.<sup>[57]</sup> The liver, kidneys, and lungs of sea otters also become damaged after they inhale oil or ingest it when grooming.<sup>[57]</sup> The Exxon Valdez oil spill of 24 March 1989 killed thousands of sea otters in Prince William Sound, and as of 2006, the lingering oil in the area continues to affect the population.<sup>[154]</sup> Describing the public sympathy for sea otters that developed from media coverage of the event, a U.S. Fish and Wildlife Service spokesperson wrote:

As a playful, photogenic, innocent bystander, the sea otter epitomized the role of victim ... cute and frolicsome sea otters suddenly in distress, oiled, frightened, and dying, in a losing battle with the oil.<sup>[4]</sup>

The small geographic ranges of the sea otter populations in California, Washington, and British Columbia mean a single major spill could be catastrophic for that state or province.<sup>[4][46][53]</sup> Prevention of oil spills and preparation for the rescue of otters in the event of one are major areas of focus for conservation efforts. Increasing the size and range of sea otter populations would also reduce the risk of an oil spill wiping out a population.<sup>[4]</sup> However, because of the species' reputation for depleting shellfish resources, advocates for commercial, recreational, and subsistence shellfish harvesting have often opposed allowing the sea otter's range to increase, and there have even been instances of fishermen and others illegally killing them.<sup>[155]</sup>



Sea otters in the Olympic Coast National Marine Sanctuary – note the unusual shape of the hind feet, in which the outer toes are longest

In the Aleutian Islands, a massive and unexpected disappearance of sea otters has occurred in recent decades. In the 1980s, the area was home to an estimated 55,000 to 100,000 sea otters, but the population fell to around 6,000 animals by 2000.<sup>[111]</sup> The most widely accepted, but still controversial, hypothesis is that killer whales have been eating the otters. The pattern of disappearances is consistent with a rise in predation, but there has been no direct evidence of orcas preying on sea otters to any significant extent.<sup>[100]</sup>

Another area of concern is California, where recovery began to fluctuate or decline in the late 1990s.<sup>[156]</sup> Unusually high mortality rates amongst adult and subadult otters, particularly females, have been reported.<sup>[97]</sup> Necropsies of dead sea otters indicate diseases, particularly *Toxoplasma gondii* and acanthocephalan parasite

infections, are major causes of sea otter mortality in California.<sup>[157]</sup> The *Toxoplasma gondii* parasite, which is often fatal to sea otters, is carried by wild and domestic cats and by opossums, and may be transmitted by domestic cat droppings flushed into the ocean via sewage systems.<sup>[157][158]</sup> Although disease has clearly contributed to the deaths of many of California's sea otters, it is not known why the California population is apparently more affected by disease than populations in other areas.<sup>[157]</sup>

Sea otter habitat is preserved through several protected areas in the United States, Russia and Canada. In marine protected areas, polluting activities such as dumping of waste and oil drilling are typically prohibited.<sup>[159]</sup> An estimated 1,200 sea otters live within the Monterey Bay National Marine Sanctuary, and more than 500 live within the Olympic Coast National Marine Sanctuary.<sup>[160][161]</sup>

## Economic impact

Some of the sea otter's preferred prey species, particularly abalone, clams, and crabs, are also food sources for humans. In some areas, massive declines in shellfish harvests have been blamed on the sea otter, and intense public debate has taken place over how to manage the competition between sea otters and humans for seafood.<sup>[162]</sup>

The debate is complicated because sea otters have sometimes been held responsible for declines of shellfish stocks that were more likely caused by overfishing, disease, pollution, and seismic activity.<sup>[53][163]</sup> Shellfish declines have also occurred in many parts of the North American Pacific coast that do not have sea otters, and conservationists sometimes note the existence of large concentrations of shellfish on the coast is a recent development resulting from the fur trade's near-extirpation of the sea otter.<sup>[163]</sup> Although many factors affect shellfish stocks, sea otter predation can deplete a fishery to the point where it is no longer commercially viable.<sup>[162]</sup> Scientists agree that sea otters and abalone fisheries cannot exist in the same area,<sup>[162]</sup> and the same is likely true for certain other types of shellfish, as

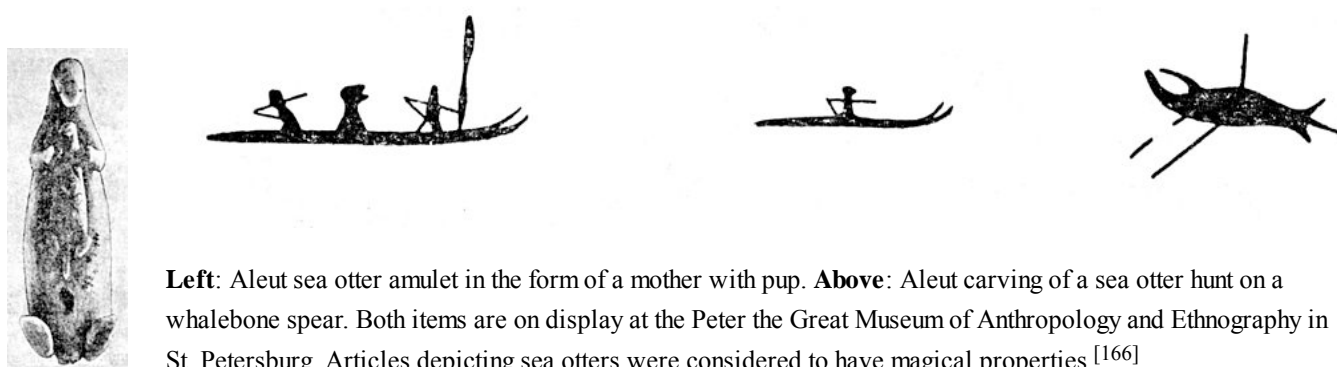


Sea otters like this one near Moss Landing are a tourist attraction in the Monterey Bay area in California

well.<sup>[111]</sup>

Many facets of the interaction between sea otters and the human economy are not as immediately felt. Sea otters have been credited with contributing to the kelp harvesting industry via their well-known role in controlling sea urchin populations; kelp is used in the production of diverse food and pharmaceutical products.<sup>[164]</sup> Although human divers harvest red sea urchins both for food and to protect the kelp, sea otters hunt more sea urchin species and are more consistently effective in controlling these populations.<sup>[165]</sup> The health of the kelp forest ecosystem is significant in nurturing populations of fish, including commercially important fish species.<sup>[164]</sup> In some areas, sea otters are popular tourist attractions, bringing visitors to local hotels, restaurants, and sea otter-watching expeditions.<sup>[164]</sup>

## Role in human cultures



**Left:** Aleut sea otter amulet in the form of a mother with pup. **Above:** Aleut carving of a sea otter hunt on a whalebone spear. Both items are on display at the Peter the Great Museum of Anthropology and Ethnography in St. Petersburg. Articles depicting sea otters were considered to have magical properties.<sup>[166]</sup>

For many maritime indigenous cultures throughout the North Pacific, especially the Ainu in the Kuril Islands, the Koryaks and Itelmen of Kamchatka, the Aleut in the Aleutian Islands, the Haida of Haida Gwaii<sup>[167]</sup> and a host of tribes on the Pacific coast of North America, the sea otter has played an important role as a cultural, as well as material, resource. In these cultures, many of which have strongly animist traditions full of legends and stories in which many aspects of the natural world are associated with spirits, the sea otter was considered particularly kin to humans. The Nuu-chah-nulth, Haida, and other First Nations of coastal British Columbia used the warm and luxurious pelts as chiefs' regalia. Sea otter pelts were given in potlatches to mark coming-of-age ceremonies, weddings, and funerals.<sup>[58]</sup> The Aleuts carved sea otter bones for use as ornaments and in games, and used powdered sea otter baculum as a medicine for fever.<sup>[168]</sup>

Among the Ainu, the otter is portrayed as an occasional messenger between humans and the creator.<sup>[169]</sup> The sea otter is a recurring figure in Ainu folklore. A major Ainu epic, the *Kutune Shirka*, tells the tale of wars and struggles over a golden sea otter. Versions of a widespread Aleut legend tell of lovers or despairing women who plunge into the sea and become otters.<sup>[170]</sup> These links have been associated with the many human-like behavioral features of the sea otter, including apparent playfulness, strong mother-pup bonds and tool use, yielding to ready anthropomorphism.<sup>[171]</sup> The beginning of commercial exploitation had a great impact on the human, as well as animal, populations the Ainu and Aleuts have been displaced or their numbers are dwindling, while the coastal tribes of North America, where the otter is in any case greatly depleted, no longer rely as intimately on sea mammals for survival.<sup>[172]</sup>



Sea otters at the Lisbon Oceanarium show their flexibility when grooming

Since the mid-1970s, the beauty and charisma of the species have gained wide appreciation, and the sea otter has become an icon of environmental conservation.<sup>[156]</sup> The round, expressive face and soft, furry body of the sea otter are depicted in a wide variety of souvenirs, postcards, clothing, and stuffed toys.<sup>[173]</sup>



## H1N1 host

According to the U.S. Geological Survey and the CDC, northern sea otters, off the coast of Washington state, are infected with the H1N1 flu virus and "may be a newly identified animal host of influenza viruses".<sup>[174]</sup>

## Aquariums and zoos

Sea otters can do well in captivity, and are featured in over 40 public aquariums and zoos.<sup>[175]</sup> The Seattle Aquarium became the first institution to raise sea otters from conception to adulthood with the birth of Tichuk in 1979, followed by three more pups in the early 1980s.<sup>[176]</sup> In 2007, a YouTube video of two sea otters holding paws drew 1.5 million viewers in two weeks, and had over 20 million views as of January 2015.<sup>[177]</sup> Filmed five years previously at the Vancouver Aquarium, it was YouTube's most popular animal video at the time, although it has since been surpassed. The lighter-colored otter in the video is Nyac, a survivor of the 1989 *Exxon Valdez* oil spill.<sup>[178]</sup> Nyac died in September 2008, at the age of 20.<sup>[179]</sup> Milo, the darker one, died of lymphoma in January, 2012 <sup>[180]</sup>

## See also

- California Fur Rush

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## External links

- Live HD Web Cam of Sea Otters in the wild. (<http://www.montereybaycam.com/>)
- The Otter Project (<http://otterproject.org/>) – Nonprofit organization
- Friends of the Sea Otter (<http://www.seaotters.org/>) - Nonprofit organization
- Otter 501 (<http://otter501.com/>) – Documentary film
- Sea otters ([https://www.dmoz.org/Science/Biology/Flora\\_and\\_Fauna/Animalia/Chordata/Mammalia/Carnivora/Mustelidae/Otters/Sea\\_Otters/](https://www.dmoz.org/Science/Biology/Flora_and_Fauna/Animalia/Chordata/Mammalia/Carnivora/Mustelidae/Otters/Sea_Otters/)) at DMOZ
- Field notes by Georg Wilhelm Steller, 1742 (<http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1019&context=libraryscience>) (PDF)
- Live sea otter webcam – Monterey Bay Aquarium ([http://www.montereybayaquarium.org/efc/efc\\_otter/otter\\_cam.asp](http://www.montereybayaquarium.org/efc/efc_otter/otter_cam.asp))
- Live sea otter webcam – Vancouver Aquarium (<http://www.vanaqua.org/ottercam/>)
- Otters holding hands (<https://www.youtube.com/watch?v=epUk3T2Kfno>) – The popular YouTube video
- Precipice of Survival: The Southern Sea Otter (<http://online.wr.usgs.gov/outreach/otter/>) (video)
- Smithsonian Institution – North American Mammals: *Enhydra lutris* ([http://www.mnh.si.edu/mna/image\\_info.cfm?species\\_id=85](http://www.mnh.si.edu/mna/image_info.cfm?species_id=85))



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