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Foreword

Humans have no natural adaptations for life in water. We therefore understandably find the abilities of mammals of aquatic habits fascinating. Their grace and endurance in water beguile us. When excellent swimming ability is coupled with a playful disposition, the animal has irresistible charm for us. Otters are a prime example of how these characteristics enchant us, as is reflected in such wonderful stories as Gavin Maxwell's *Ring of Bright Water*. The slim volume in hand, however, reflects another side of the human relationship to these captivating creatures. This side certainly should not reciprocally endear us to otters, for human activities around the world have been inimical to the very survival of this cosmopolitan group of animals.

Although the direct effects of humans on otters have been severe in some instances, as is the case for the sea otter and giant otter, indirect effects have been the more important worldwide. This Action Plan identifies and discusses several significant factors that influence habitat quality and the presence of otters. The reader will quickly see that there has been insufficient recognition of the value of otters as indicator species of environmental health. Otters are, indeed, a fine illustration of why species conservation work is so valuable generally. On the one hand, they are sensitive to degradation of water quality, aquatic food chains, and terrestrial habitat adjacent to water, and the resultant diminishment of their populations is cause alone for alarm. On the other hand, when close acquaintance is possible, people find that otters are very charismatic animals. Information and communications about them and their welfare therefore attract attention in a way that the familiar generalities about environmental problems do not. Thus, when fashioned appropriately, materials on these aquatic acrobats can go a long way to make the arguments needed to conserve riverine, lacustrine, and other imperiled otter habitats, with all of their constituent plant and animal species. For these fellow species, otters are environmental ambassadors of first-class rank.

A large part of the task ahead in the conservation of otters relates to obtaining more information about them. This Action Plan provides a succinct yet very comprehensive summary of knowledge pertinent to their conservation. It contains original materials otherwise unavailable. Yet it is obvious from the accounts that we need to know a great deal more. Among other things, basic research to help explain their comparatively low levels of genetic variation, field and captive studies on their reproductive biology, investigations of their water balance physiology, all are needed. Even more fundamental is simply determining by systematic surveys where otters still occur and assessing how well their populations are faring in a world increasingly impacted by detrimental human factors.

The long-term responses needed for conservation of otters involve major changes in the outlooks of people and governments. The growing acceptance of the biological and economic importance of wetlands through the Ramsar convention is a favorable sign of change. Still, much more needs to be done to enhance regard for the intrinsic as well as extrinsic values of the ecosystems that otters inhabit.

Finally, as I strongly commend this Action Plan for otters to governments, wildlife agencies, and conservation organizations, I sincerely hope that the officials concerned and other individuals involved will commit to rapidly making this an obsolete publication. By this I mean establishing and supporting projects and programs to supply more information on otters and their habitats and to act on available data and studies to protect and conserve these marvelous animals and the aquatic resources they symbolize. Otters and humans deserve no less.

George B. Rabb
Chairman
IUCN Species Survival Commission

Preface

This action plan for otter conservation has been compiled by the IUCN/SSC Otter Specialist Group with help and advice from many other interested parties. Contributors are listed, with thanks, in Appendix 2. The IUCN/SSC Otter Specialist Group would like especially to thank Simon Stuart of the IUCN Species Survival Commission Executive Office for overall help in compiling this action plan. On behalf of IUCN, SSC, and the Otter Specialist Group, I also wish to record my sincere thanks to the Marine World Foundation and its president, Michael B. Demetrios, for supporting my salary while I worked almost full-time on the plan.

The action plan has been designed to be useful to people new to the field of otter conservation and also to those with years of experience. The introductory chapter on the otters (2) and the chapter on threats (4) give an overview of otter biology and the conservation issues that affect them. The chapters on surveys

(3), implementing conservation strategies (5), otters in captivity (6), and reintroductions (7) are intended to give practical guidelines and cautions to those intending to pursue projects in these areas. The CITES identification sheets in Appendix 1 should be useful for biologists and conservationists around the world who need to tell one otter from another in places where more than one species may occur. The overall conservation recommendations of the IUCN/SSC Otter Specialist Group are summarized in the introduction (Chapter 1), with more detailed conservation priorities indicated in the regional and country-by-country sections that form the meat of this action plan. The final chapter summarizes the action that needs to be taken to conserve all species of otters worldwide for the long-term future.

Collecting and organizing the information for the country by country reports was the responsibility of the Otter Specialist

Group Regional Coordinators, and different approaches were taken in different regions. In Europe, Latin America, North America, and Africa, questionnaire surveys were mailed to government officials, biologists, and conservationists in all countries where contacts were possible. Follow-up letters and telephone calls were made to ensure inclusion of information from most countries in these regions. This information was supplemented with published accounts, listed in the references. The information for the Asian part of the plan stemmed largely from papers presented at the First International Asian Otter Symposium, in Bangalore, India, in October 1988, since few published status accounts existed for any Asian species, and few Asian conservationists were interested in otters prior to this meeting. Information from other countries not represented at the conference was gathered through follow-up correspondence. The information on sea otters was compiled largely through published accounts and status surveys, as this species

has been particularly well-studied and surveyed in both the Soviet Union and the United States.

This action plan for otter conservation is only a start. Already, in helping us put together this document, other agencies and some governments have been inspired to develop their own more comprehensive action plans for otter conservation in their regions. What is needed next is an infusion of appropriate financial resources to enable action to be taken. Only then can we ensure the survival of otters, and the maintenance of clean wetlands and waterways that otters represent. The Otter Specialist Group welcomes all your support, donations, and fundraising ideas.

Pat Foster-Turley
Chairman, IUCN/SSC Otter Specialist Group,
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1. Introduction and Overall Recommendations

Pat Foster-Turley

Why Otters?

Otters are semi-aquatic members of the family Mustelidae, which also includes weasels, badgers, ferrets, and mink. The IUCN Action Plan for Mustelids and Viverrids (Schreiber et al. 1989) covers the conservation of the entire family Mustelidae with the exception of otters. Why, then, is there an action plan just for otters?

Of the 13 otter species in the subfamily Lutrinae (Corbet and Hill 1980), the latest edition of the IUCN Red List of Threatened Animals (IUCN 1988) lists eight otters as either "Vulnerable" or "Insufficiently Known." The five "Vulnerable" species include the marine otter (*Lutra felina*), Neotropical otter (*L. longicaudis*), giant otter (*Pteronura brasiliensis*) of South America and the Eurasian otter (*Lutra lutra*) in Europe and northern Asia. In Asia, the Asian small-clawed otter (*Aonyx cinerea*), smooth otter (*Lutra perspicillata*), and hairy-nosed otter (*L. sumatrana*) are listed as "Insufficiently Known." In fact, most of the otters are insufficiently known, and most are rapidly disappearing along with the clean wetlands they inhabit worldwide.

This is the key to the importance of this action plan. It is not only a plan for the survival of otters; it is a plan for the survival of the remaining clean wetlands and waterways that they inhabit. Increasingly, otters are being used as the symbol for the survival of these habitats, for the reasons outlined below.

Worldwide Distribution

Otters are found throughout North America, Central and South America, Europe, Asia, and Africa. The only continents without otters are Australia and Antarctica, and the only habitats where otters are missing are deserts, polar regions, and the highest mountain slopes. Throughout their ranges, otters were once found in most streams, rivers, marshes, lakes, and coastal areas. Although most otter species are tied to freshwater sources for drinking and give birth on land, the sea otter (*Enhydra lutris*) is in all ways a fully-fledged marine mammal.

Widespread Public Appeal

People everywhere are captivated by the charm and playful behavior of these charismatic mammals. Throughout the world, otters are well-known to human residents along waterways and



Young North American river otters (*Lutra canadensis*) (Photo courtesy of Marine World Africa U.S.A., California).

coastal areas. In Bangladesh and Nepal, fishermen still use trained otters to help them fish. In Japan, otter characters form the basis of folktales, though otters are now thought to be extinct there. In the western world, otter-watching is the basis of thriving tourist industries in areas like the northern coast of California. Throughout Europe, an expanding network of non-governmental organizations, volunteer otter surveyors and conservationists monitor the otters in their countries and regions. At least two European zoos are dedicated entirely to otters and their relatives, and otter displays are often among the most popular exhibits in major zoos in Europe and America alike. Anyone who has ever seen an otter in the wild is likely to remember the experience forever.

Indicators of Healthy Wetlands and Waterways

Otters are found in oceans, rivers, lakes, and marshes, wherever there is clean, unpolluted water, undisturbed bankside cover, and a good food supply. Otters are indicators of healthy aquatic environments in much of the world. As is typical of animals at the top of the food chain, otters are among the first species to disappear when their environment is contaminated by pollut-



Eurasian otters (*Lutra lutra*) have adapted to many habitats, from the snows of European winters to the year-round warmth of tropical Asia (Photo courtesy of Alpenzoo, Austria).

ants such as heavy metals and organochlorines like PCBs (Mason and Macdonald 1986a). As the world becomes increasingly congested with humans and waterways become polluted with their wastes, otters become increasingly scarce.

A world without otters is a world without pristine streams, without unsilted rain-forest rivers, without lowland marshes that have not been "reclaimed," without uncontaminated fish, crabs, and aquatic life. By identifying the threats to otters, and taking the appropriate steps to overcome these threats, we can work towards preserving some of the important wetlands and waterways of the world.

This action plan for otter conservation is therefore not just about otters.

Overall Recommendations of the IUCN/SSC Otter Specialist Group

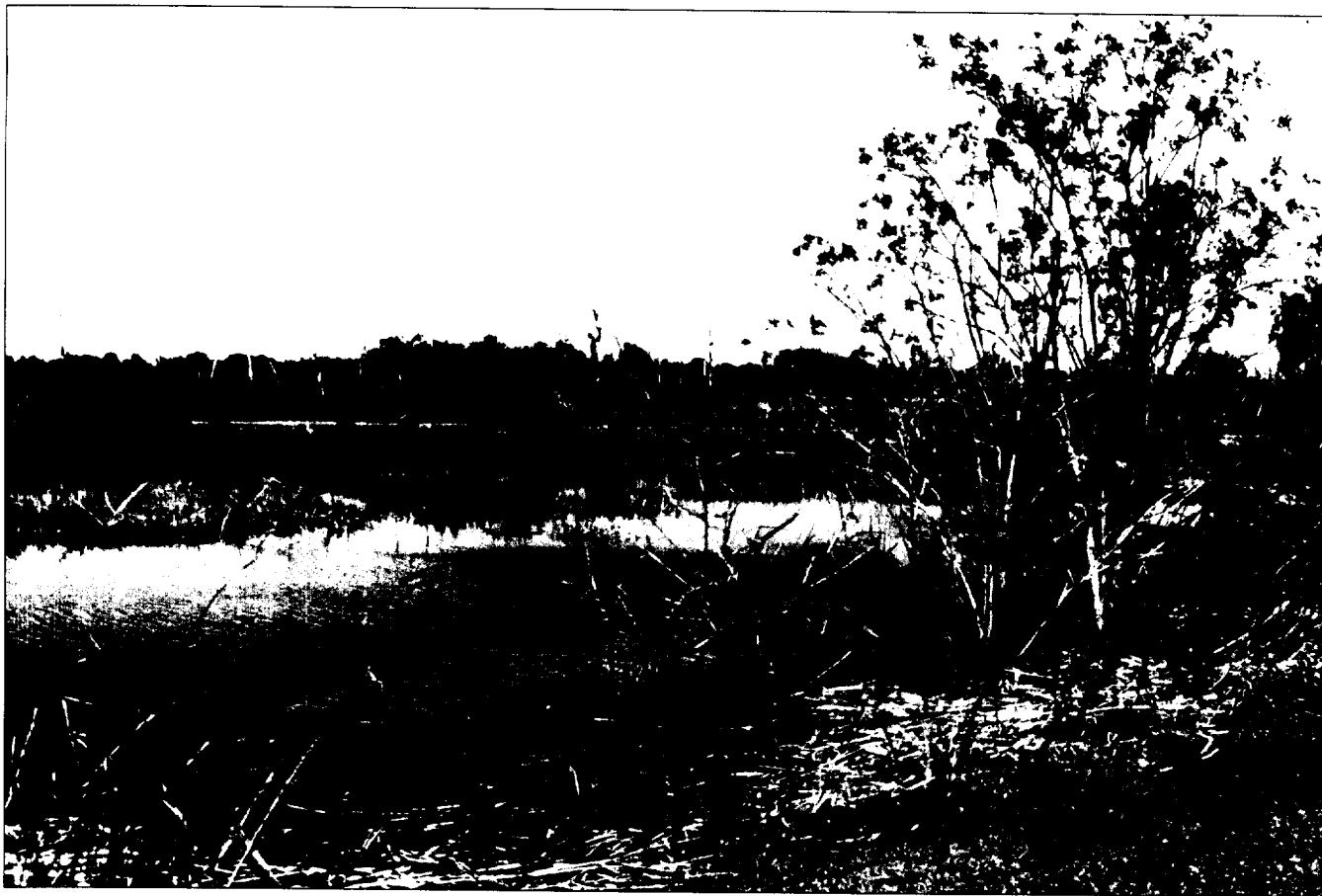
1. To ensure the protection of wetlands and wildlife, all governments which have not already done so should sign

the Ramsar Convention on Wetlands of International Importance, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and other international conservation agreements.

2. Global surveys are needed to pinpoint areas with remaining viable otter populations in order to protect these habitats from uncontrolled development. Such detailed surveys are necessary in most countries of the world.
3. Survey efforts should be followed by steps to protect remaining viable otter populations and habitats from uncontrolled development. Environmental impact assessments should be carried out before wetlands are drained or modified, streams and waterways are channelized, or new dams are constructed in areas occupied by otters.
4. In-depth studies are needed on the biology and ecology of most of the world's otter species. Even the most basic life history information is lacking on most otter species. Studies are needed to identify regional conservation problems and to establish a sound scientific basis for maintaining viable populations. In particular, research projects are needed to determine:
 - a) habitat and resource requirements for different otter species;
 - b) the size and configuration of suitable habitats necessary to maintain viable populations;
 - c) genetic structure within and among otter species and populations;
 - d) the direct and indirect influences of otters as predators in aquatic ecosystems, including the interactions of otters with fisheries and aquaculture projects.
5. PCBs and other persistent environmental contaminants must be completely banned and replaced by non-accumula-



Fisherman with trained smooth otters (*Lutra perspicillata*) in Bangladesh (Photo by Mohd Anisuzzamen Khan).



Prime otter habitat in the bayous of Louisiana, United States (Photo by Pat Foster-Turley).

tive compounds. Proper facilities for the destruction of PCBs must be further developed and strictly controlled. As long as PCBs are accumulating in aquatic environments, otters and other wildlife at high trophic levels face extinction.

6. As most otter species are known to be declining, the international trade in otter pelts might present a problem in certain species. Some otter skins are difficult to identify to species. It is recommended that those otter species on CITES Appendix II be evaluated to assess the impact of international trade on the status of their wild populations.

The North American river otter (*Lutra canadensis*) is the only otter subject to controlled management programs, though in certain cases the population monitoring of this species needs to be improved in order to assess the impact of harvest on wild populations, and to set quotas more accurately.

7. Public awareness campaigns are needed, not only on otters but on environmental conservation and controlling human population growth. These campaigns should be directed at both the general public and the policy makers at all levels throughout the world.

2. An Introduction to the Otters

Chris Mason

Introduction

Otters make up the sub-family Lutrinae of the carnivore family Mustelidae, which also includes the weasels, martens, polecats, badgers, skunks, grisons, and minks. Otters are amphibious, foraging largely in aquatic habitats, both freshwater and marine, though they also take terrestrial prey. The fur is thick and waterproof, with two types of hair. There is a dense underfur which traps an insulating layer of air and remains dry while the otter is swimming. The longer, overlying guard hairs are waterproof. Otters have long, sinuous bodies, with flattened heads and small ears. The legs are short and, in the majority of species, the five-toed paws are webbed. The broad muzzle is surrounded by long, stiff whiskers, which are thought to be used in searching for prey. Harris (1968) provides a historical review of otter biology. More recent reviews are those of Duplaix (1984), Chanin (1985), and Mason and Macdonald (1986a).

Otters use different tactics to catch their prey (Duplaix 1984). The majority of species are mouth-oriented, chasing

prey through the water and catching it in the jaws. The sea otter (*Enhydra lutris*) and the three *Aonyx* species are hand-oriented, catching food with the fore-paws.

The taxonomy of the Lutrinae is still somewhat confused, with as many as 19 species and 63 subspecies being recognized by earlier workers. Zyll de Jong (1987) has recently provided evidence that New World river otters should be separated from *Lutra* species into the genus *Lontra*. However this action plan follows the classification of Corbet and Hill (1980), which recognized 13 species in four genera: *Lutra*, *Pteronura*, *Aonyx*, and *Enhydra*. Identification guides to these species are provided in Appendix 1. The 13 species are listed in Table 1.

North America

The genus *Lutra* contains eight species. The North American river otter (*Lutra canadensis*) is characterized by its large, conspicuous rhinarium, the hairless part of the nose. This species originally ranged widely in North America, from arctic

Table 1. The 13 otter species.

English name	Scientific name	General Distribution
Cape clawless otter	<i>Aonyx capensis</i>	Africa
Asian small-clawed otter	<i>Aonyx cinerea</i>	Asia
Congo clawless otter	<i>Aonyx congica</i>	Equatorial Africa
Sea otter	<i>Enhydra lutris</i>	Pacific coast of North America, Soviet Union
North American river otter	<i>Lutra canadensis</i>	Canada, United States
Marine otter	<i>Lutra felina</i>	Pacific South America
Neotropical otter	<i>Lutra longicaudis</i>	Central and South America, Mexico
Eurasian otter	<i>Lutra lutra</i>	Europe, Asia, North Africa
Spotted-necked otter	<i>Lutra maculicollis</i>	Africa
Smooth otter	<i>Lutra perspicillata</i>	Asia
Southern river otter	<i>Lutra provocax</i>	Argentina, Chile
Hairy-nosed otter	<i>Lutra sumatrana</i>	Southeast Asia
Giant otter	<i>Pteronura brasiliensis</i>	South America

Alaska to the southern states of Florida and Texas, but its range has contracted markedly in the present century and it is now absent from much of interior United States and the southern prairie regions of Canada. The causes of the decline are habitat destruction, water pollution, and over hunting for furs. Otters are still killed for their fur in 38 states and provinces in the United States and Canada, though this is now under stricter management. The North American river otter lives in lakes, streams, coastal salt-marshes, and some rocky sea coasts. Fish form the major part of its diet and are caught in proportion to their abundance and inversely in proportion to their swimming ability. In an intensive radio-tracking study in Idaho, Melquist and Hornocker (1983) found that there was approximately one breeding female per 20 km of waterway, one adult male per 53 km, and one yearling or non-breeding adult per 14 km, the overall density being estimated at one otter per 3.9 km, with extensive overlap in the home ranges of individuals. Within each home range were a number of activity centers, located in areas of abundant food and adequate shelter. The North American river otter is unusual in that it exhibits delayed implantation. In most areas, cubs are born in late winter or early spring.



North American river otter (*Lutra canadensis*) in coastal Mendocino County, California, United States (Photo by Pat Foster-Turley).

South America

Latin America has three species of *Lutra*. The Neotropical otter (*L. longicaudis*) has the widest distribution, from Mexico to northern Argentina, and four subspecies are recognized. The species lives in a variety of habitats, from small forest streams to lakes, swamps, coastal savanna swamps, and marine coasts associated with freshwater lagoons in Santa Catarina and Rio de Janeiro states of Brazil (Blacher 1987). It feeds mainly on fish and crabs (Gallo-Reynoso 1989). Very little is known of its biology. The greatest threat is from increasing habitat alteration and water pollution; also, illegal hunting for the pelt still occurs. The southern river otter (*L. provocax*) is restricted in distribution to the southern parts of Chile and western Argentina. In freshwater environments, its diet consists almost entirely of crustaceans and bivalves (Chehébar 1985). This species, which requires dense vegetation cover near to the



Marine otter (*Lutra felina*) in Chile (Photo by Rick Ostfield).

shoreline (Sielfeld 1983; Chehébar et al. 1986), occurs in rivers, lakes, and estuaries, and in coastal habitats it overlaps with the small and distinctive marine otter (*L. felina*). The marine otter occurs along the Pacific coast, from near the equator (in Peru) to the southern tip of South America, with the most abundant populations in southern Chile. This species occurs mainly on exposed rocky shores, where shellfish form the greater part of its diet (Ostfeld et al. 1989). Both the southern river otter and the marine otter, though legally protected, are hunted for their pelts.

South America is also home to the giant otter (*Pteronura brasiliensis*), one of the largest carnivores in the region, males attaining a length of up to 1.8 m and a weight of 32 kg. The giant otter lives in large rivers and narrow forest creeks backed by dense vegetation, from Venezuela to northern Argentina, and from the headwaters of some Amazonian rivers to the Pantanal and the Brazilian Atlantic forests. The major factors influencing habitat choice are low, sloping banks, with good cover and easy access to forest creeks or swampy areas, and with an abundance of vulnerable prey in relatively shallow waters (Duplaix 1980). Fish (characoids and catfish) make up the greater part of the diet. Giant otters are mainly diurnal, and live in noisy, inquisitive extended family groups, which periodically may coalesce and travel together with as many as 20 animals forming a group. Their diurnal, noisy, and social behavior makes them very vulnerable to illegal hunting. Otter groups clear areas of river bank; these "camp sites" are up to 28 m long and 15 m wide. They are used for scent-marking, with scent, urine, and feces being spread and trampled around the area for purposes of territorial signalling. Due to heavy hunting in the past, the giant otter is categorized as seriously endangered in seven countries, almost extinct in two, and widespread only in Surinam and Guyana.

Europe and Asia

The most widely distributed otter species is the Eurasian otter (*Lutra lutra*), which ranges from Ireland in the west to Japan in the east and from the arctic to North Africa and Sri Lanka. Within this range, 10 subspecies are recognized. Many populations are severely reduced. Eurasian otters occupy a wide range of freshwater habitats and in some areas there are coastal populations (western Ireland, western and northern Scotland,



Eurasian otter (*Lutra lutra*) at the Alpenzoo, Innsbruck, Austria (Photo courtesy of Alpenzoo).

and western Norway), where high rainfall ensures that there are many small freshwater pools, required by otters for drinking and bathing, close to the shore. Coastal otters can be active by day, some individuals being almost exclusively so. However, most populations are largely nocturnal. Radio-tracking of otters on a Scottish river showed a male to patrol a home-range of 39 km of waterway with female ranges around half this length (Green et al. 1984). Ranges of individuals overlapped. Coastal animals have much smaller home ranges.

Three additional otter species occur in Asia. The hairy-nosed otter (*L. sumatrana*) has a rhinarium covered with hair, and has a generally darker coat than the Eurasian otter. Almost nothing is known of its habits. The smooth otter (*L. perspicillata*) has a short, smooth coat and is generally larger than the Eurasian otter, with big, thickly-webbed feet. It lives in large rivers, estuaries, and coastal mangrove swamps, and requires undisturbed forest or scrub adjacent to the water for security. The diet of the smooth otter consists mainly of fish. The Asian short-clawed otter (*Aonyx cinerea*) is the smallest species. Its front feet are only partially webbed, with rudimentary finger-nail-like claws, used for probing in mud and under stones. This species lives in small streams, rice fields, and coastal mangroves. It is social, occurring in groups of up to 15 individuals. Crabs, molluscs, and small fish comprise most of the diet.

Africa

Three species of otter occur in sub-Saharan Africa. The Cape clawless otter (*Aonyx capensis*) has no webbing on the forefeet, the fingers having great dexterity and being used for probing amongst stones and rocks for crabs, molluscs, frogs, and fish. Crustaceans feature prominently in the diet, more so than in the spotted-necked otter (*Lutra maculicollis*), which eats a greater proportion of fish (Rowe-Rowe 1977a). The spotted-necked

otter is a smaller, darker animal, its pale neck and chest irregularly spotted with dark markings. It prefers deeper water than the clawless otter and is most abundant in the large lakes of central Africa. It is largely diurnal in habit, compared with the crepuscular and partly nocturnal Cape clawless otter. The Congo clawless otter (*A. congica*) is very closely related to the Cape clawless otter and is restricted in range to equatorial Africa. Almost nothing is known of its ecology.

Sea Otter

The final species to be considered in this brief survey of otters is the sea otter (*Enhydra lutris*), the largest of the mustelids, with males occasionally achieving a weight of 45 kg. Spending most of their time in the sea, sea otters have developed some seal-like characteristics, with small stumpy forefeet lacking obvious toes, but highly mobile and adapted to picking food from the sea bed and manipulating it while eating. The hind-feet are large and flipper-like. Lacking a layer of blubber, the



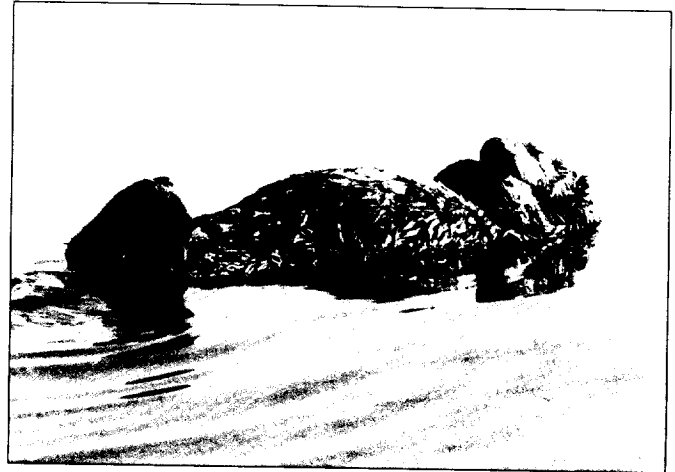
A young Congo clawless otter (*Aonyx congica*) in captivity (Photo by Elizabeth Joy).

sea otter has very dense fur to trap an insulating layer of air. To maintain the insulation, much time is spent in cleaning and grooming.

The sea otter feeds largely on invertebrates, and its teeth, unique among carnivores, have no sharp cutting edges. The rounded cusps are adapted to crush the exoskeletons of marine invertebrates. Hard shells are broken with the aid of tools, the otter lying on its back in the water and banging a shell against a rock which has been collected on the sea bed. Sea urchins and abalones appear to be preferred foods, but where sea otters are thriving and these prey species depleted, the diet is progressively expanded to include crabs, clams, and fish. At least on some coasts, sea otters are "keystone" predators: where otter populations are high, grazing sea urchins are few and luxuriant beds of kelp develop, allowing the survival of dense populations of fish and detritivorous invertebrates (Van Blaricom and Estes 1988).

Sea otters are social animals. Populations show distinct sexual segregation, with rafts of males and females occurring in different locations. The male congregations are generally larger and occupy the ends of the range in expanding populations.

The sea otter was once distributed across the rim of the Pacific Ocean from the northern Japanese archipelago to central Baja California in Mexico. It was extensively hunted during the



Sea otter (*Enhydra lutris*) off the Californian coast, United States (Photo by Richard Bucich).

18th and 19th centuries and was virtually extinct by the early 20th century. Following protection, the sea otter population recovered in many areas. It is now abundant throughout the Kuril and Aleutian Islands and along the coast of North America westward of Prince William Sound. Smaller isolated populations occur in southeast Alaska, British Columbia, Washington, and California (Van Blaricom and Estes 1988).

3. Surveys

Sheila Macdonald

Because most otters are secretive animals, the distribution and abundance of populations is difficult to determine. However, before any action can be taken to conserve an otter species, it is essential to obtain the best possible estimates of the distribution and population of that species. The methods used will be influenced by the resources available in terms of finance, manpower, and expertise, and the type and size of area to be covered by the survey. It will become clear from later chapters that for some species, in some countries, very detailed assessments, at least of distribution, are available, while in other countries we are still uncertain as to which species of otter may occur. For these reasons, surveys form a very important first step in designing appropriate conservation programs. This chapter provides a brief overview of current survey techniques and is an important part of the background for the action plan.

Hunting records

In some countries, information on the occurrence of otter species can only be obtained by observations of kills made by local hunters. Records from systematic hunting, either for sport (as formerly in the United Kingdom) or for pelts (as in North America) can, if analyzed with care, provide more accurate data on distribution and trends in the relative status of a species. In the United States, skinned carcasses of the North American river otter (*Lutra canadensis*) are collected from trappers by the U.S. Fish and Wildlife Service and, after assessments of age structure and reproductive status, local annual harvest quotas are determined (Melquist and Dronkert 1987).

Questionnaires

In Europe, information on otter distribution was traditionally collected through questionnaires sent to hunters, fishermen, and naturalists. Recently Melquist (1984) also used this method to compile a survey of otters in Latin America. However, the reliability of results from questionnaires is open to doubt. The method depends on the accuracy of human memory and correct identification of species. Replies can be colored by the degree of concern or vested interest of correspondents and only subjective information is collected. Questionnaires usually comprise general queries which cannot elicit detailed data on specific regions. Correspondents' perception of status may vary ac-



Otter resting places, like this tree root system along the Spree River in East Germany, are often marked with scats (Photo by Michael Stubbe).

cording to personal local experience, making regional comparisons difficult. The results of questionnaires can provide some useful baseline information but should be analyzed with caution and never be relied upon verbatim.

Field Surveys

It is now widely accepted that, given manpower and financial support, field surveys can provide the most accurate and objective results on otter distribution. They can also indicate the *relative* status of a species within a country or region. Field surveys based on a standardized methodology can be replicated at intervals in order to assess changes in distribution and status over time.

Sea otters (*Enhydra lutris*) feed extensively during the day. They occur in narrow strips of shallow coastal waters and spend much of their time on the surface. Thus, they may be counted directly both from the air and by observers on the shore (Geibel and Miller 1984; Wendell et al. 1986). However, most otter species are difficult to observe directly and so field surveys are based on a search for signs of the animals. The signs most frequently found are scats (feces). In some species, such as the Eurasian otter (*Lutra lutra*), the smooth otter (*L. perspicillata*)

and the southern river otter (*L. provocax*), the scats have a distinctive, musky odor. Scats do not have a uniform shape or size, but often contain distinctive food remains such as fish bones or scales, amphibian bones, and crustacean exoskeleton fragments. Scats are used by otters to mark home ranges/territories and are often deposited at conspicuous sites such as stones, logs, under tree roots or bridges, on sand bars or at stream confluences. Overland paths are also marked with feces.

Single or small collections of scats are most commonly found, but several otter species also create latrine areas where large numbers of feces accumulate (e.g. Eurasian otter, smooth otter, southern river otter, and giant otter). Latrines are usually found on banks or sand bars.

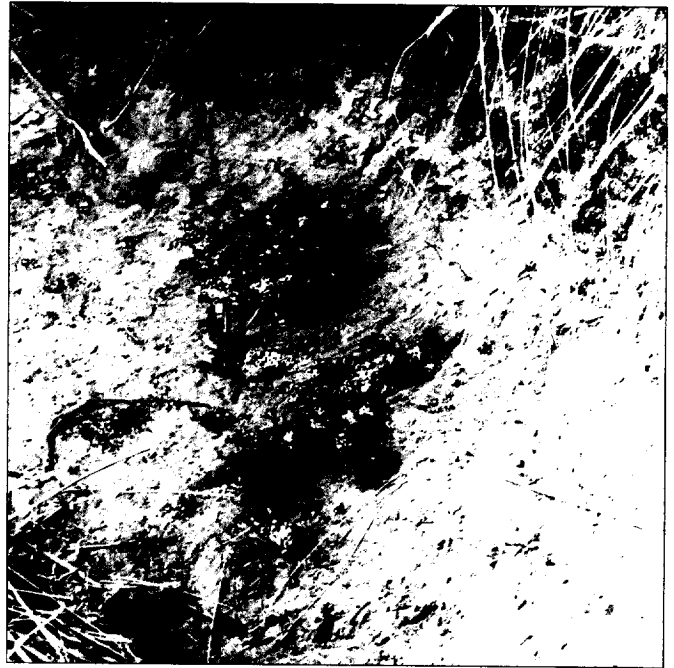
In addition to scats, otters produce jelly-like secretions. In the Eurasian otter, secretions can vary in color from white through yellow, green and brown to black. Orange-brown mucus is often found associated with the feces of the smooth otter. Several species scrape up sand or vegetation into small mounds and defecate or urinate on top.

Where the substrate is suitable, such as sand or mud, otter tracks may be found. All five toes may not be visible. Tracks of the Asian small-clawed otter (*Aonyx cinerea*) may be distinguished by the greater length of the middle digits.

Based on the recognition of field signs, a standard survey methodology was devised for the Eurasian otter in the United Kingdom during the 1970s (see Macdonald 1983) and has subsequently been successfully adapted for other species, such as the southern river otter (Chehébar 1985). For the Eurasian otter, experienced, full-time workers are employed and the survey is based on the national 10 km square grid. Within each 10 km square (given available wetland habitat), sites are visited at 8-10 km intervals along rivers, lakes, marshes, or sea coasts. Sites are, where possible, chosen for ease of access. At each site a maximum of 600 m is searched for otter signs (this distance may have to be extended for other otter species). As soon as



When more than one species of otter coexist, their scats can sometimes be told apart. The scats of the spotted-necked otter (*Lutra maculicollis*) have a mean diameter of 15 mm (Photo by Dave Rowe-Rowe).



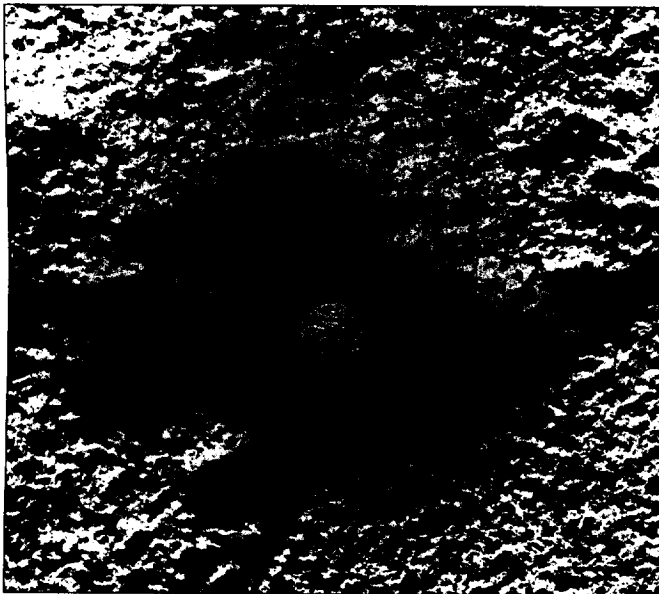
The scats of the Cape clawless otter (*Aonyx capensis*), found sympatrically with the spotted-necked otter, have a mean diameter of 25 mm (Photo by Dave Rowe-Rowe).

signs are found, the search is terminated and the site recorded as positive for otters. If nothing is found after a search of 600 m, the site is considered as negative. If time allows, it may be profitable to search a minimum of 200 m even if signs are found immediately, as this can provide some indication of marking intensity.

A data sheet is completed at each survey site. It is useful to record altitude, the type of agriculture, industry, or other land use, the level of human disturbance, the presence or absence of visible water pollution, an estimate of the availability of potential prey and an assessment of the quality of the habitat in terms of providing shelter for otters.

Using the field survey method described above, almost complete coverage can be achieved for a small country with, say, two surveyors working full-time for two years. As an example, Green and Green (1980) visited 4,636 sites throughout Scotland between 1977 and 1979. It is recognized, however, that few countries have the resources to support such a detailed study.

The method can be abbreviated to suit available time and financial support. For example, in 1981, 200 sites were surveyed within three weeks throughout southern, central, and eastern Greece (Macdonald and Mason 1982). No attempt was made to cover waterways at even intervals, but as many sites as possible, over as wide an area as possible, were visited within the available time. The standard method was followed in other respects. This type of survey can provide initial distribution data, can identify possible problems for otter survival and can form a baseline for further detailed studies.



The tracks of the Cape clawless otter (*Aonyx capensis*) show no webbing. Diameter of coin is 20 mm. (Photo by Dave Rowe-Rowe.)

Field surveys can provide some indication of the relative status of otter populations. It must be stressed that there is no known direct relationship between the number of signs found and the number of animals present. However, if, for example, searches are made at 50 sites on one river catchment and 75% prove positive with many signs found at most sites, it may be

assumed that the animals are at a higher density than on an adjacent catchment where only 15% of sites are positive with very few signs found at each site.

While field surveys are recommended as the best method for assessing otter distribution, several potential problems must be considered. It is possible that not all otters within a population leave territorial signs (scats). Additionally, where populations are at a very low level or fragmented, few signs may be found. Nevertheless, as the survey of a catchment will involve visiting a number of sites, it is unlikely that the presence of the otters will be missed completely even in regions where they are rare. The survey method will clearly identify viable and widespread populations and it is these populations which should be considered initially in any conservation program.

Some otter species in some regions, such as the Eurasian otter in the United Kingdom, display a seasonality in marking activity (Conroy and French 1987; Macdonald and Mason 1987). Thus, a site visited in August might reveal few otter signs, while the same site in January may be heavily marked. It is advisable, if making comparisons between adjacent areas, to survey both regions in the same season. Weather conditions can affect the ease of finding scats and prints. Periods of heavy rainfall or snow melt can result in most signs being washed away.

Finally, it is essential that surveys are carried out by experienced personnel. Inexperienced workers, however diligent, if unfamiliar with the diversity of otter signs, can seriously underestimate distribution ranges. This problem will be exacerbated in countries where several otter species coexist.

4. Threats

Sheila Macdonald and Chris Mason

A number of factors are involved in the decline, both in population and range, of several otter species. The most important of these are pollution (especially in the developed world), habitat destruction, and over hunting.

Pollution

There is little doubt that pollution has exerted major effects on the distribution and abundance of otters, though most work linking pollution to otter declines relates to the Eurasian otter (*Lutra lutra*) in western Europe. A review is provided by Mason (1989).

Pollution may influence otters either indirectly or directly. Indirect effects include damage to the food supply or habitat of otters, thus lowering the carrying capacity of an affected area. Direct effects impact on the animal itself, resulting either in rapid death (acute toxicity) or in a lowered fitness (sub-lethal toxicity), reducing the animal's ability to reproduce successfully or to survive in inclement conditions.

Indirect effects are most significant when they destroy the fish stocks or other prey forming the main food supply of otters. The most widespread form of pollution is organic waste from domestic and industrial sources. Where sources are small and adequately treated, organic discharges will do little damage and, by adding nutrients to streams, may enhance fish populations to the benefit of otters. However, poorly treated effluents can wipe out fish populations for long distances downstream of the discharge. Such effects can be of particular importance where large cities are situated in the middle reaches of major rivers with organic pollution rendering long stretches of otherwise suitable habitat unusable by otters. Intensive animal husbandry (such as of pigs, cattle, or chickens) also results in problems of waste disposal, the river providing the easiest, though often illegal, solution to the problem. In contrast to the effects of cities, livestock units are often situated close to smaller streams and rivers, and so pollution from these sources can remove further refuge areas for otters.

Rural industry may also pose indirect threats to otters, particularly mining for gravel and metals. In many countries gravel is extracted directly from river beds, not only destroying natural vegetation but also sharply increasing the silt load of the water, which clogs the gills of fish. Mine water is not only frequently acid but it is often rich in metals which are acutely toxic to fish. Mason and Macdonald (1988a) reported how the discharge from a small mine in a remote area of Wales destroyed the fish



Massive fish kills from pollution can deplete the food supply for otters (Photo by Martin Gaethlich).

population and made an otherwise ideal river habitat unsuitable for the Eurasian otter.

The acidification of freshwaters is now a widespread problem in the northeast United States, Canada, and Scandinavia, and has been more recently described from upland waters in the United Kingdom. Gaseous pollutants, many of them released from power stations, are eventually returned to land in precipitation at sites remote from their origin, causing episodes of very low pH as they are washed into streams with poor buffering capacity. The effect is exacerbated in those catchments afforested with conifers and the outcome is the elimination of much of the stream fauna, including fish. Few studies linking otter distribution to acidification have been made. However, Mason and Macdonald (1987) described how in the headwaters of a Welsh river, an afforested branch, receiving episodes of acid water, were not used by the Eurasian otter, while the species was resident on an adjacent branch which drained down open hills and was not subject to low pH. More recent work in Scotland has shown a relationship between low pH and reduced otter usage in streams in a region known to be suffering from severe acidification (Mason and Macdonald 1989).

Of those compounds which cause direct effects on otters, most concern has been expressed over oil, organochlorines, and heavy metals. Oil is known to have killed coastal-dwelling Eurasian otters and sea otters (*Enhydra lutris*) and acts by contaminating the fur, increasing heat loss, and reducing buoy-



Effluents from mining operations can contaminate a stream, like this one in Greece (Photo by Martin Gaethlich).

ancy of the animal (Costa and Kooyman 1982). Oil may be ingested and prove toxic during grooming, causing death by hemorrhagic gastroenteropathy (Baker et al. 1981). These effects were confirmed in March 1989 when a large-scale oil spill in Prince William Sound, Alaska, killed many sea otters.

Organochlorines and heavy metals are ingested mainly via the food supply. These pollutants are persistent, accumulating in living tissues, and they are a particular problem in freshwater because there are many sources. Rainfall will wash atmospheric pollutants and chemicals applied to land into watercourses. Some pesticides are deliberately applied to water, especially in the tropics, to control pests such as mosquitoes, black-flies, and molluscs. Many industries discharge effluents directly into rivers or indirectly via sewage works. Small amounts of persistent pollutants in effluents may become quickly concentrated in the biota. Fish take in pollutants with their food, via their gills, and through their skin. Otters obtain pollutants almost entirely through their food, but if that is contaminated, high concentrations can quickly result.

There are few direct toxicological data on otters, though the American mink (*Mustela vison*) has been used as a laboratory model. It is therefore necessary to make a subjective assessment of the significance of pollution loads which are recorded in otter tissues. Because of the possibility of sublethal effects,

which are difficult to detect but which could markedly reduce an individual's ability to survive, the conservationist should be concerned even with comparatively low levels of pollutants within tissues. It should also be remembered that an individual may carry a suite of pollutants, which might interact to produce toxic effects that are largely unknown.

Chlorinated hydrocarbon pesticides have been used widely in agriculture, horticulture, and forestry, as well as in industries such as wool and carpet manufacture and timber preserving. Their use has now been reduced in the developed world, but large amounts are still exported to the tropics. Chlorinated hydrocarbons are highly persistent in the environment, so that even if no longer applied, their effects may last for decades. High concentrations of dieldrin, for example, have accumulated in freshwater fish in southwest England, though it has proved impossible to locate the source precisely (Hamilton 1985). Chlorinated hydrocarbons are liposoluble and so build up in high concentrations in animal tissues. They may exert their toxic effects when fat stores are mobilized in periods of stress, for example during reproduction or food shortages.

Chlorinated hydrocarbon pesticides are known to have caused massive declines in the numbers of many bird and some mammal species and high concentrations have been recorded in the Eurasian otter, the North American river otter, and the sea otter (Mason and Macdonald 1986). There is little concrete evidence that pesticides have caused a decline in otters, but because of the secretive behavior of these animals, decreases may have gone unrecorded during the peak period of pesticide usage. Few otter tissues were analyzed from this period. Chanin and Jefferies (1978) attributed the decline of the Eurasian otter in Britain, which began in the late 1950s, to the introduction of dieldrin into the environment, but they have



Otters no longer inhabit rivers like this one that has been cleared of bankside vegetation and channelized (Photo by Chris Mason).

provided no analytical data to substantiate their claim. PCB usage increased exponentially during the 1950s.

Polychlorinated biphenyls (PCBs) are organochlorines, which have a wide variety of industrial uses due to their physico-chemical characteristics such as high stability, inertness, and dielectric properties. They are widely dispersed in the environment, being distributed by water and in the atmosphere. They are highly lipophilic and biologically stable. Very low

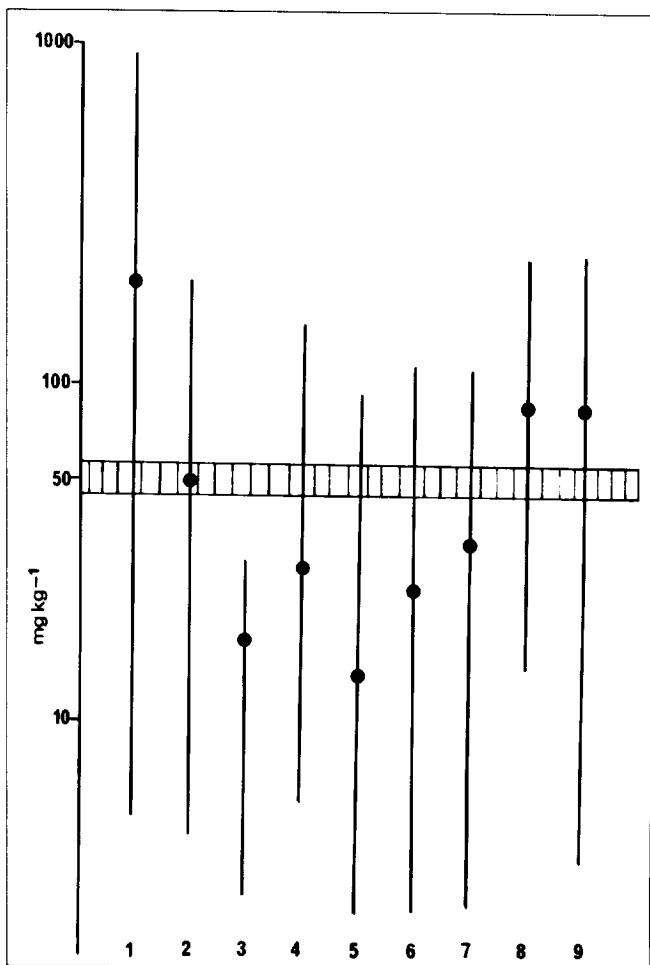


Figure 1. Mean (and range) of PCBs (mg kg⁻¹ in lipid) from different European populations of Eurasian otters, *Lutra lutra* (status of population in parentheses). 1. southern Sweden (endangered); 2. northern Sweden (severe decline); 3. coastal Norway (thriving); 4. Finland (stable); 5. Scotland (thriving); 6. Wales (expanding following decline); 7. southwest England (expanding following decline); 8. eastern England (endangered); 9. Netherlands (probably now extinct). The hatched line at 50 mg kg⁻¹ indicates the concentration of PCBs in tissues known to cause reproductive failure in American mink (*Mustela vison*).

concentrations in water, often below the level of detection, can be greatly amplified in living tissues, with bioconcentration in aquatic mammals being as high as 10⁷ (Tanabe 1988).

Experiments in which mink were dosed with PCBs have shown that reproductive failure occurs when concentrations exceed 50 mg PCB/kg fat (Jensen et al. 1977). It is known that such concentrations have been exceeded in Eurasian otters from Sweden, eastern England, and the Netherlands, where numbers have declined sharply (see Fig. 1). In contrast, thriving otter populations in northern Norway and northern Scotland have generally contained low levels of PCBs (Mason et al. 1986a; Mason and Reynolds 1988). Concern has also been expressed over PCBs in the North American river otter (Henny et al. 1981). Many of the PCB analyses are recent, indicating that the compounds are still a potent threat to populations. For example, a Eurasian otter cub, born in eastern England to a mother released as part of a restocking program, was killed by a car

when not yet weaned at only 11 weeks of age: it had already accumulated 62 mg of PCBs per kg fat in its liver (Jefferies and Hanson 1987). Two animals from eastern England, containing high concentrations of PCBs, exhibited pathological symptoms, such as ulcers and skin abnormalities (Keymer et al. 1988), similar to those recorded in Baltic seals, where the cause was considered to be PCB-induced adrenocortical hyperplasia, resulting in a failure of the immune system (Bergman and Olsson 1986). Clearly such observations have major implications for any proposed reintroduction program for otters.

Heavy metals are widely distributed in tissues of otters (Mason and Macdonald 1986a) but, unlike organochlorines, metals occur naturally in the environment. A probable case of mercury poisoning in the North American river otter has been described from an animal living in an Ontario river contaminated with chlor-alkali wastes (Wren 1985), while elevated concentrations have also been reported from the United States and from Eurasian otters in Britain. Elevated concentrations of lead and cadmium have also been reported (Mason et al. 1986b). However, in general it seems unlikely that metals have been involved directly in widespread declines of otters, though there is the possibility of more subtle, sub-lethal effects and synergistic action between metals and organochlorines (Olsson et al. 1979).

Few otters become available for analysis of pollutants, so it may be necessary to use alternative techniques to assess potential threats to otter populations, or to provide clues to their disappearance. The analysis of potential prey is an obvious technique (see Mason 1989). Preliminary work has indicated that the analysis of pollutants in spraints (scats) provides a useful way of assessing the load of metals, radioactivity, and organochlorines in otter populations (Mason and Macdonald 1986b, 1988b; Macdonald and Mason 1988).

Habitat Destruction

Otters generally require shelter in which to sleep and breed. Some, like the smooth otter (*Lutra perspicillata*) can excavate their own dens, but most make use of holes in river banks, caves, cavities amongst tree roots, log jams, or piles of rock and debris. Many simply take cover in dense waterside scrub, reed-beds, or marshes. Impenetrable riparian vegetation comprises an important requirement for many species. The removal of such habitat was cited as a major factor influencing the status of populations of the Neotropical otter (*Lutra longicaudis*), southern river otter (*L. provocax*) and giant otter (*Pteronura brasiliensis*) throughout their ranges in Latin America (Melquist 1984). Radio-tracked North American river otters avoided a reservoir with little resting and escape cover despite its suitability in other respects (Melquist and Hornocker 1983).

In Britain, den sites of the Eurasian otter are often found in eroded root systems of old riparian trees (Macdonald and Mason 1983a). Chehébar et al. (1986), working in Argentina, found the southern river otter to be restricted to lake shores covered in forest or shrubs where the animals made use of mature root systems and fallen trees. In Britain, large trees were systematically removed from river banks by water authorities in case they fell into the water and caused blockages and damage.



A degraded stream in South Africa, due to overgrazing and erosion, with no cover for otters (Photo by Dave Rowe-Rowe).

Western European rivers have been cleared of vegetation and frequently also straightened both for flood prevention and to maximize available agricultural land. Marshes have been drained. Otters disappear from areas where no suitable habitat remains but will tolerate limited alterations. Some make use of small reservoirs and canals, such as the Eurasian otter in Israel and giant otter and Neotropical otter in the Guyanas (Macdonald et al. 1986; Melquist 1984).

Deforestation for timber extraction, or for conversion to grazing lands, followed by overgrazing, is rife throughout much of South America and Asia. The riparian habitat is lost and siltation of waters reduces the otters' food supplies. Similarly, in Africa the rapidly increasing human population has resulted in unwise agricultural practices and extreme over-grazing with the same results (Rowe-Rowe 1986). Deforestation and overgrazing, common also in southern Europe, affects water flow, leading to torrents in the rainy season followed by dry river beds for the rest of the year. In Asia, clearance of mangroves and conversion of these areas to agricultural or aquacultural projects similarly reduces habitat available to otters.

The construction of dams can also threaten otter survival. In Morocco and Spain, for example, many dams have been built in the uplands where the water is retained, leaving lowland rivers dry. Irrigation water is supplied in raised channels, and artificial reservoirs are often too deep and steep-sided to provide useful otter habitat. Also, when dams are constructed in semi-arid environments, where the former riparian habitat was the only vegetation in the area, the newly created lakes are generally devoid of thick vegetation on the shores, and many years can pass before soil develops and riparian habitat regenerates. In some cases, this can fragment populations and disrupt free genetic interchange between populations.

Hunting and Trapping

Otters are shot and trapped for their pelts, in some countries legally, but in most illegally. They are also killed because of their supposed predation of fish and crustacean stocks, for

instance at fish-farms through much of Europe, and aquaculture schemes in Asia and Africa.

The North American river otter is trapped legally in 27 states in the United States, and in 11 Canadian provinces. Over the years 1985 to 1988 inclusive, 27,658, 41,222, 44,060, and 37,247 skins respectively were reported in international trade (data from Wildlife Trade Monitoring Unit). However, hunting of the North American river otter is now managed by quota and may no longer be a serious threat.

South American otters were extensively trapped for their skins in most countries until the late 1960s, when hunting was largely banned. In 1980, the net trade in the Neotropical otter was 37,443 skins. Since then, there has been a rapid decline, to 157 in 1985 (Broad 1987). Paraguay was the largest source of pelts up to the early 1980s. Some 902 skins of the threatened southern river otter were reported in international trade in 1984. There is still some residual hunting of otters in a number of countries and otter products have been reported for sale in French Guiana and Uruguay. Hunting undoubtedly has been a major cause of the decline of otters in Latin America in the past and may still be locally important, since poaching is difficult to control and the price paid for a pelt is often many times higher than a monthly wage.

Illegal hunting for pelts may also be a problem in tropical Asia, and 3,558 skins of smooth otter were exported from Bangladesh in 1980. There were also reportedly 1,032 skins of hairy-nosed otter (*Lutra sumatrana*) traded in 1987 (1,000 of them supposedly from China). The current status of this species is causing great concern to the Otter Specialist Group. In general, however, there is still very little information on which to assess the threats of illegal hunting to otters in Asia.

Other Threats

Many otters are accidentally drowned in fish traps of various types. Fyke nets (conical nets often set for eels) are responsible for many deaths of the Eurasian otter; otters also die in crustacean traps. For a review of known numbers of mortalities in Europe, see Jefferies et al. (1984). Otter deaths in fyke nets can be prevented by the use of a "stop grid" at the net entrance (Madsen 1989). Lack of recent growth of the California sea otter populations is thought to be due to entanglement in coastal set nets (Ames 1987; Van Blaricom and Estes 1988).

Otters are killed on roads by traffic. Specific numbers are only available from Europe; for example, 26 of 50 recorded Eurasian otter deaths in West Germany (Heidemann 1981).

General human disturbance is likely to be a serious problem only where the habitat is inadequate. The Eurasian, North American river, southern river, and Neotropical otters inhabit lakes used for recreation and can be found in waterways well within the boundaries of cities. Their tolerance to disturbance seems to be related to the availability of suitable escape cover. Thus, habitat destruction and human disturbance interact in their effects on otter behavior.

5. Implementing Conservation Strategies

Chris Mason and Sheila Macdonald

Otters can only be conserved in the long term through coherent, broadly-based conservation strategies. In this chapter, some of the basic elements of such strategies are outlined. Several of the otter species of the world are in urgent need of conservation, while for several other species we have too little information to be certain of their current status. A prerequisite of any conservation strategy for a species within a region or country is, therefore, an objective survey of distribution and status (see Chapter 3). In certain cases, conservation strategies will require intensive management action, in particular captive breeding and reintroductions (these are outlined in Chapters 6 and 7 respectively). This chapter focuses on legal protection, public education, and biotope management.

Legal Protection

Legal protection, either complete or to regulate hunting, is certain to be necessary. It is not possible to determine population numbers of most otter species accurately, because of their low density and secretive nature, and so the take of otters for commercial trade requires professionally guided controls and management. Identification of skins of certain species requires an expert. Since it is possible that some threatened species could be traded surreptitiously, governments should impose the necessary controls and monitoring of both domestic and international trade. It has also been shown that otter species are vulnerable to biotope degradation and populations can decline extremely rapidly, often reaching endangered status before conservationists realize that a problem exists.

Public Education

Protection by itself will achieve very little if the human population at large continues to regard otters as pests or merely as a source of revenue from pelts. A greater commitment towards enforcement and a program of education are therefore essential. Otters, by their very nature, tend to be popular with the general public so that they can be used as a focus for conservation education, especially with respect to wetlands. In several facilities have been established with the principle of promoting otter conservation: the Otter Trust in the United Kingdom (established in 1973 by Philip Wayre); the Fischottererschutz in West Germany (established in 1979 by Reuther); and the Stichting Otterstation Nederland in the Netherlands (established in 1987 by Addy de Jongh). It is over-emphasized, however, that environmental con-

servation will succeed in the long term only if it is perceived as essential by a broad section of human society. This can only be achieved if 'environmentalism' is adopted as a component of the core curriculum at all levels in the education system. Thus far the promotion of formal environmental education has proved singularly unsuccessful, even in a country such as the United Kingdom with its large, popular conservation following.

Biotope Management

Although we remain ignorant of the detailed ecological requirements of most otter species, there are three aspects which should form the basis of any program of biotope management for otters (Mason and Macdonald 1986a):

1. there should be an adequate food supply;
2. this food supply should be largely free of persistent, bio-accumulating toxic chemicals;
3. the habitat should contain sufficient shelter in the form of bankside vegetation, cavities and the like, to provide resting and breeding sites.

Food Supply

The most important components of the food supply are fish, or, for some otters, crustaceans and molluscs. Although some oligotrophic streams at high altitudes may contain insufficient food to support a resident otter population, it is likely that most waters should, in theory, hold enough food to support otters. Where this is not the case, factors such as overfishing, pollution, and habitat modification are likely to be involved. It is essential to determine the precise causes of poor productivity before any restocking with food for otters is attempted.

Toxic Chemicals

The contamination of food with persistent pollutants, especially organochlorines, is likely to be of much more general concern. Such compounds enter waters from agricultural, industrial, and domestic sources. The food supply may contain a range of pollutants, all of which may be potentially damaging to the well-being of otters. The fish themselves may appear unaffected by the pollutants. An assessment of pollution risk to otters should therefore be a high priority in any program of otter conservation. There is little point in putting resources into habitat enhancement if contamination by pollutants is likely to be limiting the population.

Habitat Improvement

The importance of riparian vegetation to otters cannot be overemphasized, but we still have very little information on those habitat features which are important to otters (Mason and Macdonald 1986a). We do not know at which point a lack of cover becomes limiting to their survival or breeding success. There are few descriptions of otter den sites, features which should be given maximum protection.

Because otters have large home ranges and population densities typically are low, conservation of wetland habitats must consider areas large enough to maintain viable otter populations. Indeed, the protection of remaining wetlands on a global scale is seen as a prerequisite to otter conservation.

Before any attempt at habitat improvement is made, the current habitat resource of value to otters should be fully described and assessed. Liaison with the appropriate authorities is essential to limit the damage done to riparian cover in "river improvement schemes." The conservation and enhancement of riparian vegetation has broad-ranging environmental value and these features should be stressed in any plan aimed at retaining and developing bankside cover. Some of these values can be listed (from Mason et al. 1984; Mason and Macdonald 1986a):

- bank erosion is reduced
- shading reduces aquatic weed growth and helps prevent flooding
- shading prevents excessive water temperatures and hence provides good conditions for fish
- the canopy provides a source of invertebrates for fish and leaf litter for fuelling aquatic food chains
- a wooded catchment regulates water flows, preventing excessive flooding or drought
- riparian vegetation enhances landscape and wildlife.

It must be emphasized that, if biotope management is carried out to improve conditions for otters, then the effects of this must be adequately monitored. Too often expensive schemes are carried out, with no subsequent follow-up to assess whether the primary objectives are being met.

Habitat improvement, as described above, relates particularly to the developed world, where the destruction of river habitat has proceeded on a very large scale in this century. The result of this is that, for example in western Europe, all remaining wetland habitats need sensitive management and biotope restoration is a major factor in otter conservation. Biotope restoration is, however, extraordinarily expensive.

The developing countries can avoid the mistakes of the northern nations in wetland and river management if sensitive management plans are initiated now to protect habitats in ways



Reconstruction work to improve otter habitat along a channelized stream in West Germany (Photo courtesy of Aktion Fischotterschutz).

that are compatible with renewable human resource requirements. Resource planning should be at the river basin level. There is also a need to incorporate the requirements of otters into the management plans of protected areas in the tropics.

In the developing countries, otters do not always have the same emotional appeal as they do in many of the Western nations and there is often little public sympathy for, or awareness of, their plight. It must, therefore, be emphasized that the basic requirements of the otter are the same as those required by local human communities in terms of aquatic resources and wholesome water. Pollution in the tropics is generally perceived as being on a more local scale than in the industrialized north, but it can still be highly damaging, the more so because it is both less monitored and less regulated. Deterioration can occur rapidly. The recent widespread contamination of parts of the upper Amazon with mercury, used in the refining of gold, and by the oil wastes from exploration sites in Ecuador, will prove detrimental both to otters and to humans. These activities are likely to demonstrate how previously intact ecosystems can be degraded by pollution and how the effects can be severe even hundreds of kilometers from the source of contamination. The uncontrolled exploitation of these resources can also open the ecosystems and the rivers to other inimical pressures by providing access for indiscriminate, illegal hunting.

Conservation of otters in the tropics is therefore likely to depend increasingly on programs to manage wetlands, mangroves, and rivers in ways that allow people to derive sustainable benefits from these habitats. The particular requirements of otters should be integrated into these larger inter-disciplinary programs.

6. Otters in Captivity

Pat Foster-Turley

Why Keep Otters in Captivity?

There are two main reasons why otters are held in captivity: public education and breeding for possible reintroductions into the wild. The first goal is easily attainable, but the second is beyond the reach of all but the most ambitious projects.

Well cared-for otters in captivity can serve a great purpose in stimulating the public's empathy for these animals and their threatened wetland habitats. An appropriate zoo display, with factual and interesting educational graphics, can be a valuable contribution to a conservation effort. A poorly conceived otter display with unhealthy animals, however, can have an equally strong negative effect on the public's perceptions.

Background

Otters have often been maintained as private pets (i.e. Maxwell 1960; Davis 1969) and they are favorite animals in many zoo collections. Despite a long captive history, they are often difficult to maintain in a healthy condition and surprisingly little is known about breeding them. Guidelines on the husbandry of most captive otter species can be found in reviews by Crandall (1964), Duplaix-Hall (1975), and Wright (1988). The following brief guidelines apply to most otter species, with the exception of the sea otter (*Enhydra lutris*), a highly specialized marine mammal that can be maintained only by the most sophisticated aquaria.

Housing

Otters are land animals that swim. Although captive otters are good swimmers, they must be maintained in an environment that provides adequate dry land for resting, grooming, exploring, and eating large prey items. The biggest mistake many new otter keepers make is in designing displays and holding compounds with large swimming pools but not enough land area for these activities. The swimming water provided for otters must be clean and free of pollutants and harmful bacteria that can build up from the otters' feces. In addition to the pool, the otters should be provided with a separate source of drinking water that is replenished daily. The land provided for the animals should include logs, rocks, and other objects for the otters to play with and explore. If the display is large enough, natural grass and plantings can greatly enhance the quality of the captive animal's life.

All otters should be provided with an enclosed, dry, secure den box within their enclosure, filled with hay or straw that is replenished whenever it becomes damp. Often otters will share the same den box, but it is safest to provide one per otter in the same enclosure.

Because otters are good climbers and diggers, they must be enclosed behind smooth unclimbable walls of at least five feet in height, by fencing with a complete roof, or behind fencing with a smooth unclimbable barrier along the top edge. The bottom edge of the fence or wall should be sunk in the ground at least two feet to prevent subterranean escapes.

Feeding

Wild otters eat a variety of prey, including fish, crustaceans, molluscs, and other animals they encounter in their environment. In captivity, an assortment of these live prey items can be provided, but usually a commercial preparation is more convenient (Foster-Turley and Markowitz 1982). Otters do well on a diet of ground mixed meat and meat products, with a broad vitamin supplement added, along with occasional small birds or fish. A diet of fish alone is not sufficient. In general, the more variety in the captive otter's diet, the less chance of nutritional deficiency. An animal or vegetable oil added to the diet helps maintain the pelage in its proper oily state.



Mealtime for trained smooth otters (*Lutra perspicillata*) in Bangladesh (Photo by Mohd. Anisuzzamen Khan).

Health

Otters are susceptible to feline and canine diseases and are often routinely inoculated against both forms of distemper as well as rabies. If this is not possible, the otters should be housed away from interactions with other animals that might transmit these diseases to them. Otters also are susceptible to pneumonia or other respiratory problems, especially if their coat is in poor condition and they are unable to keep themselves dry. To prevent this problem, otters should be given plenty of dry hay or other bedding material, and this should be changed frequently.

Traumatic injuries are a common health problem with captive otters. Otters can be very aggressive to each other. New otters should be introduced gradually, through small mesh wire barriers, until all signs of aggression disappear, in a few days to a few weeks. Even long-term cagemates may suddenly become aggressive toward each other. The otter keeper should be aware of such changes in behavior and be prepared to separate the animals should trouble arise.

Breeding

Maintaining healthy otters in captivity is far easier than breeding them successfully. Different otters have different reproduc-



Eurasian otter (*Lutra lutra*) just giving birth (Photo courtesy of Alpenzoo, Austria).

tive patterns, depending on the species and the individual. The North American river otter (*Lutra canadensis*) has only one breeding season a year, followed by a period of delayed implantation before the young are born (Liers 1951). The Eurasian otter (*Lutra lutra*), although similar in other ways, does not exhibit this pattern, but can breed year-round (Harris 1968). These otters, together with other *Lutra* species, exhibit a social system in which only the female takes care of the young, the male usually being driven away. In captivity, it is usually safest to separate the parents before birth. Sometimes the male can be carefully reintroduced to the family group at a later date. It is usually difficult or impossible to breed otters if only one pair is maintained. Some males are good breeders, others are not. Constant association between a few individuals year-round also inhibits reproductive success. The most successful breeders of *Lutra* species maintain a large number of animals in separate enclosures and try various mating combinations before they are successful (Liers 1960).

Asian small-clawed otters (*Aonyx cinerea*) in captivity are monogamous, with both members of the pair helping to raise the offspring (Leslie 1971; Timmis 1971; Lancaster 1975; Foster-Turley and Engfer 1988). Unlike *Lutra* species, the otter parents and offspring must be housed together. One breeding pair can produce two litters a year, with up to seven pups in each litter. Older siblings help raise the younger ones and a family group of these otters can build up to 15 or more in a year. Similar sized groups are sometimes observed in the wild (Furuyu 1977).

Less is known about breeding the other species of otters. The smooth otter (*Lutra perspicillata*) has been bred at the Delhi Zoo, where they are maintained in pairs year-round and appear to be monogamous (Desai in press). Spotted-necked otters (*Lutra maculicollis*) have been bred at Brookfield Zoo, Chicago, and show the typical *Lutra* pattern of reproduction (Davis 1981). The other otter species are rarely maintained in captivity and few reproductive data are available.

Cooperative Breeding Efforts

Otters are popular exhibit animals in zoos and many good zoos have excellent otter displays. Recently, a number of zoos have developed cooperative breeding programs for various otter species. Some European zoos have had notable breeding successes with the Eurasian otter and there is a cooperative breeding program for this species, as well as an International Studbook, both maintained by Klaus Robin of the Bern Zoo in Switzerland.

Asian small-clawed otters were included in the American Association of Zoological Parks and Aquariums' Species Survival Plan (SSP) program in 1981 due to their reproductive and behavioral similarities with other more threatened species, such as the giant otter (*Pteronura brasiliensis*) and the Congo clawless otter (*Aonyx congica*) (Foster-Turley and Engfer 1988). At present, 19 North American zoos are cooperating in efforts to manage this captive population. The North American Regional Studbook is maintained by Susan Engfer at the Cheyenne Mountain Zoo, Colorado Springs, Colorado. An Australasian Regional Studbook for this species is maintained by



Three-week-old female Eurasian otter (*Lutra lutra*) cub (Photo courtesy of Alpenzoo, Austria).

Chris Banks at the Melbourne Zoo, Australia, and a European Regional Studbook is being developed. Despite the intense international focus on this species, we still cannot breed them at will, or even often. Very few individual otters are successful breeders and the worldwide captive population represents the genetic contribution of a small number of animals from a handful of zoos.

Sea otters are maintained in a number of North American and Japanese aquariums, but with limited breeding success. Cooperative breeding efforts and a studbook are now being developed for this species.

Although North American river otters are maintained in most North American zoos, they rarely breed. A large proportion of captive North American river otters are probably wild-caught animals from Louisiana, a state in which large numbers of these otters are trapped for fur. We shall not know how many come from this origin until a studbook is established for this species, a project that is of top priority for captive otter conservation efforts.

The remaining otter species have no studbooks, no cooperative breeding programs, and a very small number of animals

scattered in a few zoos in Latin America, Africa, and Asia. Most of the world's otters need to be studied in greater depth in captivity and cooperative efforts and studbooks need to be initiated as part of the implementation of this action plan for otter conservation.

Providing Captive-bred Otters for Reintroductions

Some populations of endangered animals cannot be preserved by habitat protection alone. In these cases, captive breeding programs can establish self-sustaining captive populations and provide animals for the re-establishment of viable populations in the wild (IUCN 1987a).

Unfortunately, until reproductive physiologists and behaviorists find the keys to breeding otters in captivity, it is impossible to create self-sustaining captive populations. We must first learn to breed them before we can concern ourselves with managing the genetics of small populations. At present, we have great difficulties in reliably breeding *any* of the world's 13 species of otters. It is only when the art of keeping otters becomes a science that we can hope to preserve an appropriate gene pool of captive otters and can begin to consider providing animals for large-scale reintroductions into the wild.

Once we can breed otters reliably, a successful reintroduction project based upon captive-bred animals is likely to be difficult and expensive but not impossible. Because otters are social carnivores, those raised in captivity tend to respond to humans in a different way than do wild otters. Captive otters raised on standard zoo diets in zoo-like enclosures would be very unlikely to find appropriate food and shelter in the wild. Only in the most careful captive breeding project, where the offspring are raised by their parents on natural prey in a natural setting, can one hope to breed and raise otters that can successfully accommodate to wild conditions. A project of this scope should not be attempted lightly, without careful consideration of the ultimate goals and an understanding of the high financial and time commitments necessary for success.

It is hoped that appropriate captive breeding projects of this quality and scale can someday be devised to assist the wild conservation efforts. We look to our colleagues of the IUCN/SSC Captive Breeding Specialist Group, and to reproductive physiologists and behaviorists worldwide for their help in these endeavors.

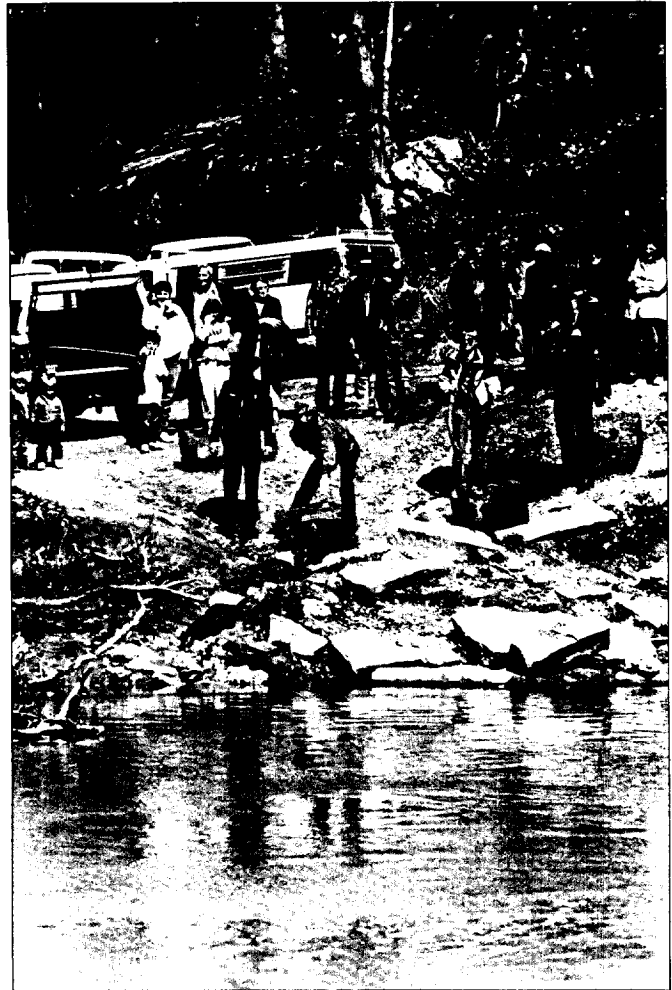
7. Reintroductions

Katherine Ralls

Reintroduction is "the intentional movement of an organism into a part of its native range from which it has disappeared or become extirpated in historic times as a result of human activities" (IUCN 1987b). The practice of releasing an organism into a part of its historic range where small numbers of the same species still exist is known as restocking. It is important to distinguish between reintroduction and restocking, because IUCN encourages reintroductions when the original causes of extinction have been controlled or removed, and the habitat is still suitable for the organism to be reintroduced, but generally discourages restocking (IUCN 1987b). IUCN recommends that restocking be used only if it has been established that the low viability of the existing population results from genetic problems rather than deterioration of the habitat (IUCN 1987b).

Reintroductions, restocking, and the introduction of non-native species are all forms of translocation (IUCN 1987b). Based on a survey of 416 attempted translocations of terrestrial vertebrates, the factors most closely associated with success are good to excellent habitat quality at the release site, the release of large numbers of animals, and the use of wild-caught rather than captive-bred animals (Griffith et al. 1988). Reintroductions are expensive and should include long-term follow-up studies (Kleiman 1989). Thus, a reintroduction should not be undertaken unless adequate resources are available.

There have been attempts to reintroduce or restock three species of otter: the sea otter (*Enhydra lutris*), the North American river otter (*Lutra canadensis*), and the Eurasian otter (*L. lutra*). Only wild-caught sea otters have been used for reintroduction. The data on this species are particularly good because of the comparative ease with which sea otters can be counted from the air or shore. Experience with sea otters confirms the general findings that large numbers of animals (in general, more than 100) are required for a successful reintroduction (Jameson et al. 1982), that a good reintroduction program is expensive in terms of time and money, and that long-term monitoring of the released animals is essential to evaluate the success of a reintroduction (Estes unpub. ms.). All reintroduced sea otter populations initially declined due to mortality and dispersal from the release site (Jameson et al. 1982; Brownell and Rathbun 1988). Even for the successful reintroductions to southeast Alaska, British Columbia, and Washington State, relocated populations are estimated to have declined by 60-90% during the first year (Estes 1990). In successful reintroductions, population growth did not occur for approximately five years but was then exponential, with the population increasing at 17



Reintroduction of North American river otters (*Lutra canadensis*) in Missouri, United States (Photo by Tom Troughton, courtesy of the Missouri Department of Conservation).

to 20% per year (Estes 1990). In unsuccessful reintroductions, otters were seen near the release site for many years, as some reproduction occurred even in declining populations, and sea otters are fairly long-lived animals. It was thus many years before the ultimate success or failure of a reintroduction could be determined.

In North America, river otters have been reintroduced or restocked in 17 of the United States and feasibility studies are underway in others (see Chapter 13). The largest program, in

Missouri, has served as a model for many other programs. As of September 1988, Missouri had released 429 otters. The goal of the program is to release about 800 otters by 1991 (Erickson and Hamilton 1988). Before the first otters were released, the range and status of otters in Missouri was determined and criteria for evaluating release sites were developed. The otters were wild-trapped in other states and almost all were of the appropriate subspecies (*L. c. lataxina*). By 1988, otters had been released at 21 sites about 100 miles apart, with the expectation that the re-established populations will eventually merge. About 20 otters, with an even or slightly female-biased sex ratio were released at each site.

It is more difficult to monitor released river otters than sea otters because of their low density, secretive behavior, and poorly accessible habitat. The first two Missouri reintroductions were carefully monitored through the use of implanted radio transmitters (Erickson and McCullough 1987). Eighty-one percent (25 of 31) of the otters survived for at least a year. Stress and human conflicts were the principal causes of mortality. Dispersal was modest, averaging 2.79 km in wetland habitats and 5.88 km in riverine habitats, although a few individuals dispersed so far that they became isolated and probably did not reproduce. Less is known about subsequent releases as the animals were not followed by radio-telemetry, although they were tagged. Accidental trapping by humans was the most significant known cause of mortality, accounting for 18 of 37 tagged otters recovered.

There have been only a few small-scale releases of the Eurasian otter, mostly in the United Kingdom (Mason and Macdonald 1986a). Most recently, 14 captive-bred individuals have been released in eastern England (Jefferies et al. 1986; Jefferies and Hanson 1987; Ridding and Smith 1987; Wayre 1988). As a few wild otters still remain in the general release

area, this effort is a restocking program rather than a true reintroduction. It is difficult to judge the success of this program because most of the released otters were not tagged or followed by radio-telemetry, and wild otters exist in the area, although there are claims that 15 litters have been born and successfully raised (Wayre 1988). The main cause of the rapid decline of the otter in England was almost certainly various forms of pollution (Mason and Macdonald 1986a). East Anglia, where these otters were released, is a region of intensive agriculture and is downwind of industrial areas. Neither water quality nor habitat structure is optimal for otters (Mason 1989; Keymer et al. 1988).

The IUCN position statement on the translocation of living organisms (IUCN 1987b) offers general guidance on the circumstances under which a reintroduction program should be undertaken and on the components of a well-designed reintroduction program. Reintroductions should take place only where the original causes of extinction have been removed, where the habitat is still suitable for the species, and where the source population is not threatened or adversely impacted by the removal of animals for relocation. A reintroduction program should include a feasibility study, a preparation phase, a release phase, and a follow-up phase. The feasibility study should include an ecological study of the proposed habitat into which the animals would be reintroduced, the attitudes of the local people and the possible need for an education program, the availability of sufficient numbers of suitable animals, and the availability of sufficient funds to ensure that the project, including the follow-up phase, can be completed. Released animals should be marked to allow individual identification and monitored to determine levels of mortality and dispersal, the need for additional releases, and the reasons for the success or failure of the reintroduction.

8. Action Plan for Sea Otters

James Estes

Introduction

The ancestors of sea otters, not unlike the modern species *Enhydra lutris*, had evolved by at least the Middle to Upper Miocene, some 7-10 million years ago (Repenning 1976; Berta and Morgan 1985). The modern sea otter probably arose in the early to middle Pleistocene. It ranged naturally from the northern Japanese archipelago, around the northern Pacific rim, to central Baja California (Kenyon 1969).

Early maritime hunters in the north Pacific Ocean exploited sea otters for food and clothing, and apparently locally eliminated sea otter populations (Simenstad et al. 1978); however, this effect was probably limited to near village sites because abundant otter populations were encountered by the explorers and fur hunters who ventured eastward from Asia through the Aleutian Islands and along the west coast of North America (Lensink 1962). The sea otter's fur, a valuable commodity, was marketed primarily in China. As fur hunters overexploited and eliminated the most accessible populations, they pressed eastward in search of new hunting grounds, eventually establishing outposts as far south as Fort Bragg in northern California (Hone 1984). At the same time, the Spanish, English, and Americans were hunting sea otters further south. Populations dwindled, the value of sea otter pelts increased, and sea otters were driven to the brink of extinction—an example of Colin Clark's "economics of overexploitation" (Clark 1973).

In 1911, recognizing that fur seals and sea otters had been overexploited, a treaty providing full protection to both species was signed by Canada (for Great Britain), Japan, Russia, and the United States. Thirteen remnant colonies are thought to have survived at this time, in total containing perhaps a thousand animals (Kenyon 1969). Several of these remnant colonies, because of illegal hunting or their precariously small size, dwindled to extinction. Others increased and by the 1940s populations in several areas were approaching equilibria with limiting resources. The sea otter currently inhabits about half of its historical range (Figure 1), exists at or near equilibrium population levels in many areas, and is still recolonizing unoccupied habitat.

Population Status

A summary of the population status of the sea otter is provided in Table 1.

Asia

Sea otters occur in three Asian regions:

1. the northern Japanese archipelago, southern Sakhalin Island, and the Kuril archipelago;
2. the Kamchatka Peninsula; and
3. the Commander Islands (Kenyon 1969).

Presently, they occur only within the jurisdictional boundaries of the Soviet Union, although H. Haseyawa reported seeing one otter off Hokkaido in recent years (pers. comm. to A. DeGange). The species is fully protected by the Soviet government.

Kuril Islands: A remnant colony survived in the northern Kuril archipelago (Kenyon 1969). Little is known of the exact location, size, or early history of this remnant colony. The sea otter population in the Kuril Islands had increased to at least 1,500 individuals by the mid-1950s (Klumov 1957), and 4,300 by the mid-1960s (Belkin 1966); a rate of increase of about 10-11% per year. By the mid-1980s, populations of sea otters apparently had stabilized at or around equilibrium densities throughout the Kuril archipelago, in total containing an estimated 6,000-7,000 individuals (Maminov 1984). These populations appear to be food-limited in some areas. However, few otters occur in the southernmost Kuril Islands and historical records suggest they were never abundant there, probably because of winter sea ice from the Sea of Okhotsk. Less frequently, sea ice may impact otter populations in the central and northern Kuril Islands as well (M.K. Maminov, pers. comm.).

Kamchatka Peninsula: Sea otters once ranged along the southeastern coast of the Kamchatka Peninsula from its southern tip to about the latitude of the Commander Islands; they apparently have never occurred in the Sea of Okhotsk or the Gulf of Anadyr (B.V. Khromovskikh, pers. comm.). A remnant colony is thought to have survived the fur hunting era on the southeastern Kamchatka Peninsula (Kenyon 1969). This population had increased to about 300 individuals by the early 1940s (Nikolaev 1961). The Kamchatka Peninsula was surveyed five times from 1972 through 1983 and the number of animals counted during this time increased from 630 to 2,132 (Khromovskikh 1984); a rate of 11% per year. B.V. Khromovskikh (pers. comm.) estimates that habitat and food resources on the Kamchatka Peninsula are sufficient to support about 20,000 sea

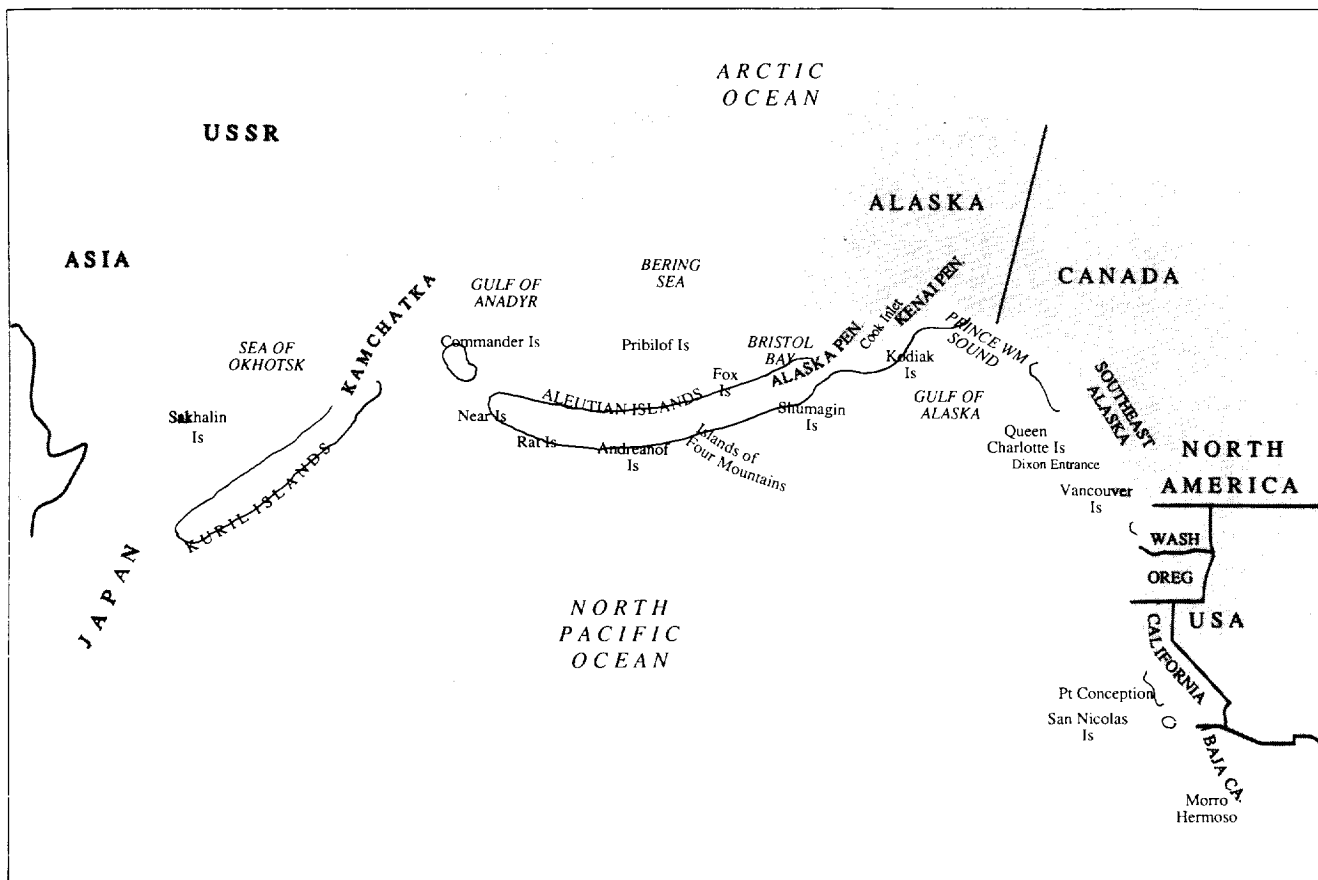


Figure 1. Distribution of the sea otter (*Enhydra lutris*).

otters, although winter shore-fast ice may limit maximum population size to about 5,000-6,000 animals.

Commander Islands: A remnant colony of sea otters survived at Medny Island; the population at Bering Island, about 40 km to the northwest, was exterminated (Kenyon 1969). By the late 1960s or early 1970s, the population at Medny Island had increased to about 2,500 animals. It then declined to 900-1,200 individuals by 1984 (A. Zorin, pers. comm.). Sea otters recolonized Bering Island via dispersal from Medny in the mid-1970s. More than 4,000 sea otters were counted in the Commander Islands in 1988, and the total population is still increasing (A. Zorin, pers. comm.).

North America

Except for a recent reintroduction to the west coast of Vancouver Island, Canada, all sea otter populations in North America occur within the territorial boundaries of the United States. Sea otters in the United States are protected by the Marine Mammal Protection Act, which prohibits their take or harassment except for public display or scientific research. Native Alaskans, by authority of the Marine Mammal Protection Act, are permitted to take sea otters for traditional-use purposes. The population of sea otters in central California has been designated as "Threatened" under the U.S. Endangered Species Act. The population of sea otters in British Columbia is fully protected by Provincial and Federal law.

Near Islands: Sea otters were exterminated in the Near Islands (Kenyon 1969). Occasional sightings were reported from the Near Islands in the late 1950s and early 1960s, and by the mid-1960s a small population had become re-established at Attu Island (Jones 1965; Kenyon 1969). The population at Attu Island was regularly surveyed from the mid-1970s through 1986, during which time it increased at 17.2%/yr (Estes 1990). In 1986, 1,599 sea otters were counted at Attu Island. Agattu Island was also recolonized in the late 1960s or early 1970s and, although never carefully surveyed, reports indicate that this population is established and increasing (unpubl. data, Alaska Maritime National Wildlife Refuge). The Semichi Islands, a chain of three small islands about 40 km east of Attu, probably do not yet support sea otters. J.A. Estes visited the Semichi Islands from 27 June-1 July 1987, during which time a single living animal (age and sex not determined) was observed on the north coast of Nizke Island and a dead adult male was found on the sand spit between Alaid and Nizke islands. In summary, the sea otter population in the Near Islands is well established and increasing, but is still well below equilibrium density.

Rat Islands: A remnant colony of sea otters survived at Amchitka Island and perhaps elsewhere in the Rat Islands (Kenyon 1969). These populations probably were the first or among the first to recover to near equilibrium levels. The Rat Islands were last surveyed in their entirety in 1965, at which time 3,145 otters were counted, 1,144 of these at Amchitka

Table 1. Size and probable status of sea otter populations in the north Pacific Ocean.

Location	Date Surveyed	Count/ Estimate ^a	Population Status ^b	Comments	Source
Soviet Union					
Kuril Islands	1984	6,000-7,000 ^a	1	Survey methods and estimation technique unknown	Maminov (1984)
Kamchatka Peninsula	1984	2,132	3	Survey methods unknown; population may be limited by winter sea ice	Khromovskikh (1984)
Commander Islands	1988	4,714	2	Survey methods unknown; Medny Island at or near equilibrium density; Bering Island below equilibrium density	A. Zorin & A. Burdin (personal communication)
Alaska					
Near Islands	1986	1,599	2	Skiff and shore survey; Attu Island only; Agattu Island unsurveyed	Estes (1990)
Rat Islands	1965	3,145	1	Aerial survey; presently may support 14,420-20,650 otters (see text)	Kenyon (1969)
Andreanof Islands	1969	2,393	1	Aerial survey; population probably much larger	Schneider & Faro (1969)
Islands of Four Mountains	1982	69	2	Skiff survey; small colony established recently	Bailey & Trapp (1986)
Fox Islands	1986	858	3	Aerial survey	Brueggeman et al. (1987)
Alaska Peninsula	1986	15,244	3	Aerial survey	Brueggeman et al. (1987)
Pribilof Islands	1988	7	2	Occasional sightings; may be wanderers from Bristol Bay	A.L. SOWLS (personal communication to A. DeGrange)
Kodiak Archipelago	1985	2,811	2	Aerial survey	Simon-Jackson et al. (1986)
Kenai Peninsula	1982	880	3	Aerial survey	Schmidt (1983)
Prince William Sound	1984-85	4,747	3	Skiff survey with zoom off-shore; occasional offshore areas surveyed	Irons et al. (1988)
Northern Gulf of Alaska	1986	1,432	2	Aerial survey; all sightings between Orca Inlet and Cape Suckling	Simon-Jackson (1986); Simon-Jackson & Hodges (1987)
Southeast Alaska	1988	4,520	2	Skiff and shore surveys	Pitcher (1987, unpublished data)

Table 1. (Continued)

Location	Date Surveyed	Count/ Estimate ^a	Population Status ^b	Comments	Source
British Columbia	1987	380	2	Aerial survey	MacAskie (1987)
Washington State	1989	211	2	Aerial, skiff, and shore surveys	R. Jameson (personal communication)
Central California	1989	1,864	3	Shore and aerial surveys	R. Jameson and J. Estes (unpublished data)
San Nicolas Island	1989	15-20	2	Shore surveys	U.S. Fish and Wildlife Service (unpublished data)

Key: ^a = Estimate; ^b: 1 = at or near equilibrium; 2 = below equilibrium; 3 = unknown or uncertain population status

Island. By at least the mid-1960s, and probably much earlier, sea otter populations throughout most of the Rat Islands had reached an equilibrium with limiting resources. However, either the 1965 counts underestimated populations, or the number of animals subsequently increased, because in the early 1970s more than 4,000 otters were counted in aerial surveys at Amchitka Island alone. When calibrated against ground surveys (Estes 1977), the population at Amchitka was estimated to contain between 5,245 and 7,511 sea otters (Estes, unpubl. ms.). A partial survey of Amchitka, carried out in June and July 1986, indicated that this density had persisted (J.A. Estes, unpubl. data). If one assumes, from Kenyon's 1965 survey, that 36% of the sea otters in the Rat Islands occur at Amchitka Island, and that population densities elsewhere in the Rat Islands are similar to those at Amchitka, then the Rat Islands altogether may support 14,420 to 20,650 individuals. Observations made at Kiska Island on 2 July 1987 (all of Kiska Harbor and most of the coast of Little Kiska Island were surveyed; J.A. Estes, unpubl. observ.) indicate that otter density at Kiska is similar to that at Amchitka.

Andreanof Islands: A remnant colony of sea otters survived in the Andreanof Islands. However, for unknown reasons recovery in this area lagged behind that in the Rat Islands. Results from early surveys of various islands in this group are summarized by Kenyon (1969). The Andreanof Islands were last surveyed in their entirety in 1969, during which 2,393 individuals were counted (Schneider and Faro 1969). Four years earlier (1965), 5,805 otters were counted in a survey of these islands. Whether the differences in these counts represents a population decline is unclear. However, it is likely that sea otters in the Andreanof Islands are at or near equilibrium with limiting resources, and that the population contains many more animals than past surveys indicated.

Islands of Four Mountains: Little is known of the history and present status of sea otters in the Islands of Four Mountains. A remnant colony probably did not survive there (Kenyon 1969).

These islands were surveyed in their entirety in 1960, again in part in 1962, and in 1972, at which time no otters were seen (Kenyon 1969; E.P. Bailey, pers. comm. to A. DeGange). They were surveyed in their entirety in 1982 when 69 sea otters were counted (Bailey and Trapp 1986). J.A. Estes visited Yunaska and Chuginadak islands on 10-11 July 1987. Judging from the size and abundance of sea urchins (Simenstad et al. 1978; Estes et al. unpubl. ms.; Estes and Duggins, unpubl. ms.) these areas appear to be unoccupied by sea otters. Because of the steep terrain, there is little sea otter habitat in the Islands of the Four Mountains. Thus, the population there will likely remain small.

Fox Islands: There is no indication that a remnant colony of sea otters survived in the Fox Islands. These islands may have been recolonized by dispersal from populations in the Sandman Reefs or Bristol Bay in the late 1950s, as Kenyon (1969) saw fewer than 50 otters in the Fox Islands during 1962 and 1965. They were most recently surveyed in 1986 (Brueggeman et al. 1987), at which time 858 otters were seen. Little is known of this population, which may intermingle with larger populations to the east in Bristol Bay and along the south coast of the Alaska Peninsula. In summary, sea otters appear to be well-established in the Fox Islands but the population probably is below equilibrium density and still increasing.

Alaska Peninsula: This includes a large area of potential sea otter habitat, from about Port Heiden on the north coast of the Alaska Peninsula, across the shallow shelf of southeastern Bristol Bay, east along the south coast of the Alaska Peninsula to the western end of the Kodiak archipelago. At least three remnant colonies probably survived there: one in Bristol Bay, one in the Sandman Reefs, and one in the Shumagin Islands (Kenyon 1969). No information on sea otters in this area is available from before the early 1950s. When Lensink (1958) surveyed the Sanak and Shumagin Islands and the Sandman Reefs in 1957, he counted 251, 1,829 and 503 otters in these areas respectively. During this same period, 3,961 animals were counted on the Alaska Peninsula. The Alaska Peninsula



California sea otter (*Enhydra lutris*) (Photo courtesy of Monterey Bay Aquarium, Monterey, California).

was most recently surveyed in 1986, when 15,244 otters were counted (Brueggeman et al. 1987). Whether or not this population is still increasing is unknown. During severe winters, sea ice may extend over much of southeastern Bristol Bay, driving otters to the southwest and perhaps limiting the large population in that area (Schneider and Faro 1975).

Kodiak Archipelago: This area, which includes the Barren Islands in the northeast to Chirikof Island in the southwest, supported a remnant colony of sea otters (Kenyon 1969). Based on the presently disjunct distribution of sea otters in the Kodiak Archipelago, two remnant populations may have survived there, one in the north near the Shuyak Islands and one in the south (A. DeGange, pers. comm.). Alternatively, the southern Kodiak population may have recolonized from the Alaska Peninsula more than 30 years ago. The Kodiak Archipelago was first extensively surveyed in the late 1950s at which time 801 otters were counted. Much of Afognak and all or most of the Kodiak Islands were uninhabited by otters at that time. In a 1978 survey carried out by helicopter, Schneider (1979) estimated that there were 400-700 otters in the Trinity Islands and about 100 at Chirikof Island. In a 1986 aerial survey, 57 otters were seen near Geese Islands, at the southern end of Kodiak, and five were seen at the Trinity Islands (A. DeGange, pers. comm.). Kodiak, Afognak, and Shuyak islands were last surveyed in 1985 when 2,811 otters were counted (Simon-Jackson and Hodges 1986). Sea otters have now reoccupied all of Afognak and Shuyak islands and northern and northwestern Kodiak Island (A. DeGange, pers. comm.).

Pribilof Islands: Although sea otters reportedly were abundant in the Pribilof Islands (Kenyon 1969), this population was hunted to extinction. Occasional animals have been sighted there during the past several decades (R.L. Gentry, pers. comm.); these otters are probably wanderers from southeastern Bristol Bay. Seven otters, including females with pups, were seen by

A.L. Sowls at St. George Island during summer of 1988; local residents say that up to 30 are present (A. DeGange, pers. comm.). During many winters, the Pribilof Islands are surrounded by heavy sea ice, which may prevent the reestablishment of sea otters.

Kenai Peninsula: Sea otters were hunted to extinction on the Kenai Peninsula. Several hundred sea otters were seen near the southern end of the Kenai Peninsula in a 1975 survey (Calkins et al. 1975). The Kenai Peninsula was first surveyed in its entirety in 1976, when 541 otters were counted. It was most recently surveyed in 1982, when 880 animals were counted. A. DeGange (pers. comm.) reports that sea otters presently are absent in Kachemak Bay and lower Cook Inlet. Although these data suggest that the population on the Kenai Peninsula is still increasing, they are inadequate to judge its status.

Prince William Sound: A remnant sea otter population survived the fur trade in southwestern Prince William Sound (Kenyon 1969). This area, including Kayak and Wingham islands, was first surveyed in 1959, when 702 otters were counted. Most of northern and northeastern Prince William Sound were apparently uninhabited by sea otters at that time. The most recent survey of Prince William Sound was carried out in 1984-1985, when 4,747 sea otters were counted (Irons et al. 1988). Although more than 800 otter carcasses were retrieved following an oil spill that occurred in March 1989, the number of animals lost in the Sound and the Gulf of Alaska is unknown.

Northern Gulf of Alaska: In the early 1980s, the sea otter population in eastern Prince William Sound expanded to the east through Orca Inlet into the Copper River delta and the northern Gulf of Alaska (Garshelis and Garshelis 1984). When surveyed in 1983, 601 otters were counted from Orca Inlet to Cape Suckling (Schmidt 1983). When this area was most recently surveyed in 1986 (Simon-Jackson 1986), 1,432 sea otters were counted. No otters were seen between Cape Suckling and Icy Point during a 1987 survey (Simon-Jackson and Hodges 1986), but a few animals were seen in this area during earlier surveys (Calkins et al. 1975).

Southeast Alaska: Sea otters were hunted to extinction in southeast Alaska (Icy Point to Dixon Entrance). They were re-established in this area when the Alaska Department of Fish and Game relocated 412 animals from Prince William Sound between 1965 and 1969 (Jameson et al. 1982). The majority (301) of these were relocated in 1968. Subsequent surveys from 1975 through 1987 (Jameson et al. 1982; Pitcher 1987) indicate that this population has increased at 17.6%/yr (Estes 1990). There are no data on the population from 1969 through 1974, but if the observed exponential growth in the population from 1975 through 1987 is extrapolated back in time, the population is estimated to have declined to about 150 individuals in 1969 (Estes 1990). When the population in southeast Alaska was most recently surveyed (1987 and 1988), 4,520 sea otters were counted (Pitcher 1987, in litt.). Despite the rapid growth of this population, large expanses of unoccupied habitat remain. For the most part, these occur south of Sitka Sound, and in the inside waters throughout southeast Alaska.

British Columbia: Although a remnant sea otter colony survived in the Queen Charlotte Islands into the 20th century, this population was either hunted or naturally dwindled to extinction (Kenyon 1969). Between 1969 and 1972, 89 sea otters were translocated to the northwest coast of Vancouver Island (Jameson et al. 1982). The population was first surveyed in 1977, when 70 otters were counted (Bigg and MacAskie 1978). Subsequent surveys in 1984 and 1987 show an increase of 17.7% per year (Estes 1990). If this growth curve is extrapolated back in time (as was done for the southeast Alaska population), the translocated population is estimated to have declined to 28 individuals by 1973 (Estes et al. unpubl. ms.). 380 otters were counted during the 1987 survey (MacAskie 1987). J. Watson (pers. comm.) counted over 400 otters during summer of 1988 in a partial survey of the sea otter's range in British Columbia, and she suspects the population is much larger. The sea otter population in British Columbia presently ranges from about Maquinna Point (Nootka Sound) to the Brooks Peninsula (J. Watson, pers. comm.). As large expanses of apparently suitable sea otter habitat remain unoccupied in British Columbia, this population should be expected to continue to increase.

Washington State: Fifty-nine sea otters were translocated to the outer coast of Washington State, 29 in 1969 and 30 in 1970 (Jameson et al. 1982, 1986). This population was first surveyed in 1977 and 1978 when 19 and 12 otters were counted, respectively. Four subsequent counts through 1987 (Jameson et al. 1986; R.J. Jameson, unpubl. data) indicate a rate of increase of 20.6% per year (Estes 1990). Extrapolating this growth curve back in time indicates that the Washington population may have declined to as few as 4 individuals in 1971 (Estes et al. unpubl. ms.). More than 200 otters were counted during the most recent survey in 1989 (R. Jameson, pers. comm.). These animals range from about Destruction Island to Point of Arches on the outer coast.

Oregon: Ninety-three sea otters were translocated to the coast of Oregon, 29 in 1970 and 64 in 1971 (Jameson et al. 1982). Twenty-one otters were counted in 1972. This population continued to decline and by the early 1980s it was probably extirpated. Besides occasional wanderers from Washington or California, sea otters presently do not occur in Oregon.

California: A remnant sea otter colony survived the fur-hunting era near Point Sur (Kenyon 1969). This population increased at about 5.5% per year through the mid-1970s, after which time it apparently declined through the early 1980s at about 5% per year (Estes 1990). The recent decline probably resulted from entanglement in a coastal set-net fishery for California halibut (Wendell et al. 1985). Since set-nets within the sea otter's range were prohibited in less than 20 fathoms of water by State Law in 1985, the otter population in central California has increased at about 7% per year (R.J. Jameson and J.A. Estes, unpubl. data). 1,864 otters were counted in a May 1988 survey. The population ranges between Ano Nuevo Island at the north and about Point Sal at the south. The status of this population is unclear. Estes et al. (1986) argued that its further growth was not resource-limited, but Ames et al. (1983) and Ralls and Siniff (1988) disagreed. In August 1987 the U.S.

Fish and Wildlife Service began translocating sea otters to San Nicolas Island in the southern California Bight. As occurred in other reintroductions, the translocated colony declined during the ensuing months. At least 18 animals have returned to central California, some to the exact location of their capture (Fish and Wildlife Serv., unpubl. data). As of this writing, 112 sea otters have been relocated to San Nicholas Island, 15-20 remain, and the Fish and Wildlife Service is still working on this program.

Baja California: A remnant colony survived the fur trade at Islas San Benitos on the Pacific coast of central Baja California (Kenyon 1969). Apparently these animals were hunted to extinction in the early 1900s. Although wanderers from the population in central California have been sighted on several occasions in Baja California (Leatherwood et al. 1978), sea otters remain extirpated in Mexico.

In summary, sea otters occur throughout most of their historical range from about Cape Suckling, in the northern Gulf of Alaska, westward through the Aleutian archipelago, Kamchatka Peninsula, and Kuril archipelago. There are probably only a few small areas that remain uninhabited by sea otters in this area and populations in many areas probably are resource-limited. Large expanses of their historical range to the southeast of Cape Suckling remain uninhabited. Except for the recently reintroduced population at San Nicolas Island, all populations in this latter area appear to be increasing.

Threats

Sea otters are now the least threatened of all the otter species. Worldwide, the population is increasing, with further increases expected so long as there is available habitat. The threats facing this species are localized, although fishery conflicts occur or are developing in some areas because of increases in range and abundance of sea otters.

Fishery Conflicts

Sea otters feed on, and are capable of limiting, populations of many benthic invertebrate species, some of which are exploited by humans for commercial or recreational purposes. This interaction has resulted in shell-fisheries conflicts as sea otters have recolonized their natural range. Further conflicts are expected as populations continue to expand.

The concept of zonal management for sea otters has been proposed to provide areas for sea otters and other areas, free of otters, for shell-fisheries. This concept was implemented with the reintroduction of sea otters to San Nicolas Island—waters surrounding San Nicolas Island have been set aside for sea otters (although fishing is permitted there)—whereas the remainder of southern California south of Point Conception is to be maintained free of sea otters. Although such zonal management probably can be achieved in the short term in localized areas (by capturing and relocating animals that might wander into designated otter-free zones), it will be difficult to implement over larger areas and longer time spans. Whether large-scale zonal management can be achieved without killing is extremely doubtful and it is unknown if such lethal containment is economically justifiable and socially acceptable.

Incidental Take

Sea otters are vulnerable to entanglement in nets. Entanglement mortality in the coastal gill and trammel net fishery for California halibut probably limited and even reduced the population in central California from the mid-1970s until the early 1980s (Wendell et al. 1985). Based on the capture rate of sea otters in observed net pulls, and the total known fishing effort, the California Department of Fish and Game estimated that about 100 otters per year died from net entanglement. Evidence supporting this conclusion is provided by the fact that the sea otter population in central California increased significantly following closures to and restrictions on gill and trammel net fishing within the species' range in 1985. Little is known of the possible influence of entanglement on sea otter populations elsewhere, although coastal set-nets for salmon and other fish species are commonly used in Washington State, British Columbia, and parts of Alaska, and sea otter entanglement is known to occur in some of these areas (Simon-Jackson 1985). Range expansion of sea otters into areas where there is coastal set-net fishing, or expansion of these fisheries into areas already occupied by sea otters, could threaten local otter populations.

Take by Alaska Natives

Sea otters are protected from all human take in Canada and the Soviet Union. The U.S. Marine Mammal Protection Act allows Alaska natives to take sea otters and other marine mammals for traditional native-use purposes. Most of the known native take of sea otters is near the villages of Kodiak and Cordova, and in southeast Alaska (Simon-Jackson 1988). Although the number of animals killed by Alaska natives has increased substantially in recent years, the impact of these activities on otter populations is unknown. For example, Simon-Jackson (1988) reported the known take of sea otters by Alaska natives to have increased from 4 in 1982, to 555 in 1986, and that a total of 1,049 animals were taken during this period. If unregulated, the take of sea otters by Alaska natives could become a serious problem. History provides a clear record of the sea otter's vulnerability to human exploitation and technological advances make sea otters more vulnerable to human exploitation than ever before.

Pollution

Sea otters are particularly vulnerable to oil pollution because oil destroys the insulative barrier to sea water normally provided by their fur (Costa and Kooyman 1982). In the cold aquatic environment of the north Pacific Ocean, oil-contaminated sea otters become rapidly hypothermic and die, and although methods have been developed for cleaning the fur of contaminated

captive sea otters, it is unlikely that in the event of a large oil spill enough animals could be captured and cleaned to benefit any local population. A recent oil spill in Prince William Sound supports this view. The increased exploration, extraction, and transport of petroleum in the northeast Pacific Ocean poses a significant threat to some localized sea otter populations.

The possible influence of other environmental pollutants on sea otters is unknown. High-density populations that occur in many areas, and the high rates of increase presently occurring in others, indicate that pollution or other forms of environmental degradation are not, at present, a significant threat to this species.

Recommended Action

Many studies on the sea otter and its habitat are currently being funded by local and national governments of the United States and the Soviet Union, and the Provincial Government of British Columbia. Continuation of these studies should be encouraged. The U.S. Fish and Wildlife Service has prepared and is presently implementing a Recovery Plan (as required under the U.S. Endangered Species Act) for the California sea otter population. Ongoing research is described and reviewed in the Final Environmental Impact Statement to translocated sea otters to San Nicolas Island (U.S. Fish and Wildlife Service, 1987) and by Rotterman and Simon-Jackson (1988).

In view of the facts that:

1. management plans have been (or are being) developed and implemented for sea otters;
 2. the species and its environment, worldwide, appear to be in healthy condition;
 3. several local or national governments have established research and management programs for sea otters;
- further funding for work on the conservation of this species should be given low priority, except in the following areas:
1. management and recovery plans should be developed and implemented for the Asian populations;
 2. reintroduction programs should be considered for parts of the former range in which the species is still absent (i.e. Japan and Mexico). Californian populations also need strengthening through reintroductions and restocking;
 3. traditional hunting of the species in Alaska should be managed under a program of carefully regulated and scientifically defensible quotas;
 4. sea otters found dead in California should be examined for contaminants which may pose a threat to long-term population viability;
 5. means need to be found to resolve perceived conflicts between fisheries and sea otters.

9. Action Plan for European Otters

Sheila Macdonald and Chris Mason

Introduction

The Eurasian otter (*Lutra lutra*) is the only otter species found in Europe, where its range formerly extended from the Arctic to the Mediterranean and from Ireland in the west to the borders of Asia, across which it extended eastward to Japan. Numbers are now seriously depleted, particularly in much of western Europe. Typically, as an otter population declines, it disappears initially from the lowland plains where the biotope is degraded by intensive agriculture, industrialization, expanding conurbations and increasing human disturbance. Animals may then become restricted to the wilder uplands although high mountain regions may remain unsuitable because of insufficient food supplies. If upland areas are also degraded, then the species faces local extinction. There are now many western European countries where the Eurasian otter is very rare or absent (see Figure 1). Pollution of both agricultural and industrial origin, together with widespread habitat destruction, are chiefly to blame for these declines.

The Eurasian otter lives in rivers, lakes, and marshes and along some rocky sea coasts (e.g. Norway, Ireland, and Scotland). The diet largely comprises fish (around 80% in most of northern Europe) with eels often favored. Amphibians and crustaceans are also commonly eaten. Occasionally birds and mammals are included in the diet; snakes are taken in southern Europe. Intertidal fishes and crustaceans are important in the diets of otters living on coasts (see Mason and Macdonald 1986a).

A small number of otters have been radio-tracked in Britain (Green et al. 1984). On rivers, males have been found to use up to 40 km of waterway, with females utilizing ranges of about half this length. On coasts, ranges are much smaller at around 5 km. It is likely that range size is related to resource availability. Essential resources include an adequate food supply, sleeping and breeding sites and cover for escape. Den sites on coasts are found in caves, rock cavities, or in peat banks. Along rivers, otters may den in eroded cavities amongst the roots of bankside trees, dense riparian scrub, rocks, ruined masonry, or piles of flood debris.

As with other otter species, the Eurasian otter marks its range with spraints (scats). There is evidence of seasonality in marking activity. This may reflect local trends in seasonality of breeding even though this species can breed at any time of the year (Kruuk et al. 1987; Macdonald and Mason 1987). One to three cubs are normally produced and they remain with the female for about one year before dispersing.

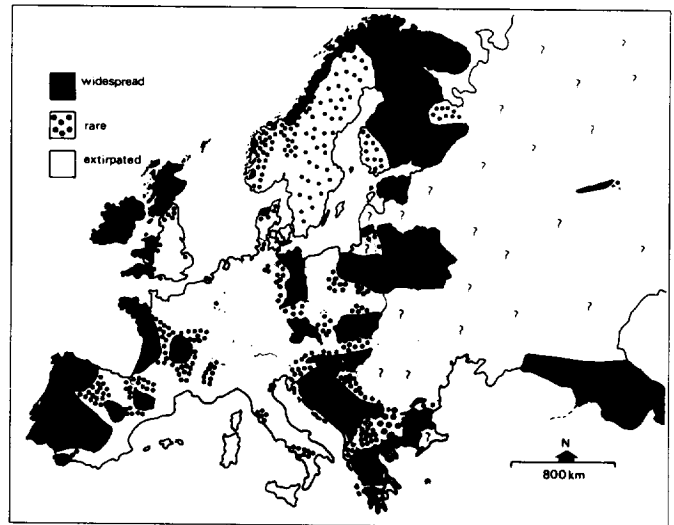


Figure 1. Distribution of the Eurasian otter (*Lutra lutra*) in Europe.

Because this otter is largely solitary, elusive and, in most places, nocturnal, field surveys for otter distribution have been developed based on searches for spraints and other signs. A standard methodology has been adopted and field surveys have now been carried out in several European countries (see Chapter 3).

The Eurasian otter is on Appendix I of CITES. It is considered by the IUCN to be Vulnerable due to the endangered or declining status of many of its populations. The species is protected in most European countries (but see individual country reports below).

Internationally, the Ramsar Convention affords a measure of protection to certain wetlands, some of which hold otters, by advocating the "wise use" of these sites. Unfortunately, not all countries respect its recommendations. The Bern Convention, which came into force in 1982, aims to conserve European wild flora and fauna and their natural habitats. Under the provisions of this convention, protection should be given to breeding and resting sites of endangered or vulnerable species like the Eurasian otter. At the time of writing the full members of the Bern Convention include Austria, Denmark, Finland, the German Federal Republic, Greece, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the EEC. Belgium and France are in the process of ratifying. It is not, however, clear that otter populations have benefitted greatly from this

convention, because its implementation by the member states has been ineffective. The potentially large range size of otters, the fact that individual animals can use several different den sites, and the difficulty of finding breeding sites means that real protection depends on the safeguarding of large areas of suitable habitat. Yet, throughout much of Europe habitat degradation continues. Water pollution remains a major source of biotope destruction. Land drainage and river improvement schemes are still carried out in an insensitive manner with little, if any, consideration of the effects on local otter populations. Within the EEC many of these land drainage schemes are funded by the Community under the Common Agricultural Policy and the Integrated Mediterranean Project. This results in the widespread destruction of wetlands of great significance to otters and other wildlife, for instance in Ireland and Greece. Environmental Impact Assessments which include a proper evaluation of the status and local requirements of otters should be mandatory for schemes in regions where otters are present or where restoration schemes are planned.

Currently within the EEC is a proposal for a new Directive on the protection of wild fauna and flora and their natural and semi-natural habitats. This might prove more effective since the European Commission could insist, if necessary through the European Court, that individual states comply with the requirement to designate a minimum number of Special Protection Areas. Clearly, however, even if this Directive does prove beneficial, it applies only to EEC member states. What is required is tighter controls on otter biotope conservation throughout Europe.

At present there is a tendency for manpower and finances to be concentrated on otter populations which are fragmented and dwindling. However, the future of the species in Europe depends on safeguarding the animal and its habitats in those countries where it still is widespread and thriving. Declines can occur rapidly and recovery, if it occurs, may be slow. Repairing the damage by re-creating habitat or cleaning up pollution is expensive and may come too late. Conservation of currently viable populations must be given top priority.

Our knowledge of the ecology of the Eurasian otter is still, in many respects, scanty, but we do know the basic requirements necessary for its survival. We know also that the ranges of individuals, at least on river systems, can be extensive. It is not a social species and natural maximum densities may be low. Individual reserves or protected areas will seldom be large enough to support self-sustaining otter populations. It is essential that we try to avoid a final situation where isolated oases of suitable habitat are all we have for otter protection. Ideally, protected areas should be linked by 'corridors' of suitable habitat to allow for free movement, exchange of genes and, where necessary, re-colonization. The maintenance or restoration of a semi-natural riparian biotope would clearly provide such corridors for otters.

Much of the decline in otter populations in Europe has been caused by bio-accumulating pesticides and PCBs. Airborne dispersal of PCBs has contaminated even remote areas, sometimes so severely that otter reproduction is affected (e.g. in northern Sweden). It is of the utmost importance that the remaining uncontaminated wetlands remain clean. PCBs should

be replaced with less harmful, non-persistent compounds and proper facilities for PCB destruction by incineration must be further developed and strictly controlled.

Trans-frontier cooperation could be vital in this respect to facilitate the control of pollution or other threats. Continued international exchange of the results of otter tissue analyses for pollutants is also essential. This would lead to an understanding of the pollutant levels which could cause problems, and also serve as an early warning system in those countries still holding widespread populations.

Overall Priorities for Europe

The overall aims of this European action plan for otter conservation are therefore:

1. to protect those key wetlands holding substantial otter populations;
2. to press for sensitive management of the river biotope;
3. to insist on tighter controls on pollution, with particular emphasis on organochlorine contamination;
4. to collect comparative data on otter ecology and conservation in contrasting regions of the continent;
5. to emphasize the international importance of otter populations in Greece, Ireland, Portugal, and Spain (countries in which the species has received little attention), and to call for more resources for the conservation of these otter populations before they suffer the same fate as those in much of the rest of Europe;
6. to educate policy-makers and the public about the significance of wetland ecosystems.

The Eurasian otter, at the apex of the food chain, is a valuable indicator of the health of the wetland environment. Any measures which successfully benefit this species will prove beneficial to the wetland ecosystem as a whole, including those resources (such as water and fish) directly utilized by man.

Country Accounts

Albania

Status and Distribution

Widespread in much of the country but range restricted in central area, coastal plain and Korce's Plain (Prigioni et al. 1986). Healthy populations are thought to occur in much of northern and southern Albania, though a full survey has not been carried out. Occurs mainly in uplands (signs to 600 m a.s.l.) but good populations also in some lowland areas and coastal marshes.

Legal Status

Legally hunted in winter with many individuals killed for fur.

Threats

1. Habitat destruction. Drainage is occurring in Shengjin and Lezhe marshes. Riparian vegetation has been destroyed due to river gravel extraction. Long reaches of rivers are embanked. Hydroelectric power plants cause some habitat modification on Rivers Drin and Mat.
2. Water pollution. Organic (urban waste water and intensive cattle farming) and industrial (mainly mine drainage and oil

refineries) cause gross pollution in lower reaches of several rivers. The tributaries/headwaters appear largely clean. The plains are intensively cultivated, and organochlorines, especially lindane, are widely used.

3. Legal hunting. Otters are also killed around fisheries and in fyke nets

Conservation Priorities

1. Complete legal protection essential.
2. Full field survey to assess otter distribution and habitat quality.
3. Development of an otter center to promote education and field/laboratory research.
4. A study of otter populations in the lagoons of Lezhe and Karavastase, two important wetlands in the Mediterranean Basin.

Austria

Status and Distribution

Threatened. Once widespread, but viable populations are now largely restricted to two areas contiguous with populations in Czechoslovakia and Hungary (full survey not complete).

Legal Status

Fully protected under hunting laws since 1947.

Threats

No immediate threats in those areas still supporting otters.

Conservation Priorities

1. Purchase of very important otter biotopes at Kamp and Lainsitz.
2. Establish nature reserves along the rivers Kamp, Lainsitz, and Lafnitz.
3. Rent fishing grounds in otter habitats to avoid disturbance and to improve food resources (artificial increase of fish and crayfish populations).
4. Advise large-scale landowners in relevant areas on management improvements for the conservation of otters.
5. Establishment of fish ponds in otter habitats with insufficient food supplies.
6. Financial compensation for otter damage in fish ponds (especially at Waldviertel).
7. Collaboration with non-professional pisciculturists on the development of damage-reducing devices in areas with potential conflict between otters and people.
8. Establish a public relations/information program on otters.
9. Establish otter breeding station at Grunau in Almtal (WWF).
10. Maintain research and breeding station at Alpenzoo, Innsbruck.

Belgium

Status and Distribution

Virtually extirpated. Just a few isolated individuals in Wallony at five sites. Probably absent from Flanders.

Legal Status

Protected.

Threats

1. All major rivers are heavily polluted.

2. Habitat destruction widespread, including canalization, drainage of wetlands, and lake exploitation.
3. Recreation on waterways is extensive, including angling, surfing, and boating.

Conservation Priorities

1. Reduction of pollution levels in rivers.
2. Reconstruction of riparian habitats and creation of corridors of suitable habitat linking wetlands.
3. Concentration of recreational activities into areas of little value to wildlife.
4. Development of education program in conservation.
5. In Wallony, priority should be given to the rehabilitation of those river catchments which still occasionally hold otters: the Ambleve, Lesse, Our, Ourthe, Semois, Sûre, and Vierre, together with the protection of the Virelles pond, reedbeds, and banks.
6. In Flanders, priority areas for the development of an otter conservation strategy include the Yser basin, the environs of Bruges and the wetlands to the northeast, parts of the Scheldt, Dyle, and Meuse valleys and the swamps of Berlare Broek.

Bulgaria

Status and Distribution

Common in the southeast, but otherwise threatened. Found in uplands, lowlands, and on the coast.

Legal Status

Fully protected.

Threats

1. Industrial pollution, causing reductions in food supply.
2. Illegal killing.
3. Habitat destruction by urbanization, removal of riparian woodland, river improvement schemes, and human disturbance.

Conservation Priorities

1. Full field survey of otter distribution throughout the country.
2. Increase in the number of protected areas in habitats supporting otters.
3. Controls on water pollution may require implementation.

Czechoslovakia

Status and Distribution

Classed as endangered in the Red Book of Endangered Vertebrates of the CSR. Population fragmented. Viable populations only in some parts of southwest and south Bohemia, the Czech-Moravian Highlands, and east Slovakia. Occurs now mainly in uplands, but is increasing in fish pond areas of south Bohemia.

Legal Status

Protected.

Threats

1. Regulation of medium and small streams.
2. Pollution by sewage, pesticides, and fertilizers resulting in loss of fish.
3. Some illegal trapping.

Conservation Priorities

1. Construction of a breeding station.
2. Regular monitoring of populations.
3. Detailed surveys using volunteers.

Denmark

Status and Distribution

Endangered. Mainly restricted to the Limfjord area with isolated population fragments around this region (Madsen 1989). Occurs in agricultural lowlands and brackish inlets.

Legal Status

Fully protected.

Threats

1. Fish traps, such as fyke nets.
2. Road traffic.
3. Recreational activities (disturbance).

Conservation Priorities

1. Provision of stop-grids for all fish traps in the Limfjord area.
2. Research into feasibility of constructing safe passages to reduce road mortality.
3. Research into use of reflectors to reduce road mortality.
4. Advice and courses in otter conservation for biologists and technicians in counties and municipalities.

Finland

Status and Distribution

Widespread, but absent from coastal areas in the south and west and also in the archipelago. Populations are not becoming fragmented and are found in upland, lowland, and coastal areas.

Legal Status

Protected under the 'Hunting Law' (as opposed to 'Conservation Law') so that the ban on hunting may be only temporary. Otters can be legally killed at fish hatcheries.

Threats

1. Hydroelectric power developments resulting in dams and thick winter ice cover on rivers.
2. Pollution of coastal waters and increased acidification of oligotrophic lakes.
3. Expansion of summer cottages and recreation in coastal areas.
4. Fish traps and persecution at fish hatcheries.
5. Road mortality.
6. Increasing demands to resume otter hunting.

Conservation Priorities

1. A national field survey.
2. Studies of diet, home range, etc., in a populated part of Finland, followed by a similar comparative study in a wilderness area.
3. Analyses for pollutants of tissues of otters found dead in coastal areas.
4. Maintain protected status of the species, and protect otters at fish hatcheries.
5. Fit protective grids to fish traps.



Eurasian otter (*Lutra lutra*) (Photo courtesy of Alpenzoo, Austria).

6. Survey habitat features of value to otters and conserve high quality riparian habitat, especially in regions of high human population density.

France

Status and Distribution

Widespread in the west from Brittany to the foothills of the Pyrenees and in the Massif Central. Becoming restricted in range on the coast and islands of Brittany. Absent from the north, most of the east and the southeast. Some populations geographically isolated. Does not occur in Corsica. For more details, see Bouchardy (1986).

Legal Status

Protection measures since 1972. Fully protected in 1976.

Threats

1. Destruction and modification of habitats through industrialization, modernization of agriculture, urbanization, land drainage, canalization of rivers, and increased tourist pressure on coasts.
2. Water pollution, especially organic, heavy metals, and organochlorines.
3. Severe eutrophication (especially in western marshes) due to excess nitrates and phosphates.
4. Accidental deaths on roads, in fishing nets, in gin-traps set for aquatic rodents, and in American mink traps.
5. Hydroelectric dams, which appear to deter recolonization.

Conservation Priorities

1. Prevent further destruction of biotopes in regions where otters still occur.
2. Set up otter havens, possibly involving some land purchases.

3. Continue the program of public education.
4. Investigate means of reducing otter mortality by ensuring wide consultations before the construction stage of new roads, bridges and the like (the "SOS-Otters Network" in Brittany being an example).
5. Continue analyses of otter tissues for pollutants.
6. Set up an otter breeding center with a view to possible future reintroduction or re-stocking programs.

German Democratic Republic

Status and Distribution

Becoming restricted in range, with population centered mainly in the north, east and southeast. Within current range, populations not considered fragmented. Occurs in lowland regions and on parts of the Baltic coast (Stubbe 1989).

Legal Status

Totally protected in the highest category.

Threats

1. Fish traps, especially in the lake district of Mecklenburg.
2. Road traffic.
3. Mortality in traps set for other carnivores.

Conservation Priorities

1. Develop methods to reduce mortality in fish traps.
2. Develop selective hunting and trapping methods for common carnivores in otter biotopes.
3. Creation of special otter protection areas.
4. Initiation of special otter protection program.

German Federal Republic

Status and Distribution

Highly endangered with very restricted range. In Schleswig-Holstein, signs of otters were found at only 8 of 356 sites surveyed in 1986-1987 (Heidemann and Riecken 1988). In Lower Saxony, fragmented populations occur in the north and some individuals seem to occur in southeast Bavaria on the borders with Czechoslovakia and Austria.

Legal Status

Fully protected.

Threats

1. Canalization of rivers and drainage of wetlands.
2. Pollution.
3. Disturbance by recreational activities.
4. Occasional mortality both in traps set for carnivores, muskrats, or fish, and due to traffic.

Conservation Priorities

1. Restoration of habitats: especially implementation of the provisions of the Bern Convention and of the Lower Saxony otter habitat management plan to include several thousand kilometers of rivers.
2. Reduction of pollution, especially by improving water purification and reducing use of fertilizers and pesticides.
3. Reduction in maintenance of river banks.
4. Zone rivers and wetlands with recreational activities cur-

tailed in some areas.

5. Intensify educational activities, using otters as indicators of a healthy wetland environment.
6. Continuation of research program.

Greece

Status and Distribution

Widespread through much of the country, being especially frequent in the area west of Kavala, the plain of Kiphissos, the Amvrakikos and Mesolongi wetlands, the Aoos-Sarandaporos catchment and in the western Peloponnisos. Fragmentation of populations apparent in central Greece and around Thessaloniki. Isolated and small populations exist on the islands of Corfu and Euboea. Otters occur in agricultural lowlands, uplands and in some coastal habitats (Macdonald and Mason 1982; Gaethlich 1988).

Legal Status

Fully protected.

Threats

1. Habitat destruction, including: hydroelectric power dams; removal of natural bankside vegetation for drainage, flood prevention, and agricultural intensification; canalization of rivers and drainage of wetlands; pumping for irrigation resulting in drying of river beds; damage resulting from sand and gravel extraction; and destruction of biotope by erosion.
2. Intensive fish-farming with attendant illegal persecution of otters.
3. Pollution from agricultural, industrial, and mining sources.
4. Mortality in fish traps and on roads.
5. Disturbance due to recreation and hunting.

Conservation Priorities

1. Enforcement of Ramsar Convention for Greek wetlands, many of which are important internationally for otters and enforce otter protection measures nationally.
2. Creation of national otter reserves; the Rivers Kompsatos (Kuru) and Sarandaporos require particular initial attention.
3. Analysis for pollutants in tissues of otters (found dead) and also in fish.
4. Study of the response of otters to current management practices, including diversion of river water for irrigation, vegetation clearance, and the like. The Nestos River would be an ideal area for study.
5. Protection by purchase of the Karystos Lakes, Euboea Island; this area constitutes a threatened wetland supporting an isolated population.
6. Management and development of a conservation area and future private otter reserve in the Kirefs River, Achmet Aga, Euboea Island.
7. Educational projects, especially in areas where persecution has been recorded. These should include publication of leaflets and posters, slide-shows and lectures.
8. Study of an experimental use of stop-grids on fyke nets, together with an assessment of damage by otters at fish-farms and investigations into methods of reducing damage.

Hungary

Status and Distribution

Thriving in parts but becoming restricted in range and, in some areas, threatened. Some populations are geographically isolated. Found in both agricultural lowlands and uplands.

Legal Status

Protected, but permission given to kill otters at fish farms.

Threats

1. Pollution, especially from pesticides and fertilizers but also from industrial wastes.
2. Habitat destruction through drainage of marshes, canalization, agricultural expansion, and urbanization.
3. High mortality at fish farms, most of which is illegal killing.

Conservation Priorities

1. Radio-telemetry project in area with abundant otters to investigate use of natural water bodies versus managed fish ponds.
2. Monitor future trends in status/distribution.

Ireland

Status and Distribution

Widespread, with signs of otters found at 92% of 2,177 sites surveyed in 1980-1981. Otters occur in a diverse range of wetland and coastal habitats, and no large area is devoid of otters. Possibly lower density on the east coast. For further information, see Chapman and Chapman (1982).

Legal Status

Protected, though licenses granted for sport-hunting with packs of dogs in some areas.

Threats

1. Direct and indirect habitat destruction, drainage being a major factor.
2. Pollution, particularly organic pollution resulting in fish kills. Agricultural sources of pollution of particular concern.
3. Disturbance of habitat by increasing recreational activities, especially angling, boating, and mariculture.
4. Accidental deaths (traffic and fish traps) and persecution.

Conservation Priorities

1. Immediate cessation of otter hunting for sport.
2. Initiation of national otter surveys.
3. Initiation of public education program.
4. Investigations into the role of various governmental departments in the conservation of otters and other wildlife.
5. Because of the international importance of Irish otter populations, baseline otter studies should be incorporated into Environmental Impact Assessments under EEC directives and be an integral part of the structure of new Irish environmental laws and practices.
6. Initiation of an active research program into the ecology of otters in a variety of habitats on a long-term basis. Specific projects include:
 - a. investigation of otter mortality caused by accidental death and persecution;

- b. analyses of organochlorines and heavy metals in otter tissues;
- c. continued in-depth study of otters in Munster Blackwater catchment, providing baseline ecological data on Irish otters;
- d. comparable studies within other lake, coastal, and river habitats.

Italy

Status and Distribution

Endangered with very restricted range. Viable populations largely restricted to the south (Basilicata/Campania) and the Fiora catchment in Latium. Mostly found in uplands (to 200-400 m. a.s.l.) (Cassola 1986).

Legal Status

Protected.

Threats

1. Habitat destruction. Bankside vegetation lost, especially in the south, due to river gravel extraction and embanking.
2. Pollution. Organic pollution, pesticides (e.g. from citrus orchards) and industrial pollution from heavy industry, textile, and chemical works.

Conservation Priorities

1. Control embanking and gravel extraction activities, especially on Rivers Agri, Fiora, Basento, Ofanto, and Calore.
2. Control use of pesticides and release of industrial pollutants, especially in valleys of Rivers Agri and Sele.
3. Cancel all EEC-funded projects for damming Rivers Fiora and Farma/Merse.
4. Reduce river pollution by enforcement of water quality standards.



Eurasian otter (*Lutra lutra*) (Photo by Claus Reuther).

5. Set up regional parks and reserves on the Rivers Fiora, Basento, Agri, Sele, Calore, and Ofanto.
6. Study the otter population in southern Italy to investigate diet, use of habitat and range size. Such data are required as the basis for planning conservation measures.
7. Study use of habitat and range size in Tuscany and Latium.
8. Conduct studies to determine the feasibility of reintroduction of otters to the Ticino Valley and development of a captive breeding program.

Liechtenstein

Status and Distribution

Extirpated. No further information.

Luxembourg

Status and Distribution

Extirpated. No further information.

Netherlands

Status and Distribution

Recently extirpated. In 1988, geographically isolated areas held only a few animals, found mainly in peat bogs, marshes, and lakes surrounded by lowland pasture (Nolet and Martens 1989). Since 1989, no signs of otters have been found.

Legal status

Protected.

Causes of Extirpation

1. Pollution. PCB, pesticide, and heavy metal pollution originate from Rhine river waters used for irrigation, and from atmospheric deposition.
2. Habitat destruction due to waterways/bank management, road building, urbanization, and tourism.
3. Fragmentation of otter populations due to road and canal construction, urbanization, and increased disturbance from tourism.
4. Disturbance from recreation, especially from water sports and hunting (for example of polecats).
5. Accidental deaths due to traffic, drowning in fyke nets and rodent traps.

Conservation Priorities

Note: the following activities should be considered in the context of a possible reintroduction program. The Dutch Ministry of Agriculture and Fisheries has already produced a detailed action plan for otter conservation in the Netherlands (Ministerie van Landbouw en Visserij 1989). This provides an excellent model for similar future action in other European countries.

1. Remove impediments to free movements of otters and other animals in Friesland by providing underpasses to roads, etc.
2. Purchase and/or lease the banks of stretches of waterways in order to improve the biotope for otters.
3. Employ a conservation officer for two years to promote the use of stop-grids in fyke nets.

4. Research on the ecology of otters in the Netherlands including studies of food availability, habitat structure, and radio-telemetry. Radio-telemetry should be used on otters reintroduced at a later stage if habitat conditions are right.
5. Survey of pollution levels by analyses of tissues of fishes taken from otter habitats in Friesland. This should include assessments of the influence of Rhine water.
6. Rehabilitation by reduction of pollution of "Alde Feanen" in Friesland, an area formerly occupied by otters: Rhine waters to be diverted and contaminated sediments removed.
7. Improvement of cover by planting of bare banks with reeds, shrubs, and trees and subsequent maintenance of the biotope.
8. Support for the Dutch Otterstation Foundation (Stichting Otterstation Nederland) in its plans to build a visitor center with public otter displays and facilities for environmental education.
9. If Dutch biotopes can be improved to reach standards necessary for otter survival, reintroductions should be considered. Support is required for the establishment of an otter breeding center at the Dutch Otterstation Foundation.

Norway

Status and Distribution

Widespread, but becoming restricted in range in some areas. Continuously distributed in central and northern Norway, at least in coastal areas. In the south, populations are probably fragmented with little contact between subpopulations. Densities are highest on the coast, but it also occurs in lowlands and uplands, except in higher mountain areas.

Legal Status

Protected. Licenses may be issued to kill otters at fish farms.

Threats

1. Pollution in southern Norway by:
 - a. bio-accumulating pollutants;
 - b. acidification removing fish stocks;
 - c. poisonous marine algae killing the majority of food species along the southern and southwestern Norwegian coast.
2. Mortality in fish traps and on roads.
3. Illegal persecution of otters at fish farms, possibly affecting viability of restricted populations.

Conservation Priorities

1. Research to increase knowledge of otter ecology and threats to their populations.
2. Implementation of national legislation and international agreements against environmental contamination.
3. Restoration of fish populations in areas with high fish mortality.
4. Development of solutions to conflicts at fish farms.
5. A detailed study of the scarce otter population in the south of Norway, to include a survey, increased attempts to obtain carcasses for pollution analyses, assessment of food supply, and identification of areas where conditions for otters can be improved.

Poland

Status and Distribution

Threatened and becoming restricted in range. Viable populations occur in the Beskidy Mountains in the south, in the lake districts of the north and in the wetlands of the River Biebrza valley, Podlasie, and Polesie in the east. Marked declines in western Poland and extirpated in central Poland and in Silesia (southwest). This information is based largely on results of questionnaires to the Polish Hunting Union in 1980.

Legal Status

Protected.

Threats

1. Pollution and management of rivers and lakes, especially in central Poland and Silesia.
2. Poaching and persecution especially at fish farms but also for fur.
3. Drowning in fish traps.

Conservation Priorities

1. Reduction of pollution levels in waters of central and southwestern Poland.
2. Increased penalties for illegal killing of otters.
3. Surveys to estimate status of otter populations in different regions (e.g. coast, lake district in the north) in relation to differing levels of pollution.
4. Analyses for pollutants in tissues of otters found dead.
5. Evaluation of real levels of predation by otters at commercial fish ponds and lakes.
6. Study of the diet of otters in a variety of habitats.

Portugal

Status and Distribution

Widespread, with otters found throughout the country, though range is probably becoming restricted in some areas. Present in all wetland habitats including rocky coasts in the southwest (Santos Reis 1983; Beja 1989). The population may be considered as one of the most important in Europe.

Legal Status

Protected.

Threats

Threats are most important in the lowland parts of the country.

1. Pollution by pesticides, herbicides, domestic, and industrial wastes.
2. Destruction of riparian vegetation during agricultural and forestry operations.
3. Persecution, probably significant in some areas, though illegal.
4. Disturbance by recreational activities, the development of tourist facilities on the coast being particularly important.
5. Coastal oil spills are potential threats to the otter population on the southwest coast.

Conservation Priorities

1. A national survey conducted by standard methodology to determine the present status, define areas of risk, assess

major threats, and locate areas suitable for detailed long-term research.

2. Ecological research to assess precise habitat requirements and patterns of resource utilization in order to implement a national conservation strategy for the species. Studies should include upland, lowland, and coastal populations, using identical methodology.
3. Studies of the role of otters within the aquatic ecosystem, particularly their interactions with recently introduced American mink. Monitoring of mink distribution is required.
4. Continuation of the study on the ecology of the population on the rocky coast in southwest Portugal, under threat from tourism, by examining the activity of free-ranging otters by use of radio-telemetry.
5. Analyses of otter tissues for accumulating pollutants.

Romania

No recent information.

Soviet Union

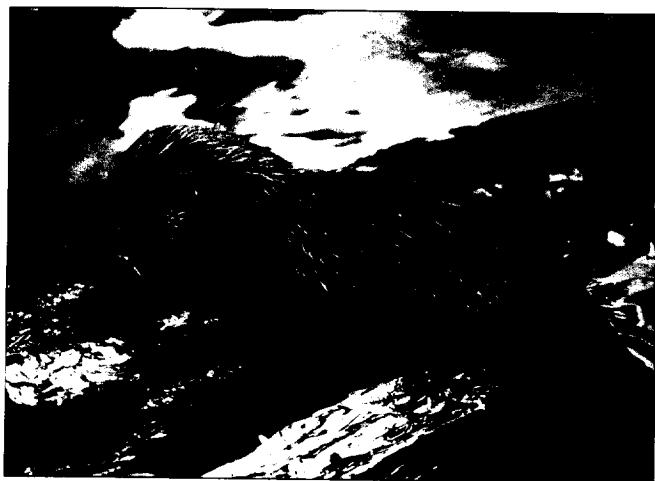
Recent information is available from a few regions only. The otter is relatively rare in the Soviet Union as a whole (Semenov-Tyan-Shansky 1982). Three subspecies are recognized, of which *lutra* is the most widespread. The other two races are listed in the Red Book of the U.S.S.R. (1984). *L. l. meridionalis* is rare, occurring in the Kuban basin and in mountain rivers, up to 2,000 m a.s.l., in Georgia, Azerbaidzhan, and Armenia, it being most numerous in Georgia. The total population was estimated at a maximum of 6,000 in 1980 and it is declining, especially in areas with increasing cultivation. *L. l. seistanica* is listed as rare and declining in the Red Book of the U.S.S.R. (1984). In the past it occurred in the mountain systems of Tien Shan, Pamir, Kopetdag and the basins of the Amudarya and the Syrdarya. Currently it is found only in isolated areas. In the Kazakh S.S.R. it is found on the Rivers Chu, Ili, Charyn, and Karatal. In the Tadzhik S.S.R. it occurs in the basins of the Rivers Pyandzh, Vakhsh, and Kafirnigan, and in the Uzbek S.S.R. in the basins of the Surkhandarya, Amudarya and Zhetysay. In the Turkmen S.S.R. it is found on the Rivers Atrek, Sumbar, Kushka, and Murgab, and in the Kirghiz S.S.R. in the River Tyup. The distribution borders Iran and Afghanistan, from which we have no recent information, and China (see Chapter 11).

We have received information on the current status and distribution of otters in the Soviet Union from the following republics or regions.

Byelorussia

Status and Distribution

Distributed over the whole area. Found in all types of river and flooded channels, often cohabits with beavers. In periods free of ice-cover, it is also found on lakes, reservoirs, and fish ponds. Estimated population of nearly 12,000 animals. Population density ranges from 1.4-7.3 individuals per 10,000 ha, higher in the north (6.5 mean, R.W. Dvina) but much lower in the south (2.1 mean, River Pripiat basin).



Two month old Eurasian otter (*Lutra lutra*) (Photo courtesy of Alpenzoo, Austria).

Legal Status

Trapped under special permission.

Threats

1. Irrational killing (mostly illegal) which interferes with the natural reproductive cycle.
2. Alteration and total destruction of habitats by the canalization of rivers, the destruction of the natural river banks, and by industrial pollution (e.g. River Svisloch).

Conservation Priorities

1. Restrictions on numbers of otters trapped.
2. Conservation of the bank structure of natural water bodies.
3. Protection of breeding sites.
4. Improvement of bankside habitat, including planting of trees along middle and slow flowing small rivers.

Estonia

Status and Distribution

Numbers declining and range becoming restricted. Generally found in agricultural lowlands. No geographically isolated populations.

Legal Status

Protected.

Threats

1. Destruction of water ecosystems: habitat destruction due to agricultural improvement which alters river water levels and reduces food availability.
2. Water pollution of both agricultural and industrial origin.

Conservation Priorities

1. Study the breeding biology of otters in Estonia.
2. Determine the distribution of otters in Estonia and, by monitoring, investigate habitat use.
3. Identify the factors determining otter population dynamics.
4. Carry out studies on diet.

Soviet Far East

Status and Distribution

Fairly widespread but a general tendency to decline in both range and population density. There is a trend of increasing reductions in otter populations moving northwards into the continent.

Khabarovsk region (Ussuriland): In the best areas (wild, forested mountain rivers where salmon spawn), otter numbers are estimated at 4-5 per 10 km. In second-class habitats on parts of the main rivers there may be up to 2.5 per 10 km. In the lower reaches of the main rivers, which are ice-covered in the winter, estimates are of 0.1-0.5 otters per 10 km. In the southern part of the Khabarovsk region otters occur in about half of the length of all waterways, but in the northern part in only 10-20% of the length.

Amur river region: Only a few otters occur.

Primozye region: Density slightly higher than in Khabarovsk region.

Sakhalin Island and the Kamchatka Peninsula: Density even higher. On the islands and peninsulas of the Pacific, conditions are ideal for otters.

Izkutsk and Okhotsk regions: In the rivers of Izkutsk region and in the area north of Okhotsk, otters are rare.

Legal Status

Hunting is allowed but strictly controlled in relation to population estimates.

Threats

1. Rivers are generally clean, but some pollution is caused by timber production and by local communities.
2. Some illegal hunting.
3. Total ice cover in winter in the interior of the region. In Siberia, because living conditions are so severe, the additional stresses of reduced food resources, pollution, and illegal hunting, could force the otter population into local extinction.
4. Accidental catch in traps set for mink.

Conservation Priorities

1. Conserve those stretches of river where otters occur, especially in those areas where the population occupies 5-20% of the total area.
2. Extend the system of nature reserves.
3. Introduce a more careful approach to forestry in the catchments in the mountains.

Karelia

Status and Distribution

The otter is found throughout the region but numbers have declined during the past 20 years. A 1987 census suggests that, in the south, otters occur at a density of 0.6 animals per 10 km of waterway shoreline and in central regions at a density of 0.3 per 10 km. In the north, with fewer pressures, the otter population appears to have remained stable with 0.8 individuals per 10 km.

Legal Status

The otter is currently not protected, but the hunting laws are being modified to forbid the trapping of otters in southern and central Karelia.

Threats

1. Habitat destruction and reduction in fish stocks due to the felling of forests, the drainage of bogs and wet woodland, timber floating on waterways, and pollution from agriculture and from industries such as paper manufacture.
2. Human disturbance, especially near towns and villages.

Conservation Priorities

1. Encourage a more sympathetic approach to wetland habitat utilization.
2. Encourage measures to reduce levels of water pollution.

Lithuania

Status and Distribution

Found throughout most of the region in all types of suitable habitat. Between 1969 and 1984 numbers are thought to have decreased substantially, but recently numbers have stabilized and may even have increased.

Legal status

Protected from hunting since 1975. In April 1989, the otter was included in the Red Book (IVth category) of Lithuania.

Threats

1. Habitat destruction due to land reclamation and the straightening of river beds.
2. Loss of food supply due to water pollution.
3. Mortality in traps set for beavers.

Conservation Priorities

1. Conservation and ecological improvement of natural water bodies and of water quality.
2. Increase protection in areas holding the highest density of otters by the introduction of non-trap methods for catching beavers.
3. The monitoring of otter abundance, distribution, and mortality.

Murmansk Region

Status and Distribution

Found throughout the region (except near human settlements and roads) but becoming rare. Since the foundation of the Lapland Reserve in 1930, the population has steadily declined. For example, in the 1930s one observer could see an average of 0.41 animals annually but only 0.08 by the 1970s. In the 1930s trappers in the Murmansk region caught 59-125 otters per annum but only 6-42 in the 1960s. By the end of the 1960s only odd animals were caught. Trapping was a major cause of the decline.

Legal Status

Fully protected since 1977. Listed in the Red Book of endangered species of the Murmansk Region.

Threats

1. Habitat destruction due to forestry operations, especially the floating of timber down rivers.

2. Air pollution leading to acidification of waters.

3. Hydroelectric power generation with attendant dams and deep reservoirs.

4. Considerable reduction in fish stocks (especially trout), due in part to over-fishing.

5. Possible conflict with American mink, which spread into the area during the 1950s.

Conservation Priorities

1. Encourage the present reduction in the practice of timber-floating on rivers and lakes.
2. Encourage a reduction in acidification of waters so that fish stocks may be restored.

Tartar A.S.S.R.

Status and Distribution

Distribution limited. Found regularly only in the north of the Republic, for instance on the River Ilet and its tributaries on the border with neighboring Mariisk A.S.S.R. Irregular distribution in the northeast where, in some years, animals come in from the Udmurtsk A.S.S.R. along the tributaries of the Rivers Vyatka and Kama. The species has not been recorded in recent years in the remaining parts of the Tartar A.S.S.R.

Legal Status

Protected, with hunting forbidden since 1930. In 1986, the otter was included on the list of rare and disappearing species of the Republic.

Threats

1. Destruction of riparian habitat by the cutting of the forests and other vegetation along rivers.
2. Habitat destruction by grazing of domestic animals on river banks.

Conservation Priorities

1. Field research is required to establish the distribution of the otter throughout the Republic and to monitor populations.
2. Investigations into the feasibility of reintroductions into rivers previously holding otters such as the Rivers Maly, Cheremshan, Izh, and Toyma.

Other Regions

In the Mariisk ASSR and in the Kirousk region hunting is allowed under license from 1 November to 1 March. The species is considered to be common enough to withstand hunting pressure.

In Bashkir A.S.S.R. and Udmurtsk A.S.S.R. the otter population is not thought to be threatened, but hunting is still forbidden.

Spain

Status and Distribution

Widespread in the west of the country, becoming restricted in range in central regions and threatened in the east where populations are becoming isolated. Still found almost everywhere in the uplands but becoming scarce in lowlands with good populations only in the west. Very rare on coasts and restricted to the northwest and southwest. Information from Elliot (1983) and Delibes (in press).

Legal Status

Protected.

Threats

1. Habitat destruction caused by channelization, removal of bankside cover and intensive irrigation projects. Reservoir construction a significant threat in uplands. Tourist developments important on the coast.
2. Pollution from agriculture (pesticides and fertilizers), towns, and industry in lowland and coastal areas.
3. Drainage of marshes.
4. Illegal hunting and trapping, particularly in upland areas.
5. Disturbance by tourism, mostly in the Pyrenees and in mountains close to large conurbations.

Conservation Priorities

1. Habitat improvement, including recovery of riparian vegetation and the control of pollution.
2. Evaluation of pesticides in freshwater ecosystems.
3. Certain populations at risk due to isolation, and land-use changes should be studied, using standard survey techniques, and specific conservation plans should be developed for discussion with water authorities and regional wildlife services.
4. Research into the autecology of otters in Spain. Detailed telemetric studies thus far have been carried out only in northern Europe. In southern Europe, where rivers have high fish production and a different pattern of flow, otters may use rivers in an entirely different way. Research would involve habitat assessments, evaluation of threats, and continuous monitoring of individual animals to determine habitat use, response to flow and food, and the minimum length of waterway able to support a viable population.
5. Since the last national field survey in 1984, there is evidence of further decline in some areas. A second national survey, using a professional survey team rather than volunteers, is needed urgently.
6. Establishment of reserves, especially in areas where populations are becoming isolated, and protection of habitat by reserve creation at the mouths of small rivers to avoid further isolation of populations.
7. An education program aimed at making the general public aware of the otter and its plight.

Sweden

Status and Distribution

Endangered in the south, threatened in central and northern Sweden. Some populations geographically isolated. Mostly found in eutrophic upland lakes in the south and upland waters in the north.

Legal Status

Protected.

Threats

1. Airborne and local contamination with organochlorines.
2. Habitat destruction by channelization and drainage in agricultural lowlands.

Conservation Priorities

1. A three year study to compare levels of environmental pollution in areas where otters still survive and in adjacent areas from which they have disappeared. Concurrent field studies in these areas to determine status and breeding success of otters present.
2. Analyses of fish and fish predator tissues to increase knowledge of range and levels of pollutants in Swedish waters.
3. Reduce pollution levels both locally and internationally since much pollution is air-borne to Sweden.
4. Prevent further damaging habitat modification in areas where otters still occur.
5. Prohibit the use of fyke nets in areas where otters still occur.
6. Public education on otter conservation.
7. Improve biotopes between isolated populations in order to encourage genetic exchange.

Switzerland

Status and Distribution

Almost extirpated: restricted to one small lowland area only (remnant of reintroduction program in 1975).

Legal Status

Protected.

Threats

1. Habitat destruction and fragmentation of suitable habitats.
2. Water pollution.

Conservation Priorities

1. Assessments of habitat and pollution levels throughout Switzerland as basis for a decision on possible reintroduction of otters.
2. Continue monitoring remnant otter population.

United Kingdom

Status and Distribution

Thriving populations mainly in upland and adjacent coastal areas. Widespread in Scotland, populations being especially strong on the west coast and the western and northern islands (Green and Green 1987). In Wales, generally widespread and populations probably expanding, though absent from the industrial south and recently extirpated on the island of Anglesey (Andrews and Crawford 1986). In England, thriving populations only in the southwest and the borders with Wales and Scotland. Otherwise England supports only scattered, endangered populations (Lenton et al. 1980). Re-stocking has recently been attempted in some rivers in eastern England.

Legal Status

Protected.

Threats

1. Pollution, especially by organochlorine compounds in lowland and coastal areas.
2. Drowning in fyke nets and crustacean traps.
3. Riparian habitat destruction important in the past, probably less so now, but much degraded habitat has resulted from



Six-week old Eurasian otters (*Lutra lutra*) (Photo courtesy of Alpenzoo, Austria).

past activities.

4. Drainage of wetlands locally important.
5. Rapid and largely uncontrolled mariculture, particularly of salmon, in Scottish sea lochs poses a potential threat to very important coastal populations.
6. Increasing recreational activities in areas where habitat is sub-optimal.

Conservation Priorities

1. Continued studies of accumulating pollutants in otters found dead and development of techniques to assess pollutants in extant populations, for example using burdens in spraints.
2. Intensified studies of otter ecology (including radio telemetry) in threatened populations, particularly in agricultural lowlands.
3. Monitoring, on a regular basis, those populations which appear to be spreading and assessment of habitat require-

- ments and pollution burdens as they move into new areas.
4. Studies of interactions between otters and mariculture.

Yugoslavia

Status and Distribution

Occurs through most of the country, with the exception of the mountainous northwest part of the Adriatic coast and the islands. Good populations exist in central parts and along the edges of the Pannonic lowlands. Inland, the population density along the main rivers (e.g. Sava, Danube, upper Drava) is generally low or the species is extirpated. Virtually nothing is known of the distribution in the eastern part of the Pannonic lowland.

Legal Status

Some regional variations. Fully protected (date of protection in brackets) in Croatia (1972), Serbia (1976), Macedonia (1973), Slovenia (1976), Vojvodina (1977), Kosovo (1976), and Montenegro (1987). Partial protection, with a hunting season, in Bosnia and Herzegovina.

Threats

1. Habitat destruction, particularly river regulation and irrigation schemes.
2. Pollution of industrial and agricultural origin, and in some parts also with sewage.
3. Road traffic.
4. Disturbance.
5. Illegal killing.

Conservation Priorities

1. Unify the legal status throughout the country; sign both the CITES and Bern Conventions.
2. Educational work for both public and local authorities.
3. A field survey of the status of the otter throughout the country.
4. Assessment and conservation of good otter habitat.

10. Action Plan for African Otters

D.T. Rowe-Rowe

Introduction

Four otter species occur in Africa. The Eurasian otter (*Lutra lutra*) occurs only in the rivers rising in the Atlas mountains. Three species are endemic to Africa: The Cape clawless otter (*Aonyx capensis*), the Congo clawless otter (*Aonyx congica*), and the spotted-necked otter (*Lutra maculicollis*). Throughout the high rainfall regions (i.e. within the 500 mm isohyet) of sub-Saharan Africa at least one of these species, often more, can be expected to be present. Otters are absent from only six countries on the African continent: Djibouti, Egypt, Libya, Mauritania, Somalia, and Western Sahara. With the exception of Egypt, these countries probably do not have sufficient permanent water for otters.

In most of the countries, within the ranges of the four otter species, the greatest threat to the existence of the animals has been identified as the rapidly increasing human population. This leads to drastic habitat alteration or loss of habitat following increased agricultural activity, unsound agricultural practices, overgrazing, or lack of natural resource conservation. The mean annual human population growth rate of the countries in which otters occur is 2.9%, which represents a doubling time of 25 years.

In this chapter nomenclature follows Meester et al. (1986). Status is rated as very rare, rare, fairly common, or common. Data on human populations were obtained from Coulombe (1982) and Willett (1987). Otters occur in 41 African countries, and each of these is discussed in the country accounts below. Information was collected by contacting nature conservationists and biologists in countries throughout the distributional ranges of the three sub-Saharan otters. Addresses of environmental protection agencies were obtained from IUCN/UNEP (1987). Data on the Eurasian otter were provided by C.F. Mason *in litt*.

Cape Clawless Otter (*Aonyx capensis*)

The Cape clawless otter is distributed from South Africa northwards to Ethiopia in the east and Senegal in the west, but is absent from the central rain-forest area of the Congo Basin (see Figure 1). Throughout its range it occurs in rivers and lakes, and all streams and swamps in which there is sufficient water to support crabs, frogs, and catfish or mudfish. Aspects of the Cape clawless otter's ecology and behavior have been studied in some detail in South Africa (Rowe-Rowe 1977a, b, c; van der Zee 1981, 1982; Arden-Clarke 1986). Conclusions drawn from



Cape clawless otter (*Aonyx capensis*) in South Africa (Photo by David Rowe-Rowe).

these studies were that the Cape clawless otter has evolved primarily as a feeder on crabs in freshwater habitats, where the diet is supplemented with frogs and fish. At some coastal localities this otter obtains food in the sea, taking mainly crustaceans and molluscs.

Congo Clawless Otter (*Aonyx congica*)

The Congo clawless otter occurs in the rain-forest habitats of the Congo River basin, extending eastward to the forests and wetland areas of Rwanda, Burundi, and Uganda (see Figure 2). No ecological studies have been carried out on this species. Kingdon (1977) suggested that the Congo clawless otter is dependent on "worms, insects, molluscs, crustaceans, and amphibians" in "montane marshes and lowland swamp forests".

Spotted-necked Otter (*Lutra maculicollis*)

The spotted-necked otter occurs throughout most of Africa south of 10° N. It is absent from the eastern half of Tanzania, Zimbabwe, all but the extreme northern portions of Botswana and Namibia, and the western half of South Africa (see Figure 3). Information on the ecology and behavior of the spotted-necked otter is contained in publications by Mortimer (1963), Procter (1963), Rowe-Rowe (1977a, b), and in recent reports by Lejeune (1989, in press a, b). The spotted-necked otter coexists



Spotted-necked otter (*Lutra maculicollis*) in South Africa (Photo by Dave Rowe-Rowe)

with the Cape clawless otter over most of its range, and the Congo clawless otter elsewhere. The spotted-necked otter is better adapted for the capture of fish than are the two clawless otter species, and is therefore more dependent on permanent, clear water.

Eurasian Otter (*Lutra lutra*)

The Eurasian otter in Africa is limited in distribution to the Maghreb (see Figure 4). Otters are not found in Egypt, despite the country being traversed by the River Nile with its extensive marshes and delta. The North African population is centered on the rivers rising in the Atlas Mountains. There have been no ecological studies of otters in the region, but field surveys have plotted the distribution of the species, though some areas remain to be surveyed. In this heavily grazed region, bankside vegetation is of particular importance to otters. The plant *Nerium oleander*, which is associated with streams and is poisonous to livestock, forms dense riparian thickets which provide shelter for otters, especially in the rivers of north Tunisia.

Country Accounts

Algeria

Species Present
Eurasian otter

Status and Distribution

The Eurasian otter is very localized. Present in Kabylie, particularly in the upper reaches of the Oued Sebaou catchment, but indications are that the population is low (Macdonald et al. 1985). Locally present in the western coastal hills, where it is contiguous with the Moroccan population, and also present in the northeast of the country, for example around El Kala, where populations are contiguous with those of Tunisia (K. de Smet, pers. comm).

Legal Status

Protected.

Threats

1. Gross pollution of many rivers, especially from domestic and industrial sources, with much industry being sited in small towns providing few facilities for pollution control. Agriculture is being extended and pollution from pesticides is likely. All water resources are threatened.
2. In many areas, riparian vegetation is largely absent, and there is much erosion of river banks.

Conservation Priorities

1. A complete field survey of the country is necessary to determine distribution more accurately, assess threats, and locate areas where conservation measures would be most effective.
2. Protection of wetland at El Kala and the rivers of Kabylie.
3. The control of pollution, especially in rural, upland areas where viable otter populations are most likely to occur. In particular, installation of sewage systems in villages of the Sebaou catchment.

Angola

Species Present

Cape clawless otter, Congo clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is rare, occurring in the southwest and apparently absent from eastern Angola (Crawford-Cabral 1989). The Congo clawless otter is rare, being limited to the tributaries of the Cuango and Casai Rivers (Crawford-Cabral 1989). The spotted-necked otter is fairly common, possibly occurring in all major rivers (Crawford-Cabral 1989).

Legal Status

No recent information.

Threats

Otters are killed, but the degree of exploitation is not known.

Conservation Priorities

The country's government departments are being reorganized following 14 years of civil war. Immediate priorities are the reinstatement of national park management and law enforcement.

Benin

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is rare and declining in some parts of the country. The spotted-necked otter is rare to very rare.

Legal Status

Protected in National Parks.

Threats

1. High human population density of $>35/\text{km}^2$ and rapid annual rate of population increase (2.8%).
2. Increasing demand for more agricultural land.
3. Overhunting and overfishing of all indigenous fauna.

Conservation Priorities

Programs on the conservation of agricultural resources and natural resources are required.

Botswana

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

Both the Cape clawless otter and the spotted-necked otter are rare, but as abundant as can be expected. They occur only in the Okavango Swamps and Chobe River, the rest of the country being arid to semi-arid.

Legal Status

Fully protected.

Threats

At present there are no major threats. Efforts to create faster water flow by 'channel improvement' could have effects on aquatic fauna in the Okavango Swamps, as would any attempts at draining the swamps.

Conservation Priorities

Sound management of the wetland areas (Okavango and Chobe), and strict control of their use by humans for tourism and pastoral reasons.

Burkina Faso

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is rare and probably declining. The spotted-necked otter is very rare. Both species are limited to the moister south and southeast of the country, and there is very little recent information.

Legal Status

Protected in National Parks. No recent information on legal status outside protected areas.

Threats

1. Human and agricultural expansion.
2. Overhunting and overfishing.

Conservation Priorities

A field survey needs to be carried out and suitable areas for otter conservation identified. There is a shortage of staff and funds.

Burundi

Species Present

Congo clawless otter, spotted-necked otter

Status and Distribution

The Congo clawless otter and the spotted-necked otter possibly still occur (Coetzee 1971; Meester et al. 1986), but there is no recent information on status.

Legal Status

Unprotected.

Threats

No recent information.

Conservation Priorities

A survey is needed to assess the status and conservation needs of otters in Burundi.

Cameroon

Species Present

Congo clawless otter, spotted-necked otter

Status and Distribution

The Congo clawless otter is very rare and the spotted-necked otter is rare.

Legal Status

No recent information.

Threats

No recent information.

Conservation Priorities

More information on the status and distribution of otters is needed.

Central African Republic

Species Present

Cape clawless otter, Congo clawless otter, spotted-necked otter

Status and Distribution

The Congo clawless otter is locally fairly common in the dense lowland rain-forest region in the southwest, where the spotted-necked otter is also fairly common. Elsewhere both the Cape clawless otter and the spotted-necked otter are very rare. The rivers have sterile, sandy beds and do not support much aquatic life.

Legal Status

Otters are fully protected in nature reserves and may not be hunted outside reserves, unless accidentally caught in fish traps or nets.

Threats

No major threats. Otters are killed opportunistically for food, or caught in fish traps or nets.

Conservation Priorities

1. A field survey to determine the status and ecology of otters, particularly the Congo clawless otter, is necessary.
2. Conservation of the lowland rain-forest region in the south-

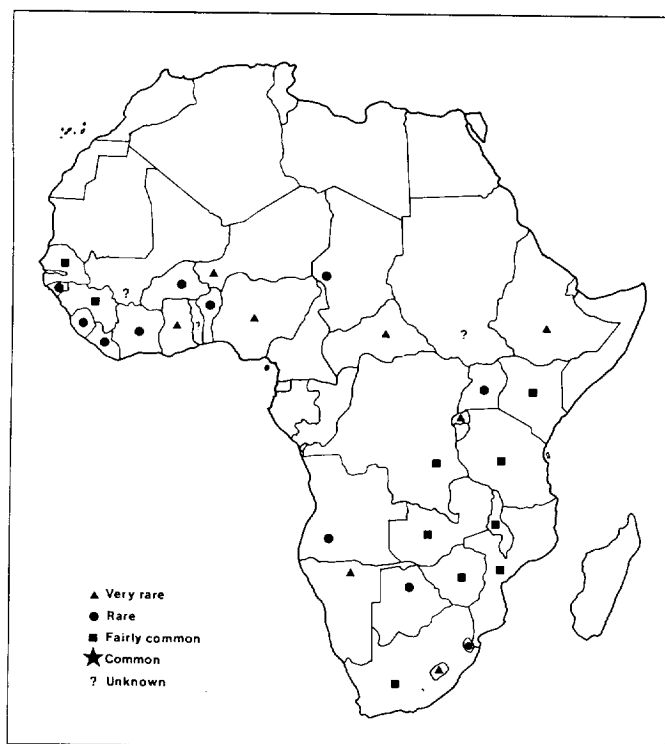


Figure 1. Distribution of the Cape clawless otter (*Aonyx capensis*).

west, including carefully planned sustainable use of forest products.

Chad

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter and the spotted-necked otter occur only in the vicinity of Lake Chad, where they are locally rare to fairly common.

Legal Status

Otters do not occur in any of the country's national parks. Outside of parks they are offered legal protection in terms of the nature conservation ordinance.

Threats

1. Drying-up of Lake Chad.
2. Declines in food resources.
3. Hunting.

Conservation Priorities

1. Enforcement of the hunting and nature conservation ordinance.
2. Protection of some otter habitats.
3. Assist the people around Lake Chad to use natural resources wisely and to avoid overexploitation.

Congo

Species Present

Congo clawless otter, spotted-necked otter

Status and Distribution

The Congo clawless otter is rare, inhabiting small streams in dense forest. Locally fairly common in the Likouala and Cuvette regions. The spotted-necked otter is fairly common in Lake Tele (Likouala region). Its status is not known in the rest of the country.

Legal Status

Otters are protected in certain parks and faunal reserves, depending on the status of the protected area.

Threats

No serious threats have been identified. Some otters are caught in fish nets or fish traps. Otters are also killed as they are regarded as competitors for food, or because they damage fish traps and nets.

Conservation Priorities

More information is needed on the distribution and status of otters, and on the ecology of the Congo clawless otter.

Equatorial Guinea

The Congo clawless otter and the spotted-necked otter presumably both occur, but there is no recent information.

Ethiopia

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

Both the Cape clawless otter and the spotted-necked otter are apparently very rare.

Legal Status

Protected in at least one national park. Also protected outside protected areas.

Threats

1. The dense human population (>30/km) which continues to increase at approximately 2.6% per annum has been responsible for some environmental changes and degradation which adversely affect otter habitats. Other habitat modifications, such as the construction of large dams and many small hydroelectric schemes, are likely to be beneficial to otters.
2. Some otters are killed and the skins sold on local markets.

Conservation Priorities

1. More accurate information on the status and distribution of otters is required.
2. Information on the condition of wetland habitats in major national parks (e.g. Awash and Bale Mountains Park) is required before predictions on the future for otters can be made.

Gabon

Species Present

Congo clawless otter, spotted-necked otter

Status and Distribution

The Congo clawless otter is rare to fairly common, depending on habitat suitability. The spotted-necked otter is rare.

Legal Status

Apparently protected in conservation areas but unprotected elsewhere.

Threats

No serious threats but reports of decreases in otter numbers in rivers which are heavily fished and where all game is hunted.

Conservation Priorities

Acquire information on the ecology and habitat requirements of the Congo clawless otter.

Gambia

The Cape clawless otter presumably occurs, but there is no recent information.

Ghana

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is very rare. The status of the spotted-necked otter is unclear, and it is not certain whether it is still present.

Legal Status

Protected in national parks and reserves.

Threats

The human population density is very high ($>60/\text{km}^2$) with an annual growth rate of 3.6%. Consequently, there is increasing

pressure on the land to produce more food and raise more livestock. Habitats for wildlife are being lost or altered and wild animals forced out or exploited.

Conservation Priorities

Determine the status of otters in protected areas and identify factors which will ensure their continued existence in these areas.

Guinea

Species Present

Cape clawless otter

Status and Distribution

The Cape clawless otter is locally fairly common in suitable habitat.

Legal Status

Special authority is needed to hunt otters. They are fully protected in strict nature reserves and national parks.

Threats

1. The mismanagement of natural resources, particularly gallery forest.
2. Some otters are illegally killed for meat.
3. Other threats may be identified if more detailed studies of the country's fauna and habitats are undertaken (see below).

Conservation Priorities

1. Surveys should be carried out to determine the distribution and status of otters, and to identify important habitats with viable populations.
2. Improve resource management, and the protection of wetlands and other otter habitats.
3. Laws protecting fauna and flora need to be more strictly applied.
4. New approaches are needed to make people more aware of the importance of habitat conservation.

Guinea-Bissau

Species Present

Cape clawless otter

Status and Distribution

The Cape clawless otter is rare.

Legal Status

Unprotected.

Threats

1. There are currently no protected areas for wildlife, but a number of controlled hunting areas exist. Otters are not specifically hunted in these areas.
2. Some traditional hunting of otters takes place and the skins are sold in the capital.
3. Agricultural development, especially the cultivation of rice, is responsible for loss of habitat and habitat changes.

Conservation Priorities

1. The creation of protected areas for wildlife.
2. Better law enforcement.

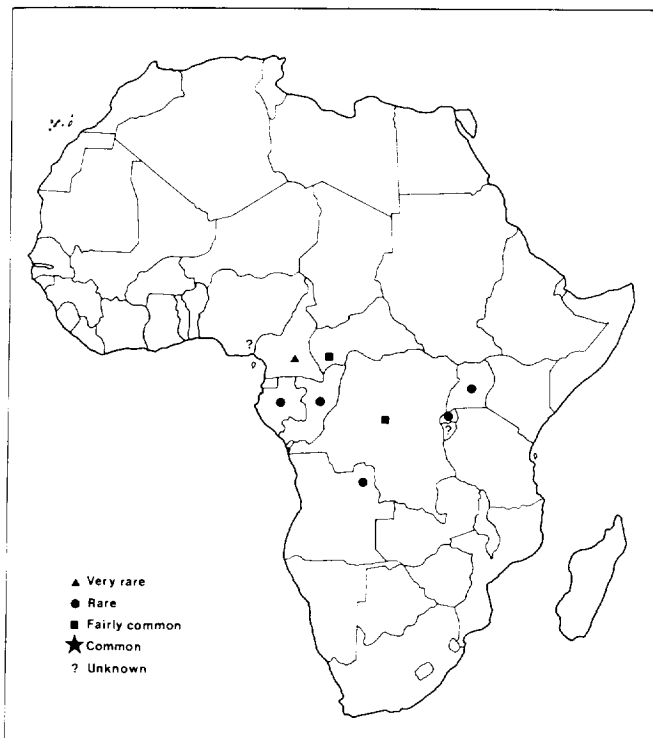


Figure 2. Distribution of the Congo clawless otter (*Aonyx congica*).

Ivory Coast

Species Present

Cape clawless otter, spotted-necked otter

Status Distribution

The Cape clawless otter is rare. The status of the spotted-necked otter is not known. Earlier distribution records referred to its occurrence (Meester et al. 1986), and it has recently been recorded in Tai National Park.

Legal Status

The Cape clawless otter and spotted-necked otter occur in at least one national park and are also protected outside parks.

Threats

1. The country has a fairly dense human population (33/km) which is increasing at 4.3% per annum.
2. Major threats to otters emanate from loss of habitat and deforestation.

Conservation Priorities

1. The implementation of forest conservation measures and better land management throughout the country generally.
2. Improved enforcement of the hunting laws.

Kenya

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is fairly common in suitable habitats. The spotted-necked otter is rare, but locally fairly common on the shores of Lake Victoria.

Legal Status

Fully protected: a license is required to capture or kill otters.

Threats

1. The human population of c. 35/km² has an annual growth rate of 3.5%. Wetland areas are being cleared and drained for agriculture.
2. Rural populations are increasing with consequent effects on riparian vegetation and stream quality.
3. Streamflow in hilly areas is not as regular as formerly, owing to deforestation. This could have an indirect effect on the Cape clawless otter.
4. The spotted-necked otter is being affected mainly by increased human activity on the lake shores.

Conservation Priorities

1. Educational programs to promote family planning and sound agricultural practices.
2. The identification of sufficient suitable wetland areas within national parks or outside of them, to ensure the future of otters in Kenya.
3. Catchment protection by enforcing the laws within forest National Parks (especially against logging).
4. The future of the spotted-necked otter depends largely on the prevention of further interference on the shores of Lake Victoria. There needs to be cooperation between Kenya, Uganda, and Tanzania on the conservation of this species.

Tanzania has a very important population in Rubondo Island National park in Lake Victoria.

Lesotho

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is very rare and declining. The spotted-necked otter is possibly extirpated.

Legal Status

Protected only in the country's single national park.

Threats

The high human population density (c. 50/km²) and high annual growth rate of 2.5% have led to:

1. Severe siltation of streams following overgrazing and agriculture.
2. Increased hunting pressure on all animals.

Conservation Priorities

Implementation of catchment conservation measures. Some are currently planned.

Liberia

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

Both the Cape clawless otter and the spotted-necked otter are fairly common in Sapo National Park. Elsewhere in the country they are locally rare to fairly common.

Legal Status

Otters are fully protected in the country's single national park and partially protected elsewhere.

Threats

1. The human population which has a density of 20/km² increasing at 3.4% annually.
2. Loss of primary forest and silting of streams.
3. Pollution of St. John River from iron ore extraction.
4. Some otters are killed for meat or skins. Hunting pressure ranges from moderate to intense in a few areas.

Conservation Priorities

1. A nationwide mammal and hunting survey (currently being undertaken).
2. Public awareness campaigns and education programmes in habitat protection.
3. Staff development programs, increased public involvement, and enforcement of wildlife regulations.

Malawi

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is fairly common in wetland areas and streams. The spotted-necked otter is common in Lake Malawi,

and fairly common in major rivers.

Legal Status

Fully protected.

Threats

1. Malawi has a dense human population (c. 60/km²) which has a high annual growth rate of 2.9%.
2. Agricultural expansion in rural areas with loss of wetland habitats and pollution of streams, and increased human settlement on the shores of Lake Malawi.
3. Although protected, otters are killed opportunistically and the skins are sold. Some are caught in fish traps and nets.
4. Increase in tourism, number of motorized boats, and activity on the lake.

Conservation Priorities

1. The identification of some wetland areas (marshes, swamps, and associated streams) which should remain undisturbed.
2. Education in family planning, soil conservation, and sustainable agriculture.

Mali

The Cape clawless otter and the spotted-necked otter have been recorded, but there is no recent information on their status.

Morocco

Species Present

Eurasian otter

Status and Distribution

The Eurasian otter is widespread in rivers of the foothills of the Moyen Atlas, but rather scarce in the lowlands where popula-



Spotted-necked otter (*Lutra maculicollis*) (Photo courtesy of the Chicago Zoological Society).

tions are becoming fragmented. The species also exists on the Saharan side of the Atlas where rivers run into the desert (Macdonald and Mason 1984; Broyer et al. 1984; Aulagnier 1985.)

Legal Status

No recent information.

Threats

1. Construction of dams and abstraction of water for irrigation, leaving many river beds dry.
2. Removal of bankside vegetation for fuel and by overgrazing.
3. Pollution with pesticides may be important in lowland areas of intensive agriculture.

Conservation Priorities

1. Systematic field survey of whole country to determine distribution more accurately, assess threats, and locate populations requiring particular conservation strategies.

Mozambique

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is possibly fairly common in streams and wetland areas. The spotted-necked otter is very rare.

Legal Status

Protected in four national parks and five reserves. Hunting outside reserves is controlled by legislation.

Threats

1. Otters are killed for meat and their skins, but the extent of killing is not known.
2. Lack of law enforcement owing to staff shortage, and inaccessibility of many areas because of the security situation.
3. Agriculture on river banks appears to be a significant threat.

Conservation Priorities

1. An assessment of the current status of otters. At present conservation priority is given to economically important or vulnerable large mammals. The conservation significance of otters is not recognized.
2. The identification of threats to the existence of otters, and the promotion of conservation awareness with particular emphasis on habitat conservation.

Namibia

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is very rare and occurs only in the Okavango and Kunene rivers on the northern border. The spotted-necked otter is very rare in the Kunene and slightly more abundant in the Okavango river.

Legal Status

Protected.

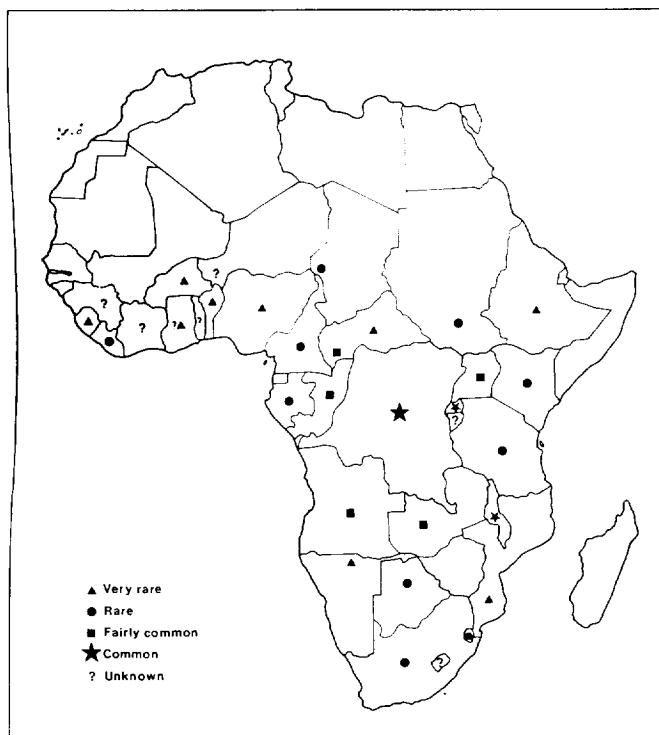


Figure 3. Distribution of the spotted-necked otter (*Lutra maculicollis*).

Threats

Very little is known about otters in these two rivers, which form international borders in what has been an area of military activity.

Conservation Priorities

1. Determine the status of otters in the Okavango and Kunene rivers.
2. Identify any threats.

Niger

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is very rare and occurs only in the south of the country. The spotted-necked otter has not been reported in recent years, though Coetzee (1971) referred to distribution records of this species in the south.

Legal Status

Total protection is afforded.

Threats

Alteration of habitats and habitat destruction.

Conservation Priorities

1. Inventory of remaining otter refuges.
2. Increased public awareness and involvement in environmental conservation.
3. More staff and equipment, and improved law enforcement.

Nigeria

Species Present

Cape clawless otter, Congo clawless otter, spotted-necked otter

Status and Distribution

Both the Cape clawless otter and the spotted-necked otter are very rare, and possibly declining. The Congo clawless otter has been reported from Cross River State (in the southeast of the country), but its current status is not known.

Legal Status

Protected.

Threats

1. Nigeria has a very high human population density of c. 100/km² with an annual growth rate of 3.2%.
2. Otter numbers and their distributional range have declined following loss of habitat and habitat changes owing to human expansion.
3. Deliberate and widespread poisoning of riverine fish with natural and synthetic toxins.

Conservation Priorities

Determine the status of otters in the country's nature reserves and identify issues which might affect their survival in these areas.

Rwanda

Species Present

Cape clawless otter, Congo clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is very rare, occurring mainly in marshes. The Congo clawless otter is rare, occurring around some lakes and along certain rivers, as well as wetland areas at Nyungwe. The spotted-necked otter is common in Lake Muhazi, and fairly common in Lakes Kivu, Bulera, and Luhondo.

Legal Status

Otters are protected in two national parks, but not elsewhere.

Threats

Loss of habitat owing to a high human population density (c. 180/km²) with an annual growth rate of 2.4%. There is also some traditional hunting.

Conservation Priorities

A survey is needed of all otter species to assess their conservation requirements.

Senegal

Species Present

Cape clawless otter

Status and Distribution

The Cape clawless otter is fairly common.

Legal Status

Protected.

Threats

No major threats known at present. The construction of dams

might affect stream flow and flood mangroves, but could also provide additional habitat for otters.

Conservation Priorities

A study is needed in the south of the country to gain a better understanding of the ecology of the Cape clawless otter in Senegal, and to provide guidelines for conservation measures.

Sierra Leone

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is rare. The spotted-necked otter is very rare.

Legal Status

Protected in nature reserves. Exploitation is controlled by hunting regulations outside of reserves.

Threats

1. The human population density of c. 55/km² has an annual growth rate of 2.6%.
2. Natural vegetation is being cleared for agriculture, consequently affecting water quality and aquatic life.
3. Increased human activity on rivers and lakes, including poisoning of fish.

Conservation Priorities

1. A field survey to establish the current status and distribution of otters.

2. Better protection of otters, and conservation management of suitable habitats.

South Africa

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is fairly common and occurs throughout the eastern half of the country and along the southern coast. The spotted-necked otter is rare and occurs in permanent inland waters in the eastern half of the country.

Legal Status

Protected in the 151 national parks and game or nature reserves in which they occur. Outside of reserves skins or live animals may not be sold.

Threats

1. Increasing rural human population (growth rate of 2.8%) with agricultural expansion and over-grazing by livestock in some areas.
2. Siltation of streams where soil and water conservation are not practiced.
3. Urban expansion with pollution of streams and rivers in the vicinity of towns.

Conservation Priorities

1. Increased efforts in campaigns to promote family planning.
2. Increased efforts to educate rural people in soil and water conservation, reduction in livestock, grassland management, and sound agricultural practices.

Sudan

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The current status of the Cape clawless otter is not known, though it was previously recorded in southern Sudan (Meester et al. 1986). The spotted-necked otter is rare.

Legal Status

Otters are protected in national parks and areas outside reserves.

Threats

No major threats identified. Some otters are accidentally caught in fish nets.

Conservation Priorities

A survey is needed to identify conservation needs.

Swaziland

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is widely distributed, but rare. The spotted-necked otter is rare.

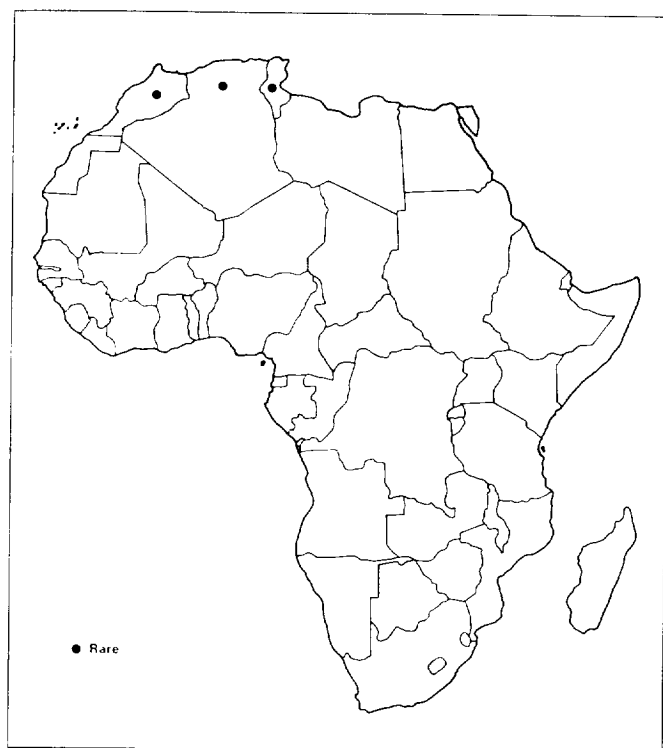


Figure 4. Distribution of the Eurasian otter (*Lutra lutra*) in Africa.

Legal Status

Otters are protected in the country's five game reserves, where their status is secure. Outside of reserves they are not protected.

Threats

1. The dense human population (40/km²) is increasing at 3.3% per annum, with consequent over-grazing by livestock, soil erosion, and siltation of streams.
2. Some otters are hunted and killed opportunistically. Associated with the increasing human population is an ever-increasing number of dogs which hunt and disturb wildlife.
3. Aquatic pollution stemming from paper-pulp milling and mining.

Conservation Priorities

1. The promotion of sound agricultural practices, and soil and water conservation. A National Environment Education Programme is currently in operation and working towards conservation awareness.
2. Controls on the discharge of effluent into streams need to be implemented.

Tanzania

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is fairly common where there is suitable habitat in rivers and streams. The spotted-necked otter is fairly common on the shores of Lakes Victoria, Tanganyika, Malawi, and Rukwa, but very rare or absent from the rest of the country.

Legal Status

Protected in national parks. May not be hunted or captured without a permit outside of parks.

Threats

1. Expansion of human population, damage to wetland sponges, and draining of swamps.
2. Disturbance of the lake shores by increasing human settlements and their domestic animals, including dogs.
3. Intensive fishing, the accidental capture of the spotted-necked otter in fish nets, and the disruption of indigenous fish communities (e.g. by the introduction of Nile perch).
4. In hilly areas deforestation or other disturbances on slopes has been detrimental to streamflow, and will have an indirect effect on the Cape clawless otter.

Conservation Priorities

1. Wetland conservation.
2. Catchment protection, particularly the enforcement of laws governing deforestation, to ensure a constant flow of clean water.
3. The protection of the lake shore habitats from further interference. Ideally more lake parks (like the existing Rubondo Island and Gombe Stream National Parks) are needed to protect both the shores and the open water used by the spotted-necked otter.



Spotted-necked otter (*Lutra maculicollis*) (Photo courtesy of the Chicago Zoological Society).

Togo

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter and the spotted-necked otter have been recorded in the country (Coetzee 1971; Meester et al. 1986), and are believed still to occur, but there is no recent information on status.

Legal Status

Otters are protected throughout the country and laws are strictly enforced.

Threats

1. The country is densely populated (>50/km²) and many natural habitats have been lost or altered.
2. The spraying of insecticides on riverine vegetation may have adverse effects on aquatic organisms.

Conservation Priorities

1. Information on the distribution and status of otters, as well as their habitats, is required.
2. A country-wide fish survey is planned, with the aim of developing a plan for the wise use of indigenous fish.

Tunisia

Species Present

Eurasian otter

Status and Distribution

The Eurasian otter is largely restricted to the area west of Tunis and north of the Oued Medjerda, but in this area it appears widespread and locally common. Lake Ichkeul and its feeder rivers are of particular importance. An isolated population is present to the south and east of this region (Macdonald and Mason 1983b).

Legal Status

Protected.

Threats

1. Dams for irrigation, particularly on those rivers flowing into Lake Ichkeul.
2. Increased irrigation and hence agricultural productivity may lead to increased use of pesticides.

Conservation Priorities

1. A more intensive survey of the country to assess distribution and assess potential threats more accurately.
2. Ecological study on Lake Ichkeul and its rivers, including determination of diet and use by otters of the catchment, so that the potential effects of ecological changes caused by damming of affluent rivers can be assessed.

Uganda

Species Present

Cape clawless otter, Congo clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is rare. The Congo clawless otter is rare, occurring only in the west of the country. The spotted-necked otter is fairly common, for instance in Lakes Bunyeni and Kigezi, though rare in the Ugandan portion of Lake Victoria. It occurs also in larger permanent rivers.

Legal Status

Protected in three national parks, but unprotected elsewhere.

Threats

1. A dense human population (c. 70/km²) which is rapidly expanding (3.4% per annum), and continually requires more land for agriculture and livestock.
2. The draining of swamps and natural wetland sponges.

Conservation Priorities

Programs to encourage family planning and to promote conservation of soil, water and wetlands.

Zaire

Species Present

Cape clawless otter, Congo clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is fairly common in the Lualaba River area in Katanga. The Congo clawless otter is fairly common in

lowland and rain forest rivers. The spotted-necked otter is common along rivers, mainly in forest areas and around Lakes Edward, Kivu, and Tanganyika.

Legal Status

Protected in national parks. A permit is needed to hunt otters outside of parks.

Threats

More information is needed.

Conservation Priorities

A detailed field study on the Congo clawless otter needs to be undertaken, concentrating on diet and habitat requirements.

Zambia

Species Present

Cape clawless otter, spotted-necked otter

Status and Distribution

The Cape clawless otter is fairly common. The spotted-necked otter is fairly common in the west, but very rare or absent in the east.

Legal Status

The Cape clawless otter is protected in eight national parks where they definitely occur. They are possibly present in another eight parks. The spotted-necked otter is protected in four national parks where they definitely occur, and in another nine where they possibly occur. A licence is needed to hunt otters outside of national parks.

Threats

No major threats known. Very limited hunting for skins.

Conservation Priorities

None so far identified, other than a survey to assess conservation needs more adequately.

Zimbabwe

Species Present

Cape clawless otter, spotted-necked otter (?)

Status and Distribution

The Cape clawless otter is fairly common along some rivers and man-made lakes. The spotted-necked otter is generally believed to be absent, but may occur in the Zambezi River above the Victoria Falls.

Legal Status

Protected in national parks. Landowners may hunt otters, but overexploitation is curtailed by the wildlife regulations.

Threats

No major threats. Some streams have become silted owing to overgrazing or agriculture. Generally, however, it is believed that water conservation measures and the construction of numerous lakes and dams throughout the country have enhanced rather than threatened the status of otters.

Conservation Priorities

Implementation of conservation-oriented farming practices, particularly regarding the regulation of livestock numbers.

11. Action Plan for Asian Otters

Pat Foster-Turley and Charles Santiapillai

Introduction

Five species of otter are known from Asia. They are: the Eurasian otter (*Lutra lutra*), the smooth otter (*Lutra perspicillata*), the hairy-nosed otter (*Lutra sumatrana*), the Asian small-clawed otter (*Aonyx cinerea*), and the sea otter (*Enhydra lutris*). The sea otter is thoroughly covered in Chapter 8, and will not be considered again here. Likewise, what is known of the Eurasian otter in the Asian regions of the Soviet Union is covered in Chapter 9.

Throughout their distribution in Asia, otters are being threatened by a combination of habitat destruction, hunting, and environmental pollution, especially from the organochlorines. The demand for natural resources in the Asian region is bound to increase sharply. The human population is predicted to reach 3.4 billion by the year 2000 and is not expected to stabilize below 6 billion in the latter part of the twenty-first century. This growth rate alone indicates a doubling in the demand on the natural resources every 30 years or less. In reality, the situation is likely to be worse than this, since most Asian economies are booming, and the resource use per person can be expected to increase drastically over the next 20 years. One of the consequences of the burgeoning human population across Asia is the rapid conversion of forests to other land uses. The conversion of forests in general and the riparian vegetation in particular is a serious conservation problem in Asia. Otters are among the animals that suffer.

Direct threats to the otters in Asia include killing them for their pelts, or for their organs, which are thought to have medicinal value in some regions. Otters are also sometimes killed because they are thought to compete with fishermen, or because of their depredations upon fish-farming operations. The indirect threats such as pollution of the environment with industrial and agricultural wastes are even more serious. Of particular concern are the organochlorines, especially PCBs (polychlorinated biphenyls), which are bio-magnified at the top of the food chain. As the level of PCBs in the wetlands increases, there is usually a general decline in aquatic mammals, such as otters. It is therefore quite alarming to note that large quantities of PCBs are still in use in Asian countries. Unless these are collected and destroyed, they will remain a potent threat to the survival of the otters and other wildlife in the wetlands. Evidence suggests that the accumulation of PCBs has been largely responsible for the widespread decline of populations of the Eurasian otter in Western Europe (Mason and Macdonald 1986a). A similar problem could be developing in



Asian small-clawed otter (*Aonyx cinerea*) at the Bronx Zoo, New York, United States (Photo courtesy of New York Zoological Society).

Asia. In many countries in Asia where otters were once common, they have disappeared due to a combination of these direct and indirect threats. In Hong Kong, Japan, and Singapore, otters are believed to be extirpated, and otters of all species are rare in much of the rest of Asia.

Despite the overall pessimistic condition facing otters in Asia, there are some causes for guarded optimism as well. In Peninsular Malaysia, for instance, otters are still widespread in many areas, even beyond the boundaries of protected areas. In other countries, healthy populations of otters remain in national parks and preserves. Indonesia in particular has an excellent system of protected areas that covers all the major habitat types and ecosystems. However, the main problem is in protecting these areas from those activities of people that are incompatible with otter survival. National parks and other protected areas are prone to environmental disturbances outside their boundaries. Herein lies the crux of the problem concerning the conservation of otters in Asia.

With the exception of the sea otter, little is known about the natural behavior and ecology of the Asian otters, apart from the summaries in general field guides and mammalogy references like Medway (1978), Lekagul and McNeely (1977), Roberts (1977), and Nowak and Paradiso (1983). This information is summarized below, as presented at the Fifth International Otter Colloquium (Foster-Turley in press).

Asian Small-clawed Otter (*Aonyx cinerea*)

The Asian small-clawed otter is the smallest of the world's otters, rarely weighing more than 5 kilograms. A gregarious species, it is often seen in large groups of up to 15 animals (Furuya 1977), and captive studies suggest that these groups are composed of an alpha breeding pair and their offspring from successive litters (Foster-Turley and Engfer 1988). Asian small-clawed otters have unusual hand-like front paws with increased tactile sensitivity (Radinsky 1968) and reduced webbing, which they use to forage for their prey of crustaceans, molluscs, and small fish. Asian small-clawed otters are found from Palawan (Philippines) through Indonesia, southeast Asia, southern China, and westwards through the Himalayan foothills of Bangladesh, Bhutan, and Nepal. A disjunct population occurs in southern India (see Figure 1).

Smooth Otter (*Lutra perspicillata*)

Smooth otters are so-named for their shorter, smoother coats, as compared to the similar-sized sympatric *Lutra* species. From captive studies (Desai in press) this otter appears to be monogamous and is usually seen year-round in small family groups. Although little is known about the ecology of this species, it is known to occur in a variety of Asian habitats, from mangroves, to freshwater wetlands and large forested rivers. The smooth otter is distributed throughout southern Asia from Indonesia, through southeast Asia, and westwards through southern China and India, with an isolated population in Iraq (see Figure 2). In most of its range it is sympatric with the Asian small-clawed otter and sometimes the other *Lutra* species. Of all the Asian otters, this one seems to be the most common through most of its range.

Eurasian Otter (*Lutra lutra*)

The Eurasian otter has been well-studied in Europe (Chanin 1985; Mason and Macdonald 1986a), but its ecology in Asia remains unknown. Eurasian otters are primarily fish-eaters, although they also eat other vertebrates and crustaceans. In Europe these otters tend to be solitary and generally at low density when found in freshwater rivers and marshes, but are more numerous in coastal environments where food is more plentiful. In Asia, they are very elusive and rare. They are especially susceptible to human-induced disturbances and thus occur mostly in higher altitude streams and other remote areas. The Eurasian otter is widely distributed throughout all of Eurasia from Western Europe to the Northern Pacific coast and south through Central and Southeast Asia (see Figure 3). More information is also provided in Chapter 9 (on its status in Europe) and Chapter 10 (on its status in North Africa).

Hairy-nosed Otter (*Lutra sumatrana*)

The hairy-nosed otter is the rarest and the least known of the Asian otters and is also the most difficult to identify in the field. It gets its name from the presence of hair on its rhinarium; in most other respects it is similar to the Eurasian otter. It is probably verging on extinction in the northern parts of its range,

and is of uncertain status elsewhere. This otter was once found from southern Indochina and Thailand through Malaysia and Indonesia (Sumatra, Java, and Borneo), although its current distribution is unknown (see Figure 4).

Information for the following country by country accounts was compiled from data presented at the First International Asian Otter Symposium held in Bangalore, India, in October 1988, and from responses to a questionnaire mailing. All correspondents providing information on their countries are gratefully acknowledged in Appendix 2.

Country Accounts

Afghanistan

The Eurasian otter has been recorded, but there is no recent information on its status.

Bangladesh

Species Present

Asian small-clawed otter, smooth otter, Eurasian otter

Status and Distribution

All species of otters were once widespread throughout the country but habitat destruction and human encroachment now confines them mostly to certain wetland areas and remaining tracts of forest.

The Asian small-clawed otter is very rare and found in small numbers in forested areas in Chittagong and the Chittagong Hill Tracts, in wetlands in Sylhet and in the Sunderban Forest in Khulna. It is non-existent in most populated and agricultural areas, although it has been sighted in homestead areas around Dhaka.

The smooth otter is the most common otter throughout Bangladesh, although its distribution and numbers are shrinking. It is common in forested areas in Barisal, Chittagong, and the Chittagong Hill Tracts, in the wetlands and homestead areas of Mymensingh, and the Sunderbans Forest and homestead areas of Khulna. This otter is common in homestead areas around Dhaka and is also occasionally sighted in all other districts of Bangladesh.

The Eurasian otter is very rare and found in small numbers in forested areas in Chittagong and the Chittagong Hill Tracts and in the wetlands of Mymensingh and Sylhet districts. It is non-existent in agricultural and homestead areas throughout the country except for occasional sightings in Dhaka and Mymensingh districts.

Legal Status

Protected: internal and external trade and local consumption are banned.

Threats

1. Habitat destruction due to human encroachment. Forests are now restricted to less than 9% of the total land area, and more land is continually being cleared for agricultural or maricultural use. Brushy cover near homestead areas is disappearing due to fuelwood collection, and herbaceous plants and aquatic vegetation in wetland areas are also collected for fuel.

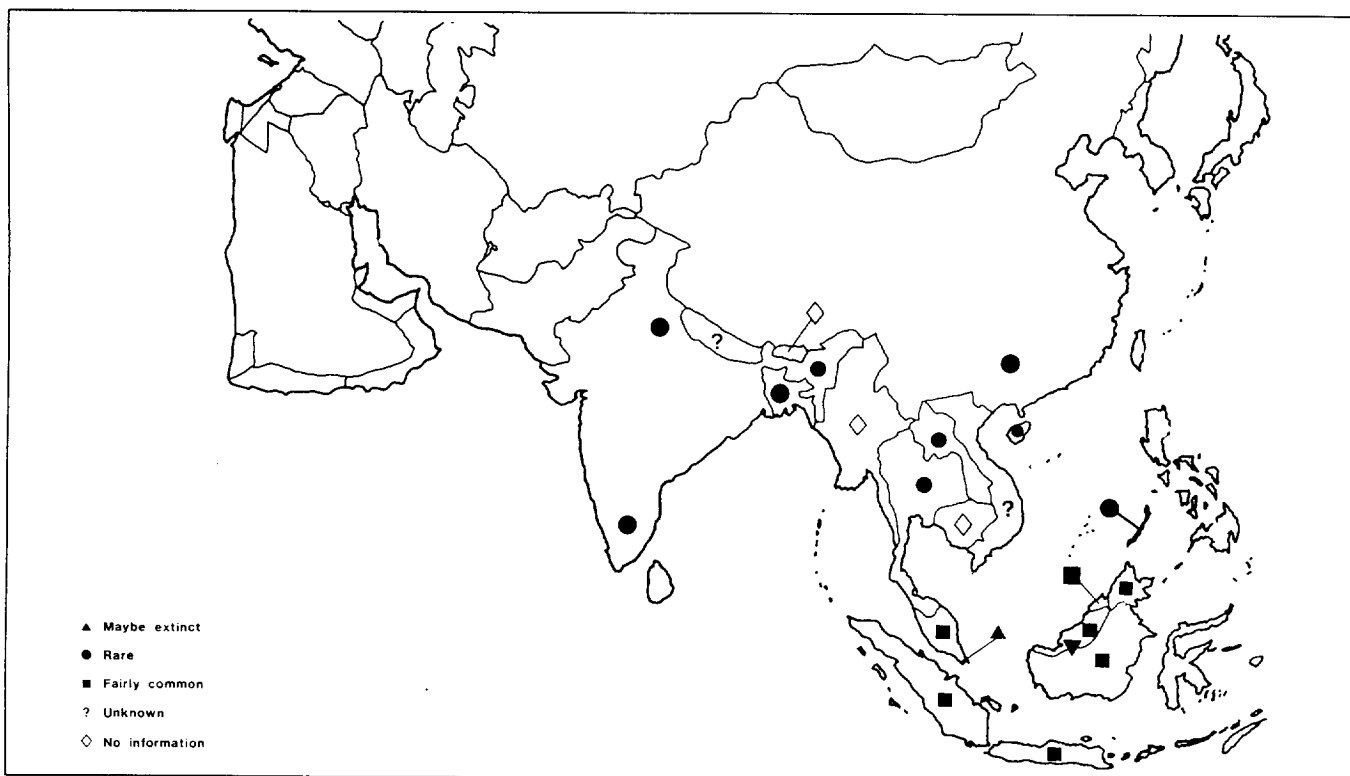


Figure 1. Distribution of the Asian small-clawed otter (*Aonyx cinerea*).

2. Otters are killed because of perceived competition with fishermen. More than five million people are dependent on fishing for their livelihood and many of these fishermen still depend on tame otters to drive fish into their nets. Historically these otters have been reared in captivity.
3. Otters are hunted illegally for the fur trade and sometimes for meat. CITES reports that 3,558 skins of smooth otter, originating from Bangladesh, entered international trade in 1980, with a further 427 in 1982.
4. Large-scale local embankment, and dike, dam, and road construction throughout the country is altering the free flow of water and drying up some bodies of water.
5. Heavy use of pesticides and fertilizers is contaminating many ponds and water bodies in rural Bangladesh.

Conservation Priorities

1. Legal protection and conservation programs for wetlands and other threatened habitats and species need to be developed. Specifically, the existing Bangladesh Wildlife (Preservation) Act of 1973 needs to be updated and enforced.
2. Complete surveys of otter habitats need to be continued to identify key potential areas for otter and wetland conservation efforts.
3. Key wetland areas should be declared as otter sanctuaries.
4. Environmental and other factors should be surveyed to determine the cause of otter declines.
5. People should be encouraged in social forestry. This will enable people to meet their fuelwood needs without removing the vegetation cover around the bodies of water.
6. Awareness among the local people about the conservation of these species should be pursued through a publicity campaign.
7. A well-considered captive breeding, public display, and possible future reintroduction program should be started.
8. A study should be made of the fishing communities that use trained otters and a cooperative society should be developed for the education and training of these fishermen in otter conservation.

Bhutan

The Asian small-clawed otter, the Eurasian otter, and the smooth otter historically occurred in Bhutan, but no current information is available.

Brunei

The Asian small-clawed otter, the smooth otter, and the hairy-nosed otter historically occurred in Brunei, but no current information is available.

Burma

The Asian small-clawed otter, the smooth otter, and the Eurasian otter historically occurred in Burma. Salter (1982) considered the smooth otter to be widely distributed, but no other current information is available. The extensive wetlands in this country are likely to represent important otter habitat.

Cambodia

The Asian small-clawed otter, the smooth otter, the hairy-nosed otter and the Eurasian otter historically occurred in Cambodia but no current information is available. The extensive Tonle Sap wetlands are likely to be important otter habitat.

China

Species Present

Asian small-clawed otter, smooth otter, Eurasian otter

Status and Distribution

The populations of all otters in China are declining, a fact reinforced by the declining numbers of otter furs traded in recent years.

The Asian small-clawed otter is mainly distributed in Yunnan, Guangdong (including Hainan island), Guangxi, and Fujian Provinces.

The smooth otter is currently only found in southwestern Yunnan province and the coastal area of Guangdong Province (Zhongshan County and Taishan County.)

The Eurasian otter is found throughout China from the northern regions, where it occurs alone, to the southern provinces, where it is sympatric with the Asian small-clawed otter and the smooth otter.

Legal Status

The Eurasian otter and the Asian small-clawed otter were listed in the protected animal list (class II) by the Commission for Environmental Protection, the State Council in July 1987.

Threats

1. Habitat alteration due to logging and resulting siltation is damaging the streams and wetland habitats of otters.
2. Large-scale water pollution is causing the loss of fish and contamination of the otters' food sources.
3. Otters are hunted for their furs, a valuable monetary resource, especially in Guangdong Province, but also in Sichuan, Hunan, Hubei, and Jiangzi Provinces and throughout the otters' range. Under the China Wildlife Act of November 1988, otters cannot be hunted without permission from the provincial department of forestry.
4. Otters are hunted for their livers, which are thought to have medicinal value.

Conservation Priorities

1. Overall surveys of otters and their habitats are necessary in order to assess the status of otters, the reasons for their decline, and to identify particular wetlands of importance in their conservation.
2. The habitat of otters needs protection throughout China.
3. Existing protected areas that already contain otters need to be more intensively patrolled and scientifically managed. New otter reserves need to be developed and similarly protected.
4. In-depth studies need to be carried out on the otter species in China.
5. Public education needs to be initiated and a non-profit, non-governmental organization needs to be established to protect otters and their habitats.

Hong Kong

Species Present

Asian small-clawed otter (?), Eurasian otter (?)

Status and Distribution

The Eurasian otter was formerly present in the northwest New Territories on the shores of Deep Bay. It has been largely absent

for the past 30 years apart from a single individual present at the WWF-Hong Kong Mai Po Nature Center during early 1986. The Asian small-clawed otter probably once occurred in Hong Kong, but there are no recent records of its presence.

Legal Status

Otters are fully protected under the Wild Animals Protection Ordinance, Cap. 170. Trade in otters is controlled under the Animals and Plants (Protection of Endangered Species) Ordinance, Cap. 187, which is the enabling legislation for CITES in Hong Kong.

Threats

1. The otter species probably disappeared from Hong Kong due to hunting for pelts and for livers, which are thought to have medicinal value.
2. Habitat disturbances, such as the development of housing estates and fish ponds, have reduced available otter habitat.
3. Increasing problems of industrialization in Hong Kong and the adjacent Shenzhen Special Economic Zone in China are leading to increasing threats of pollution by PCBs and heavy metals.

Conservation Priorities

1. WWF-Hong Kong is looking into the possibility of reintroducing otters to Hong Kong.
2. Otters imported from China are no longer sold for food in Hong Kong, but live otters may still be imported into the territory—this should be investigated.

India

Species Present

Asian small-clawed otter, smooth otter, Eurasian otter

Status and Distribution

All otters in India are becoming increasingly rare outside of national parks and wildlife sanctuaries, and are threatened in many areas due to reduction in prey biomass, poaching, and reduction of habitat. The remaining otters in India are in fragmented populations and are rarely encountered outside the protected areas.

The Asian small-clawed otter is thought to be the rarest otter in India. It is found in the Himalayan foothills from Kulu in Himachal Pradesh eastwards to the northeast hill states; in the plains of Assam and West Bengal; in the higher elevations of hill ranges of Coorg (Kodagu) in Karnataka; in Goa; and in the Nilgiris and the Palni Hills (Tamil Nadu). There have been no recent sightings or captures of this otter in the high ranges of Kerala, however. It is absent over the whole of central India.

The smooth otter is found throughout India from the Himalayas southwards. It is reported in the states of Kerala, Andhra Pradesh, Mizoram, West Bengal, Gujarat, Himachal Pradesh, Uttar Pradesh, Bihar, Madhya Pradesh, Karnataka, Punjab, and Maharashtra. In most of these states, the otter populations have declined in areas in which they were once quite common outside of the protected areas. There are very good populations in the Periyar and Nagarhole National Parks.

The information on the Eurasian otter in India is vague, but it is known to occur in the foothills of the western Himalayas and in the southern Indian states of Kerala, Tamil Nadu, Karnataka, and in Goa. In the protected areas in the Terai, and

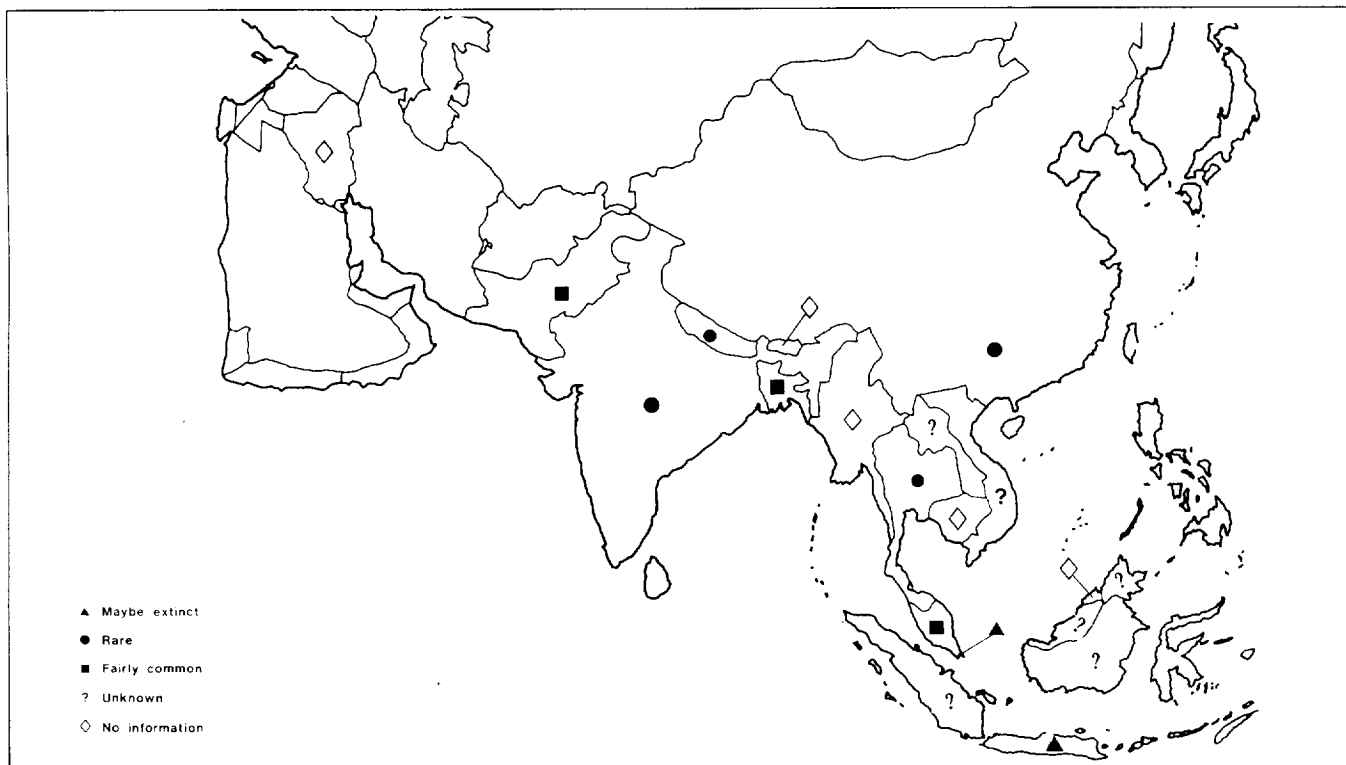


Figure 2. Distribution of the smooth otter (*Lutra perspicillata*).

foothills of the Himalayas (for instance in the Dudhwa and Corbett National Parks), there are thriving populations.

Legal Status

The Asian small-clawed otter is included in Schedule I, and the Eurasian otter and the smooth otter are included in Schedule II (Part II) of the Indian Wildlife (Protection) Act of 1972. All otters are covered under Part A of Schedule I of the Export (Trade) Control Order, 1988. Certain wetlands containing otters have been declared as wildlife sanctuaries and national parks.

Threats

1. Habitat destruction resulting from reclamation of wetlands for agricultural purposes, deforestation, and the construction of dams and barrages across rivers pose the greatest threats to Indian otters. Decimation of fish fauna due to various factors is also a major cause of declines in populations of otters.
2. Pollution of waterways with industrial, agricultural, and municipal wastes threatens to contaminate the food chain on which otters depend.
3. Otters are sometimes killed for their pelts and there is evidence of illegal export via Bangladesh and Nepal to European and other fur markets. It is not clear whether this is a continuing problem. They are also hunted by tribal people for their meat and in Mizoram, male otters are killed for their sexual organs, which are thought to have medicinal value by the Burmese people across the border.

Conservation Priorities

1. Legal trade in Asian otter pelts should be banned internationally to prevent the smuggling of otter pelts across Indian

borders, where they are then exported to the Western World.

2. More detailed surveys of otters should be conducted throughout India to get a more accurate indication of which species of otters are found in which locations, and their current status.
3. Effective protected areas should be established wherever possible in areas where otters survive and where there is good potential for the conservation of viable otter populations. In existing wildlife sanctuaries fishing should be carefully regulated (as is currently the case in national parks) to enhance the prey base of the otters. Where protected areas have been established at the edge of reservoirs and rivers, these adjacent bodies of water should also be included in the protected areas to conserve these neighboring otter habitats more efficiently.
4. Otters should be promoted as the symbol of Indian wetlands, to encourage more public participation in their protection. Public education programs should also be devised to increase awareness of the value of otters and the wetlands they stand for.
5. More scientific studies are needed on the behavior, ecology, food, and habitat requirements of otters in India.

Indonesia

Species Present

Asian small-clawed otter, smooth otter, Eurasian otter, hairy-nosed otter

Status and Distribution

The Asian small-clawed otter is found in Java, Sumatra, and

Kalimantan, and possibly in the Lesser Sunda Islands. It is reported in the Riau and Lingga archipelagos off Sumatra, and on the island of Sumatra in the Padang-Sugihan Wildlife Reserve (Sumatra Selatan), the Way Kabas Game Reserve (Lampung) and the Lunang peat swamp forests (Sumatra Barat). In Java, it is reported in Muara Bobos (Java Barat), Cilacap/Segara Anakan (Java Tengah) and upstream areas of Cigenter and Cikareng in Ujung Kulon National Park. In Kalimantan, this species is reported along the Upper Kapuas River (Kalimantan Barat), Pleihari (Kalimantan Selatan), and the upper reaches of Sungai Mahakam (Kalimantan Timur).

The smooth otter is found in Sumatra, Java, and Kalimantan. It has recently been reported in Sungai Bahau in East Kalimantan and historical records dating to the turn of the century report it in the environs of Jakarta, on Java. No recent sightings in this location have been confirmed, however.

The Eurasian otter is found only on the island of Sumatra, where it has been recorded in the peat swamp forests of Berbak Game Reserve (Jambi province); in mangroves in the Banyuasin Musi River Delta (Sumatra Selatan); and in freshwater swamp forests and the Way Kanan of the Way Kambas Game Reserve (Lampung).

The hairy-nosed otter is widely distributed in Sumatra, Kalimantan, and Java, where it inhabits freshwater and coastal areas, especially mangroves. In Sumatra it is reported in the Padang-Sugihan Wildlife Reserve (Sumatra Selatan), the Way Kambas Game Reserve (Lampung), Ketambe (Aceh), and on Bangka Island off the Sumatra coast. In Kalimantan it is reported in the Sungai Kapuas and near Pontianak (Kalimantan Barat) and in the upper reaches of the Sungai Barito (Kalimantan Tengah). The hairy-nosed otter is also found along the northwest coast of Ujung Kulon National Park and along the north and south coasts of West Java.

Legal Status

No legal protection.

Threats

1. Conversion of primary forest into agriculture holdings in the lowlands has destroyed much of the available habitat and necessary cover. Between 65% and 80% of the forests in the lowlands of Sumatra have already been lost.
2. Extensive embankment of canals and rivers to control flash-flooding destroys otter dens and reduces bank vegetation needed for cover.
3. Heavy use of pesticides in agriculture, the dumping of toxic wastes from factories, and domestic wastes and detergents from human settlements are contaminating many rivers and water systems in Indonesia, causing a severe threat to the entire aquatic food chain, including otters.
4. The draining of wetlands in Sumatra and Kalimantan for agriculture and human settlement destroys important otter habitats and results in a decline in prey species.
5. Gravel extraction from river beds in Sumatra destroys otter habitats and increases levels of suspended sediments in the water with resulting deleterious effects on fish.

Conservation Priorities

1. More scientific studies and data are needed to assess the distribution, numbers, habitat requirements, behavior, and ecology of the otter species in Indonesia.

2. As a logical follow-up to the IUCN/WWF Wetlands Campaign, the habitat requirements of a number of keystone species, including otters should be assessed, and conservation areas should be established for their protection.
3. Captive breeding and possible reintroductions into protected areas should be undertaken.
4. Otters should be given legal protection in Indonesia, although it is known that legal protection alone will not ensure the otters' survival there.

Iran

The Eurasian otter is known to occur in Iran, but no recent information is available.

Iraq

The Eurasian otter and a disjunct population of the smooth otter are known to occur in Iraq, but no current information is available.

Israel

Species Present

Eurasian otter

Status and Distribution

Virtually extirpated in the coastal regions. Good populations still exist in the Jordan river catchment, including Lake Tiberias, but because almost the entire population is concentrated in the one system, it must be considered threatened. Within the system, otters occur in uplands, agricultural lowlands, and fish ponds (Macdonald et al. 1986).

Legal status

Protected.

Threats

1. Gross pollution of rivers (sewage, pesticides) in the coastal plain and potential threat of pollution, mainly from agricultural pesticides, in the Jordan river.
2. Destruction of riparian habitat for agricultural intensification.
3. Construction of reservoirs on tributary streams.
4. Mortality on roads.

Conservation Priorities

1. Analyses of dead otters and of their food supply for pollutants to assess potential threats to the population in the Jordan catchment.
2. Reduce levels of pollution in watercourses of the coastal plain.

Japan

Species Present

Eurasian otter (?)

Status and Distribution

Although the Eurasian otter was historically found throughout Japan, it is probably nearly extirpated today. In 1986, a dead otter was found in Kouchi Prefecture, but since then no other living or dead otters have been sighted, and their continued existence has been confirmed only through field signs. The

number of field signs has been decreasing year by year, but there remains some possibility that a few individuals still exist in southwest Kochi Prefecture.

Legal Status

The Eurasian otter has been protected as a special national natural monument of Japan since 1965.

Threats

1. The main reason for their decline is water pollution and the destruction of their habitat by industrial development, agricultural chemicals, and synthetic detergents. Water pollution has caused the depletion of their food and may have directly damaged their health.
2. Otters have been rapidly losing their habitat due to the destruction of shores and banksides, and through the construction of many dams in the mountains.
3. Otters are considered by fisherman to be competitors. This conflict has undermined conservation efforts.
4. Hunting for fur (for domestic markets) may still be a problem in the last remaining possible otter habitat, in Kochi Prefecture.

Conservation Priorities

1. A thorough survey needs to be undertaken in the areas where there is a possibility of the otters' existence, especially in southeast Kochi Prefecture, to assess how many otters remain.
2. The remaining otter habitat needs to be protected from any disturbances. All industrial development should be banned in this area and the water quality needs to be strictly controlled. Strict laws must be enforced to prohibit hunting or harming any remaining otters.
3. As depletion of clean fish reserves is thought to be a principal reason for the decline of otters, fish cultivation ponds could be set up within the habitat of the otter.
4. Captive breeding and reintroduction projects should be seriously considered in Japan.
5. Public education needs to be carried out to resolve opposition to otter conservation.

Jordan

Species Present

Eurasian otter

Status and Distribution

Threatened. Restricted to the rivers Jordan, Yarmouk, and Zarka, the only permanent waterways in the Kingdom. No previous information is available on distribution, so it is not known if any change has occurred.

Legal Status

Protected under the Agriculture Act No. 20, 1973 which protects wildlife in general.

Threats

1. Water pollution; all three river systems are polluted.
2. Accidental drowning in fishing nets.
3. Accidental killing in traps set for other species, such as leg traps set for wild boar.

Conservation Priorities

1. Field survey to determine more precisely the distribution of the species in Jordan.
2. Tissue analysis of otters found dead for PCBs, pesticides, and metals.
3. Retention of the dense vegetation present (for security reasons) along the rivers Jordan and Yarmouk.

Laos

Species Present

Asian small-clawed otter, smooth otter (?), Eurasian otter

Status and Distribution

Otter populations are small in Laos because of habitat destruction and human encroachment. The smooth otter might occur, but there are no recent records.

The Asian small-clawed otter is found in the central part of the country, especially in Nam Song river, Nam Soung wetland, and Nam Sang and Nam Kading rivers.

The Eurasian otter is found in Nam so, Oudomsay province, in the northern part of the country, and Sekong and Sekhamane, Attapeu province in the southern part of the country.

Legal Status

In the past, Laos did not have any measure to protect otters. During 1988, the Department of Forestry began preparing a law to protect wildlife in the country, and this law is scheduled to be completed shortly, ready for final approval by the national assembly. Based on this law, all otters in Laos will be declared protected animals.

Threats

1. Habitat destruction due to deforestation along river banks.
2. People kill otters because of supposed competition for fish.
3. Lack of protected areas and wildlife law to protect otters.

Conservation Priorities

1. The highest priority is to establish protected areas in Laos, such as forest reserves and wildlife sanctuaries, including rivers, wetlands, and marshes. If this happens, otters, as well as other wildlife, will have a more secure future.
2. The new wildlife law needs to be approved and implemented, in order to protect otters and other wildlife in Laos.

Lebanon

The Eurasian otter occurs in adjacent rivers in Israel, so is probably present, but no recent information is available.

Malaysia

Species Present

Asian small-clawed otter, smooth otter, Eurasian otter (?), hairy-nosed otter

Status and Distribution

The Asian small-clawed otter and the smooth otter are relatively common throughout Peninsular Malaysia, while the current existence of the Eurasian otter and the hairy-nosed otter on the peninsula is unconfirmed. In Sabah and Sarawak (East

Malaysia), on the island of Borneo, at least three species of otter occur: the hairy-nosed otter, the smooth otter, and the Asian small-clawed otter.

The Asian small-clawed otter is common throughout the rice fields, mangroves, and wetlands of Peninsular Malaysia, with the highest numbers being recorded from the state of Kedah. In East Malaysia, this species is also widely reported from all areas of Sabah and Sarawak.

The smooth otter is common throughout Peninsular Malaysia, inhabiting mangroves, rivers, rice fields, and wetlands throughout the peninsula. The greatest numbers of this otter have been recorded from the state of Kedah. In East Malaysia it appears to be more rare.

The Eurasian otter was recorded by Medway on Langkawi Island off the west coast of Peninsular Malaysia in 1978, but since then no other records of this species have been confirmed anywhere in the country.

The hairy-nosed otter is reported from scattered localities in East Malaysia but has not been recorded from Peninsular Malaysia in recent years. If it still exists in Peninsular Malaysia, it is thought to remain in the rivers at higher altitudes, far from human presence.

Legal Status

All species of otters are totally protected under the Wildlife Enactment 76/72.

Threats

1. Encroachment by humans into their habitat has resulted in both the Eurasian otter and the hairy-nosed otter becoming rare and possibly disappearing entirely from Peninsular Malaysia. Both the Asian small-clawed otter and the smooth otter appear more able to withstand proximity to humans.
2. The conversion of estuarine areas into aquaculture and agriculture schemes will reduce the otters' available habitat, if not properly controlled.
3. Removal of cover from paddyfields will greatly reduce the available sites for otter dens and shelter, especially where these areas border the mangrove feeding grounds for both the Asian small-clawed otter and the smooth otter.
4. The excessive use of pesticides in paddyfields and agricultural schemes may contaminate the food chain, with deleterious effects on the otter populations.
5. Otters in paddyfields are often regarded as pests by the farmers, and they are sometimes killed or captured as cubs for pets.

Conservation Priorities

1. More research is needed on the distribution and status of all the species of otters in Malaysia, with special efforts made to identify remaining populations of the Eurasian otter and the hairy-nosed otter.
2. An in-depth study of the habitat and ecological requirements of the Asian small-clawed otter and the smooth otter should be initiated, in a location where they are found coexisting and in healthy numbers. This study could be used to formulate more detailed plans for their conservation throughout their ranges, in Malaysia and elsewhere.

3. Areas known to be preferred otter habitats should be conserved to ensure the continuity of a healthy otter population in Malaysia. In particular, the mangrove forests on the west coast of Malaysia should be preserved, as this is an important habitat for both the smooth otter and the Asian small-clawed otter. If remnant populations of the Eurasian otter and the hairy-nosed otter are found, their remaining habitats should receive the strictest protection.
4. The use of pesticides should be monitored to determine their effects on the otters and their food species.
5. There is a need to educate farmers on the role of otters in controlling pests such as rats in their paddyfields. Farmers should also be encouraged to maintain areas of shrubs and dense vegetation around their fields to provide necessary cover for the otters in these areas.
6. There is a need for stricter compliance with the wildlife protection laws in some areas where otters are found.

Mongolia

Species Present

Eurasian otter

Status and Distribution

Otters exist in very low population densities in three areas (Stubbe et al. 1989): eastern Mongolia in the river system of Chalkhin-gol; northern Mongolia in many small rivers belonging to the Jenissei System; and western Mongolia in the upper parts of the river Chod in the High Mongolian Altai.

Legal Status

Otters have been on the Protected Animal List (Class I) since 1930.

Threats

No detailed information though habitat loss may be important.

Conservation Priorities

Otters should be reintroduced to areas where they are absent and where the habitats have not been destroyed and fish and other prey resources are adequate.

Nepal

Species Present

Asian small-clawed otter (?), smooth otter, Eurasian otter (?)

Status and Distribution

Otters are declining throughout Nepal. Information is vague on the existence and whereabouts of the Eurasian otter and the Asian small-clawed otter in Nepal. The smooth otter appears to remain in isolated populations in the Koshi, Narayani, Kamali, and Mahakali rivers.

Legal Status

Protected under the Aquatic Animal Conservation Act.

Threats

1. Habitat destruction (including deforestation along waterways), and river pollution threaten the otter population.
2. Otters in Nepal are still illegally hunted for their pelts, which are made into collars and cuffs of overcoats and

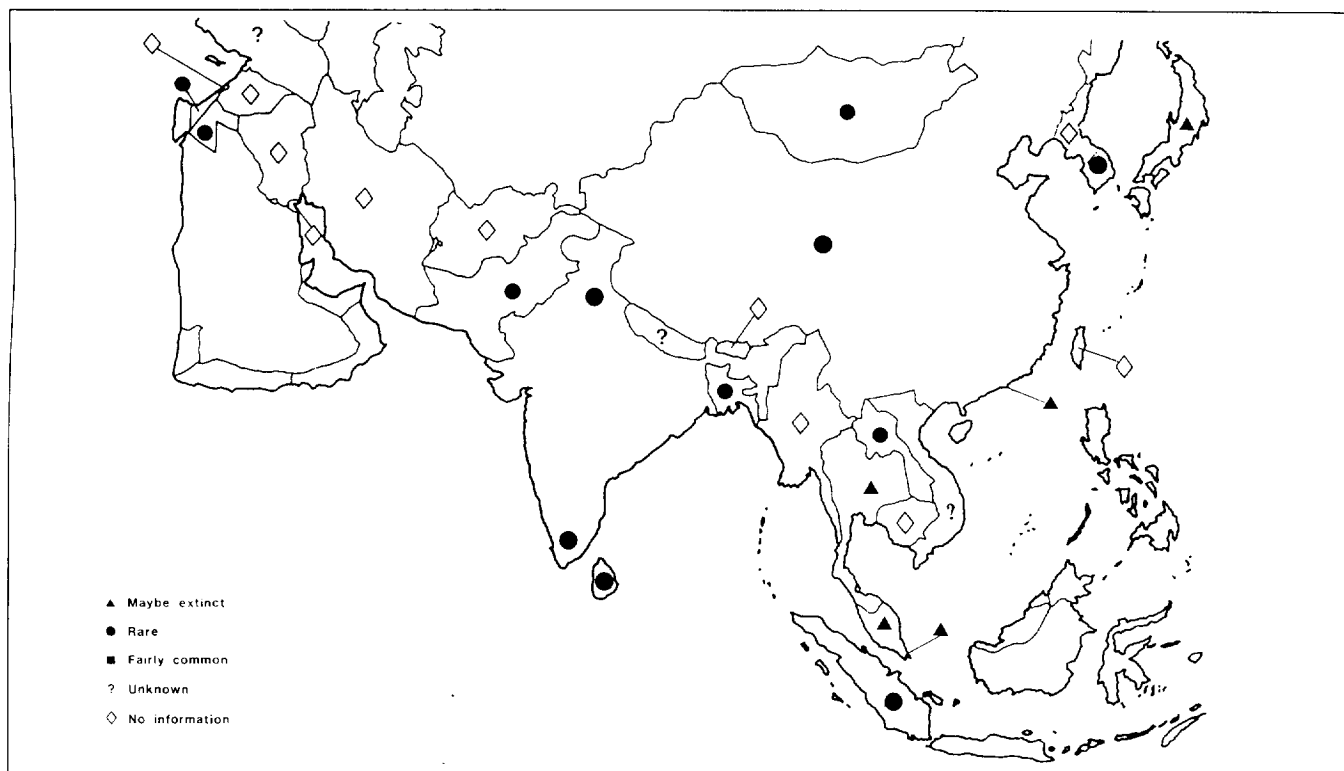


Figure 3. Distribution of the Eurasian otter (*Lutra lutra*) in Asia.

ladies' sport coats and trimmings. They are also hunted for their meat and the uterus of females, which is thought to have medicinal value.

3. Large hydroelectric projects and dams have fragmented the otter populations. In particular, the Narayani, Koshi, Mahakali, and Karnali rivers until twenty years ago were connected with the Ganges river system, but the construction of a dam has isolated these systems. These isolated and fragmented populations of otters are susceptible to the deleterious effects of inbreeding along with other more immediate pressures.

Conservation Priorities

1. It is essential to conserve the watershed of Gandaki, Koshi, and Karnali rivers, particularly the riverbank plant communities and aquatic ecosystems, to provide proper habitat for the otters remaining in these areas.
2. More research is needed on the ecology and behavior of otters in Nepal, including their breeding requirements, the effect of fish swarming on the seasonal migrations of otters, and the vulnerability of otters during flood and drought.
3. A feasibility study should be carried out to see whether irrigation systems developed near the barrage can support otters and forage fish. If so, diversions of irrigation canal water could be made to create otter havens.
4. Educational material should be assembled to dispel the myth of the utility of the uterus and meat of the otter as a medicinal substance. Hunting otters for skins should also be discouraged.

5. The Aquatic Animal Conservation Act of the Nepal Government should be enforced.

North Korea

Species Present

The Eurasian otter probably occurs, but there is no recent information.

Pakistan

Species Present

Smooth otter, Eurasian otter

Status and Distribution

The Eurasian otter was once widely distributed in the rivers and streams of the northern part of the country. The smooth otter occurred over major parts of the Indus Plain and was quite common in the Indus River system in lakes, streams, and canals. Due to various factors, both species have now been confined to water reservoirs and some undisturbed remote areas, as described below.

The smooth otter is common and is found in Bannu and Dera Ismail Khan districts of North West Frontier Province; Mianwali, Muzaffargarh, Rahimyar Khan, and Khanewal districts of Punjab; and Hyderabad and Sukkur districts of Sindh. Its population is mainly restricted to water reservoirs at dams and barrages.

The Eurasian otter is rare and occurs in rivers and streams of Chitral, Dir, Swat, and Mansehra districts of North West

Frontier Province. It also occurs in other northern areas and Azad Kashmir. Its population is restricted to remote areas away from human populations.

Legal Status

Both species are totally protected.

Threats

1. Construction of barrages has checked the natural flow of water in the rivers. Major parts of the rivers Jhelum, Chenab, Ravi, and Sutlaj remain dry during most of the year, bearing no suitable habitat for otters except water reservoirs at dams, barrages, and head works, where permanent water is available.
2. Overhunting: otters have been excessively harvested in the past, which has been one of the major factors contributing to their decline.
3. Since otters are considered to be serious pests with regard to fisheries, they are often under extreme persecution by fishermen and owners of fish farms.
4. Disturbance by human settlement. The ever-increasing human population has eliminated otters from the more disturbed parts of their former ranges and consequently they are now restricted to more remote and undisturbed areas.

Conservation Priorities

1. Extensive surveys should be conducted to identify key otter habitats, to determine the exact status of otters and to pinpoint causes of their decline.
2. Key wetland areas should be declared otter sanctuaries.
3. A publicity campaign is essential for public awareness.
4. Captive breeding studies should be started.

Philippines

Species Present

Asian small-clawed otter

Status and Distribution

The Asian small-clawed otter is distributed in rivers, creeks, estuaries, and tidal areas throughout Palawan. It has been sighted most often in Brooke's Point, Narra, Bataraza, and St. Paul's Bay.

Legal Status

Protected by Proclamation No. 219, and amended by Proc. Nos. 1232 and 1440, which declare the whole province of Palawan as a Game Refuge and Bird Sanctuary. Aside from this, the otter has no specific legal protection in Palawan.

Threats

1. The greatest threat is loss of suitable habitat as a result of shifting cultivation, mining and logging activities, construction of roads and other infrastructure, and increase in human settlements. These disturbances lead to siltation and eutrophication of rivers and coastal areas where the otters feed.
2. Otters are collected for pets and, possibly, for meat.

Conservation Priorities

1. A basic research and conservation program is needed to learn more about this otter's status, distribution and ecological requirements on Palawan.

2. Stricter protection is needed, including the designation of riparian reserves as otter havens.

Singapore

The Asian small-clawed otter, the smooth otter, and the hairy-nosed otter once probably occurred in Singapore. Nearby Peninsular Malaysia has good populations of the Asian small-clawed otter and smooth otter, but all species of otter in Singapore are now believed to be extirpated.

South Korea

Species Present

Eurasian otter

Status and Distribution

Endangered. Once found in rivers, lakes, and estuaries throughout the country, except for Chung Nam province, but now rarely occurs anywhere. There are captive specimens in Kumgang Zoo (Busan), the Forestry Research Institute, and Kyeong Hee University (Seoul).

Legal Status

Protected by the Cultural Properties Management Law, as a Natural Monument (Number 330). Any person who has illegally captured this species is liable to be sentenced to at least two years in prison.

Threats

No detailed information, though habitat loss is believed to be a severe problem.

Conservation Priorities

1. Conservation of the natural environment of otters and protection from artificial destruction.
2. Environmental Impact Assessment studies are needed where water flow is to be altered by large-scale construction of dams and roads.
3. Research needed for captive breeding efforts.

Sri Lanka

Species Present

Eurasian otter

Status and Distribution

Otters once were commonly observed throughout Sri Lanka in a variety of habitats including streams, rivers, lakes, lagoons, and paddyfields. Although in smaller numbers now, otters are still found in all the major river systems, from the brackish water estuaries to the headwaters at altitudes over 2,000 m. As the lowland dry zones are receiving increasing human pressures, the mountainous areas may provide the remaining safe havens for otters.

Legal Status

No information available.

Threats

1. Pesticide pollution of the waterways is a potential threat to otters in Sri Lanka, although much rice is still cultivated using traditional methods instead of a heavy reliance on chemical fertilizers and pesticides.

2. Massive hydroelectric schemes, such as the Accelerated Mahaweli Development Project, divert rivers and greatly reduce riparian habitat necessary for otter survival.
3. Over-cutting of lowland forests, with a decline in forest cover from 2.9 million hectares in 1965 to 1.6 million hectares in 1981, is also reducing available riparian habitat for otters.
4. Overexploitation of mangroves for fuel, food, and fiber, and the conversion of mangrove land to coconut and cinnamon plantations, housing schemes, and tourist hotels greatly reduces the amount of this rich habitat available to otters.

Conservation Priorities

1. Strict controls are needed on the amount of deforestation and chemical contamination of river systems in Sri Lanka.
2. Surveys need to be carried out throughout Sri Lanka to determine the whereabouts of viable populations.
3. Areas of sufficient remoteness, difficulty of terrain, and density of cover to provide natural protection from people should be preserved as otter havens.
4. More scientific studies need to be carried out on the behavior and ecology of the otters in Sri Lanka before serious environmental problems threaten their survival.

Syria

The Eurasian otter occurs in adjacent rivers in Israel and Jordan, so it is probably present in Syria, but no recent information is available.

Taiwan

The Eurasian otter once occurred in Taiwan, but no current information is available.

Thailand

Species Present

Asian small-clawed otter, smooth otter, Eurasian otter (?), hairy-nosed otter (?)

Status and Distribution

All otters in Thailand are severely threatened due to habitat destruction, pollution of waterways, and human encroachment. Two species, the Eurasian otter and the hairy-nosed otter, may already have disappeared from Thailand.

The Asian small-clawed otter is still found in many wildlife sanctuaries and national parks in Thailand, where it frequents streams, rivers, marshy wetlands, and the sea coasts. Outstanding numbers are found in the western forested areas and in the marshy wetlands in southern Thailand, including Nung Tung Tong Reserve and Pattani and Songkla Provinces.

The smooth otter still occurs in the Huay Kha Khaeng Reserve in western Thailand; in the Tapi River, Phru-Toa-Dang Peat Swamp Forest, Bang Lan Dam and Ao Phangnga National Park in the south; and in the Mun River in the northeast.

Legal Status

All four otter species were officially declared protected wild animals of the first category by the Ministerial Regulation No. 10 in 1975, in accordance with the Wild Animals Reservation and Protection Act B.E. 2503 (1960). According to this act, no

persons shall kill protected wild animals of the first category except for educational purposes or scientific research. Trading of otter skins and carcasses is also prohibited by law.

Threats

1. Municipal, agricultural, and industrial wastes in most waterways throughout Thailand have severely threatened the otter populations.
2. Habitat destruction, including logging and hydroelectric projects which alter river systems, have reduced the habitat available to otters. The hydroelectric dams replace natural rivers with steep-sided reservoirs devoid of surrounding cover and thus unsuitable for otter habitation. The changing of mangrove forest into shrimp and fish aquaculture projects also diminishes otter habitats and puts otters in more direct competition with man.
3. Competition with people for fish supplies has resulted in direct killing of otters in areas where they would otherwise occur.
4. Insufficient enforcement of existing wildlife laws and reserved areas provide little more than "paper" protection for otters and their remaining habitats.

Conservation Priorities

1. A complete survey of otters and their remaining habitats needs to be initiated quickly to pinpoint areas of critical concern for each otter species. Efforts should be made to determine areas where small pockets of the Eurasian otter and the hairy-nosed otter might still occur.
2. Habitats that still contain otter populations should be declared "otter reserves" and legal action should be taken to protect these areas. Existing protected areas also need to be more closely monitored and protected.
3. Public education programs should be initiated to develop awareness of the importance of conservation of otters and other wetland inhabitants and of a clean environment in general.
4. Reintroduction programs should not be considered at this time; efforts should focus instead on protecting the habitats of the remaining otters in Thailand. Only if and when the overall pollution problems are solved, can otters be reintroduced into areas where they now no longer occur.

Turkey

Species Present

Eurasian otter

Status and Distribution

No systematic observations. Said by Turan (1984) to have a wide distribution, occurring in most rivers and lakes around the Black Sea and some rivers draining the Aegean Sea. Also known from the European part of Turkey.

Legal Status

No information available.

Threats

Threats may be the intensification of agriculture in the lowlands, the building of irrigation canals, and the draining of some wetlands.

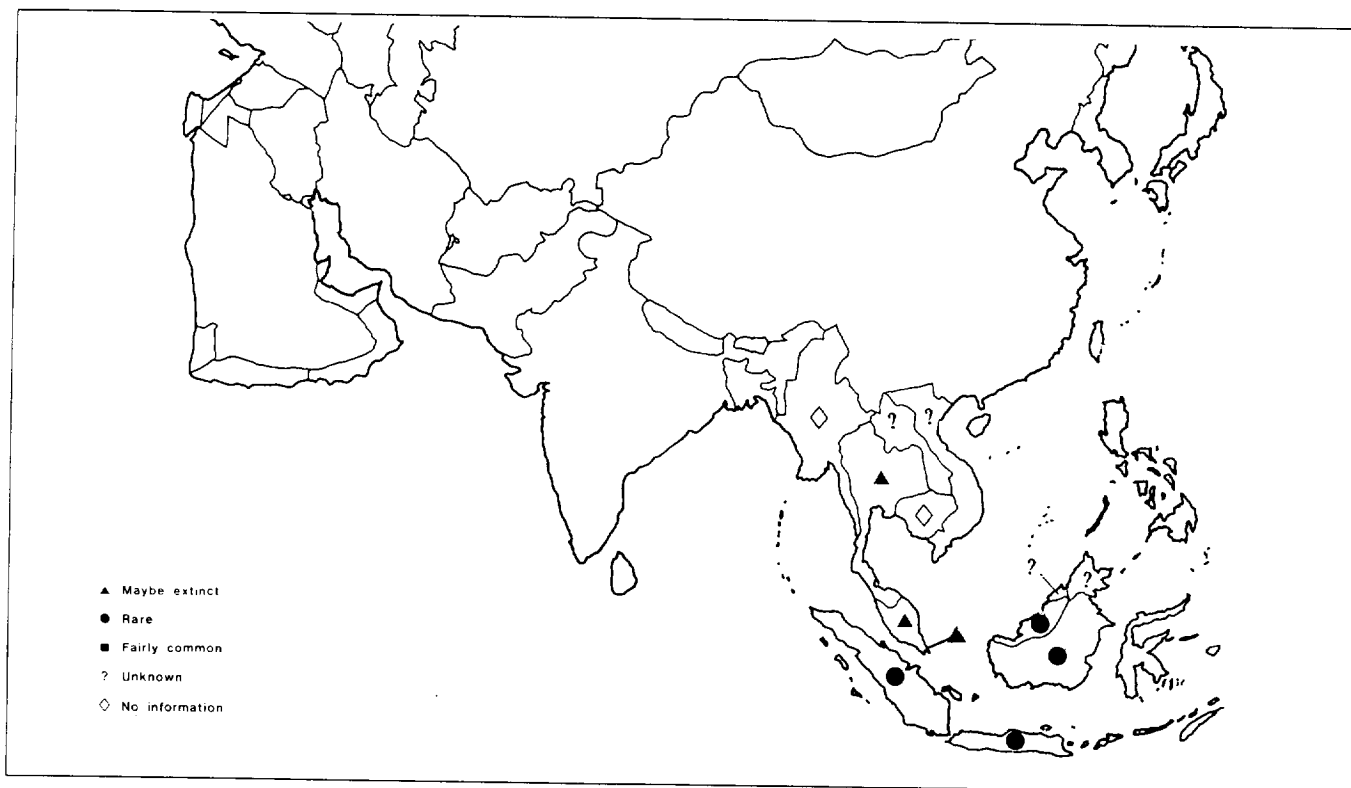


Figure 4. Distribution of the hairy-nosed otter (*Lutra sumatrana*).

Conservation Priorities

A full field survey of this country, with its many important wetlands, is urgently required.

Vietnam

Species Present

Asian small-clawed otter (?), smooth otter (?), Eurasian otter (?), hairy-nosed otter (?)

Status and Distribution

Otters are widely distributed in Vietnam, from the south to the north, in a variety of habitats including rivers, streams, swamps, lakes in the highlands, deltas, and along seashores and nearshore islands. There are old records of all four Asian species, but there

is great uncertainty about the current status of any of them. Although it is known that otters still occur in reasonable numbers, their specific identity needs to be clarified.

Legal Status

No information available.

Threats

Habitat destruction due to increasing human settlements along rivers in Vietnam.

Conservation Priorities

An accurate survey and scientific investigation of the ecological and biological characteristics of otters in Vietnam is necessary as an initial conservation effort. The existence of all four species requires confirmation.

12. Action Plan for Latin American Otters

Claudio Chehébar

Introduction

Four otter species are found only in Latin America: the giant otter (*Pteronura brasiliensis*), the Neotropical otter (*Lutra longicaudis*), the southern river otter (*Lutra provocax*) and the marine otter (*Lutra felina*). There are two additional species recorded from Mexico: the North American river otter (*Lutra canadensis*) and the sea otter (*Enhydra lutris*), though this latter species is now extirpated in Latin America.

Latin America displays a great diversity of climates, from equatorial to sub-antarctic and from sea coast to the high Andes. Otters are found in most of these habitats except large arid areas. The two most widespread species are the Neotropical otter, which ranges throughout Central and South America (Figure 1), and the giant otter, which inhabits most South American countries, but is not found in Central America (Figure 2). The southern river otter (Figure 3) and the marine otter (Figure 4) are much more restricted in their range. Both have their strongholds in Patagonia. The range of the marine otter extends along the Pacific coast almost up to the equator. Most countries in South America have two species living in sympatry, usually the giant otter and the Neotropical otter. In Chile, the southern river otter and the marine otter coexist.

Three otter species in Latin America are severely threatened: the giant otter, the marine otter, and the southern river otter. The giant otter's range has been greatly reduced and its diurnal, social habits, along with its size (and consequent pelt value) make it exceptionally vulnerable; the species is severely threatened. The two Patagonian species, the marine otter and the southern river otter are of special concern due to their restricted ranges and because they are often still hunted for their pelts.

In the past, and especially during the last two centuries, humans made heavy use of otters for skins. Otter pelts were very much in demand in the international market during the first half of this century. Since the 1960s the hunting pressure declined significantly, due to the growing concern for wildlife conservation and because of the participation of Latin American countries in CITES. Nevertheless, otters are still hunted in several parts of the continent. Enforcement of bans on hunting and trading is made difficult by the poverty of many people who harvest wildlife illegally and by the weakness of the governmental natural resources departments.

There are two major threats to otters in Latin America today: habitat destruction and water pollution. Habitat destruction includes deforestation, clearing or alteration of riparian vegetation, and drainage of wetlands for agricultural or other uses.



Neotropical otter (*Lutra longicaudis*) in Mexico (Photo by Juan Pablo Gallo).

Water pollution, already serious in some areas of heavy agricultural or industrial use, is now being made worse by the heavy metal pollution in some portions of the Amazon basin as a result of gold mining operations.

The "agricultural frontier" is still expanding into the major wildlands of South America. Unless wise use is made of these areas, the short-term development that is driven by the problem of external debt could result in the continuing decrease of the wildlife resources, including the otters.

The system of protected areas has grown substantially in recent decades and this provides important protection opportunities for otters. Nevertheless, the concept of hydrological basin management and planning should be put into practice as protected areas alone will probably not guarantee the long-term survival of otters.

Otter surveys have been conducted in very few and relatively small areas, so evaluations of status in the future will need the input of extensive surveys. Due to the enormity of the South American continent and adjacent Central America, and the short time scale necessary for conservation action, field surveys which cover large areas with less detail are to be preferred over very detailed ones in small areas. Surveys are especially needed in large wild areas such as the Amazon, the Pantanal, and the southern Pacific channels and islands. Trends in habitat condition on a large scale, like the evaluation of riparian vegetation and the total wetland area, should also be assessed.

A monitoring program, with some degree of coordination, should be organized, particularly for a close follow-up of some

giant otter, marine otter, and southern river otter populations. There is also an urgent need for knowledge about basic features of the ecology, natural history and behavior of the four Latin American otter species.

Concern about otter protection is getting stronger in Latin America. In 1984, the First Working Meeting of Experts in Aquatic Mammals of South America was held in Buenos Aires, Argentina. This meeting included a workshop on conservation status of otters, which produced species accounts and recommendations. There is now a need to consolidate this process to arrive at a more precise knowledge of the status of various species, and to promote effective conservation measures.

A growing number of people are working on otter research and conservation in Latin America. It is very important to support the work of existing local groups or institutions which are already doing research and conservation work in this region. Only then can effective conservation action be taken.

The remainder of this chapter considers the status and conservation requirements of Latin American otters in greater detail on a country by country basis.

Country Accounts

Argentina

Species Present

Neotropical otter, southern river otter, marine otter, giant otter

Status and Distribution

The Neotropical otter is still widespread in the central and northern portions of the country. However, the distribution of this species is becoming fragmented, and its range continues to diminish. There are still important populations in the Parana River Delta, Esteros del Ibera, the humid Chaco, and the subtropical forests of the northwest. It is present in all eight national parks and all the provincial reserves in its range.

The southern river otter is rare and much restricted in range in Argentina (Chehébar 1985; Chehébar and Benoit 1988). Although it has probably always had a restricted natural distribution, surveys in the northern portion of the Andean-Patagonic region reveal that it has disappeared from several areas. Only one important population remains today, that of the Nahuel Huapi Basin and nearby sub-basins, with occasional sightings in other freshwater Andean systems. Though more surveys are needed in the southern portion of the Patagonian Andes, it seems never to have been common or present there. The only other known population lives on Staten Island (near Tierra del Fuego) and its status needs to be evaluated. This species is considered endangered in Argentina.

The marine otter has always been somewhat marginal in Argentina, but is now on the verge of extinction. It was at one time abundant in the Beagle Channel, as Darwin stated in *Voyage of the Beagle*, but is now extirpated from the Argentine portion of the Beagle Channel. The only known population lives on Staten Island (in sympatry with the southern river otter) where its status needs to be evaluated. The southern river otter uses the inland freshwater systems and the quiet coastal habitats, while the marine otter uses the rough marine coasts.

The giant otter and the jaguar are possibly the two most endangered mammal species today in Argentina. The giant otter has suffered a dramatic reduction in range. Its former distribution was the Uruguay and Parana River catchments, with populations in the Mesopotamia region, the Eastern Humid Chaco, and the subtropical jungles of Misiones province. Today there are occasional sightings of individuals (no longer groups) in the northernmost fringe of the Misiones province, particularly in Iguazu National Park. There are unconfirmed indications of a population in Esteros del Ibera, and some southern tributaries of the Uruguay River in the Corrientes province. This species is also considered to be on the verge of extinction.

Legal Status

All four species are protected.

Threats

1. Habitat destruction due to human encroachment is the principal threat. In the north of the country, deforestation is proceeding at an alarming rate. In the Andean-Patagonic region, the remnant southern river otter populations, though rather well protected in National Parks, are threatened by habitat alteration in the semi-arid fringe containing the rivers which connect the different basins. Also, the construction of hydroelectric dams in these semi-arid, sub-Andean areas renders the shorelines of the newly-created lakes inadequate for otters, and it will be many years before soil and vegetation cover develops again.
2. In the center and north, water pollution is increasingly affecting catchments, along with siltation due to soil erosion. Increased use of pesticides and fertilizers, and effluents from industrial centers, are sources of concern.



Southern river otter (*Lutra provocax*) in Argentina (Photo by Claudio Chehébar).

3. Neotropical otters are still hunted in some areas. Though a regular and strong demand for pelts has not existed for some time, very recently some large illegal stocks have been sequestered by wildlife officials.
4. The isolation of remnant populations (especially of the giant otter, the marine otter, and the southern river otter) is in itself an important problem.

Conservation Priorities

1. Survey the Misiones province to evaluate giant otter populations there; support projects to search for the giant otter in Corrientes Province (Esteros del Ibera). Support protected area management in Misiones.
2. Protect Staten Island (Tierra del Fuego), where the southern river otter and the last remnant population of the marine otter survive.
3. Survey otters on Staten Island.
4. Hydroelectric projects and agricultural schemes should take into account the habitat requirements of otters.
5. A publicity campaign should be carried out to promote awareness of the critical situation of the most endangered species of otters in Argentina.
6. Extensive surveys of the Neotropical otter are needed, as well as support for law enforcement to control poaching.
7. Ongoing studies on the southern river otter should be encouraged. Monitoring of this species should be coordinated with similar efforts in Chile.

Belize

Species Present

Neotropical otter

Status and Distribution

The Neotropical otter is reported to occur in fair numbers (Florence 1986), but there is no further recent information on status or distribution.

Legal Status

No recent information.

Threats

None reported so far.

Conservation Priorities

A survey is needed before any conservation needs can be assessed.

Bolivia

Species Present

Neotropical otter, giant otter

Status and Distribution

The Neotropical otter presumably has a wide distribution, excepting the Altiplano and the southeastern Chaco. A recent survey in Amboro National Park (on the eastern slope of the oriental Andean range) found a good population of this species. As important tracts of forest remain, the prospects seem good in this country (Melquist 1984), but there are few data. It has been reported that this species is found in all of Bolivia's national parks (Dunstone and Strachan 1988).

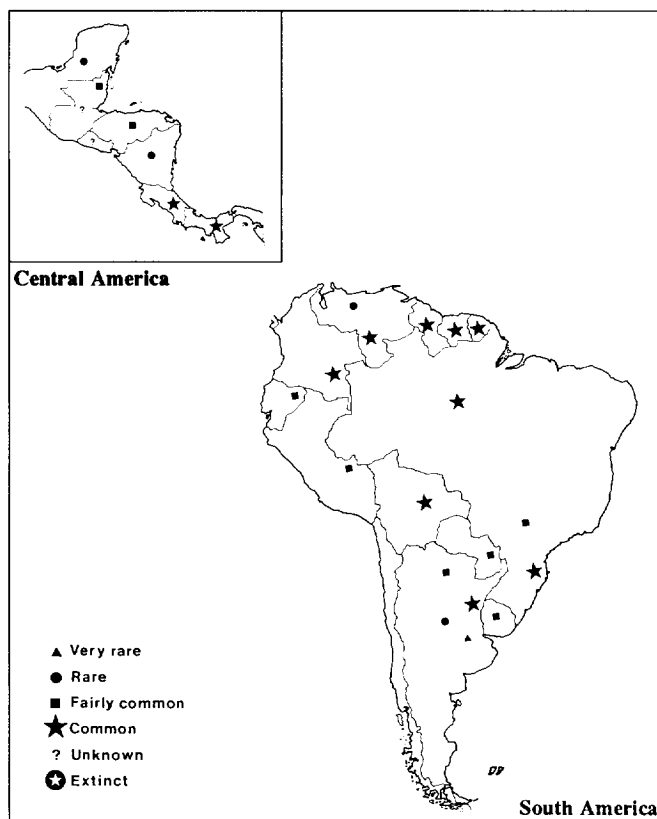


Figure 1. Distribution of the Neotropical otter (*Lutra longicaudis*).

The giant otter is apparently restricted to isolated populations in and around the Reserva Nacional de Fauna Manuripi, in Pando province. It is also a rare visitor to Amboro National Park (Tello, in Dunstone and Strachan 1988). There is little further information.

Legal Status

Both species are protected.

Threats

With respect to poaching, there is some illegal trade in skins, but this has apparently reduced as there is no longer a strong market. No further information is available.

Conservation Priorities

Not clear at present.

Brazil

Species Present

Neotropical otter, giant otter

Status and Distribution

The Neotropical otter has a wide distribution all over the country. It lives in several protected areas and is also found in marine habitats such as those in the states of Santa Catarina and Rio de Janeiro. The main decreases have occurred in the more developed south. Some survey work has been done in small areas in the south and in the Amazon, but most of the country has yet to be surveyed. The species is considered to be diminishing and vulnerable.

The giant otter is endangered. It has disappeared from most of the southern half of the country. Some good but apparently

isolated populations remain in the Pantanal, Rio Negro (Matto Grosso do Sul), and in thin populations in the Parana-Iguacu area (together with Argentina). In the north, there are populations in the Amazon basin, but their status has not been evaluated, except for some local surveys near hydroelectric projects. This species is considered to be marginally protected by the protected areas system. It was seriously threatened by intensive hunting, and from 1950 to 1975 underwent a most dramatic reduction. Populations now seem to be recovering in some areas due to alleviation of hunting pressure. However, new threats have emerged, which are stressing populations that were already seriously impaired by past over-harvesting.

Legal Status

Both species are protected.

Threats

1. Habitat destruction is proceeding rapidly in the southern industrial states. Deforestation has reduced the original 85% forest cover of Santa Catarina state to 6%. Also, deforestation continues in the Amazon region.
2. Water pollution is of growing concern, due to the growing agriculture, agro-industries, and wood industry. A serious problem, with dangerous potential for otters and all the aquatic biota and humans, is the mercury pollution being produced by the washing of gold in the "garimpos" in portions of the Amazon basin.
3. Hunting for fur of both species has decreased substantially since the 1960s, when otter hunting was completely banned (1967). Since 1980, the government has not sequestered any hides of the Neotropical otter and, since 1986, of the giant otter. However, some illegal hunting still persists, partially because of conflicts with fishermen and poultry. Some export trade of the giant otter (which is illegal under Brazilian law) is believed to continue, taking advantage of the caiman trade through Paraguay and Bolivia. The price of one giant otter hide is said to equal three first quality caiman hides.
4. Several large hydroelectric projects have been or are being constructed in the Amazon basin and their potential impact upon otters has not yet been assessed. There are some concerns about the effects on the normal flow of animals along the basins and also the habitat alteration and human encroachment encouraged by these projects. All these changes could be detrimental through bottleneck effects, especially for the giant otters.

Conservation Priorities

1. Establish protected areas which include populations of the giant otter, especially in the Pantanal and the Amazon basin.
2. Monitor closely the main identified populations, especially of the giant otter.
3. Address immediately the growing problem of water pollution in the Amazon basin.
4. Continue and improve the ongoing protected areas management and monitor closely the otter populations in these reserves.
5. Encourage the continuation of otter research and survey efforts now under way by local workers, particularly in the

Amazon, Santa Catarina, and the Pantanal, and make it possible for them to be extended to larger areas.

6. Establish a program for the protection of the giant otter by coordinating and broadening the efforts currently in practice.
7. Ensure that the requirements of the otters be considered in hydroelectric projects.
8. Evaluate the feasibility and need of restocking giant otters via translocation in some areas of the Pantanal.

Chile

Species Present

Southern river otter, marine otter

Status and Distribution

The southern river otter is considered endangered. The original distribution was from 36° S to the Magellanic region, the southern islands and Cape Horn. Its range has contracted in the northern portion, and the species is now extinct from south of Temuco to near Santiago. This species has disappeared from the northern fringe of its former range due to overhunting and habitat alteration, especially the clearing of riparian vegetation. Important populations persist in the southern portion of the country (XI region and southward). There are freshwater populations from Aysen to the north. The marine and estuarine populations from Aysen to the south seem to be of higher density than the freshwater ones, and also have a much larger total amount of habitat including oceanic islands and fjords (canales). This species also lives in several protected areas.

The marine otter is considered by most authorities to be threatened or endangered. There are important populations from Chiloe Island to the south, along the coasts and islands of



Giant otter (*Pteronura brasiliensis*) (Photo courtesy of the Chicago Zoological Society).

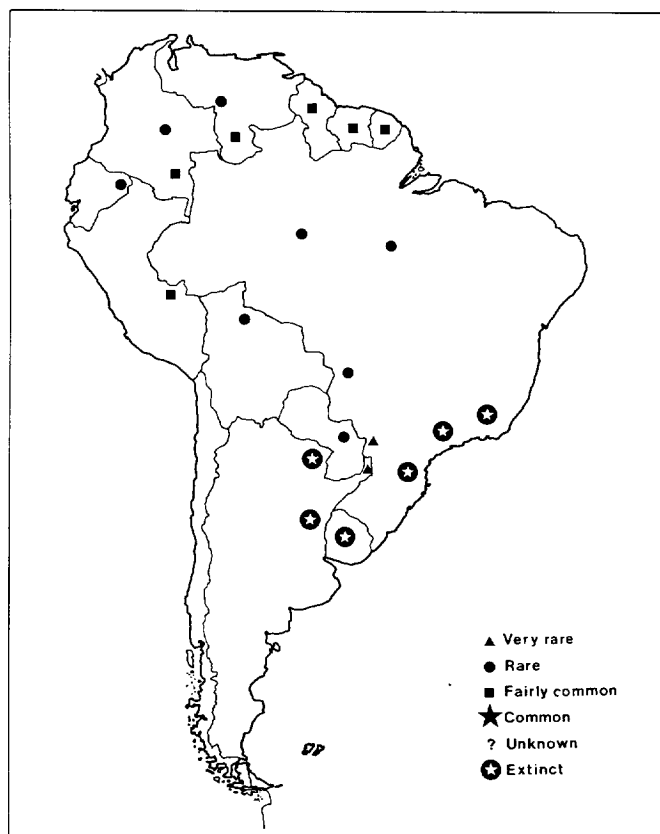


Figure 2. Distribution of the giant otter (*Pteronura brasiliensis*).

the southern Pacific (Cabello 1983; Sielfeld 1983). The marine otter coexists with the southern river otter and the two species divide the habitat neatly. The marine otter lives in the exposed and wavy shores and the southern river otter is found in the quiet and calm bays and inlets. The marine otter is very endangered in the northern portion of the country, with isolated nuclei near Chanaral, Caldera, and Coquimbo. It is rare in central Chile (remnants near Valparaíso and Quintay), where the species is more vulnerable due to more limited suitable habitat north of Chiloe. It is marginally present in the protected areas system.

Legal Status

Both species are protected.

Threats

1. Poaching of both otters for domestic use continues, with most of the pressure on the marine otter. Poaching is difficult to control due to the inaccessibility of many areas and because of the economic incentives to fishermen with low incomes.
2. Riparian vegetation destruction and freshwater pollution in central Chile is an increasing threat.
3. Deforestation in some areas of southern Chile is advancing.
4. Pollution of nearshore areas with heavy metals and other toxic substances from the mining of minerals (such as copper) in northern Chile, and by sewage and garbage in central Chile.
5. Intense harvesting of littoral and sublittoral algae (especially *Lessonia* spp. and *Macrocystis* spp.). Exploitation of kelps

may reduce productivity and abundance of invertebrates and fishes on which the otters depend.

6. Over-exploitation by fishermen of nearshore invertebrates and fishes, on which otters depend for food.
7. Fishing techniques that result in accidental capture and drowning of otters in nets.

Conservation Priorities

1. Monitor closely the marine otter populations of the central and northern parts of the country.
2. Support the work being done on both species by several local institutions and researchers, and extend these efforts geographically, in order to arrive at a more precise picture of the status of populations, and changes in population size over time.
3. Develop techniques for accurate census taking.
4. Study the impact of human harvesting of kelps and shellfish on otters, particularly in central and northern Chile.
5. Determine the annual schedules of mating, birth, and lactation of both species. Determine home range size, habitat use patterns, and diet in various areas.
6. Produce teaching materials for study of both species in school and university programs.
7. Survey the extensive islands and canals of the southern Pacific, a region not yet severely modified. It is important to have a good picture of otter status there before any major development begins.
8. Determine the routes by which illegally obtained otter furs are transported and sold, and support the enforcement of the existing legislation banning hunting and trade.
9. Coordinate with Argentina a common monitoring and protection program for the southern river otter.
10. Establish parks and reserves in areas important for remnant populations in northern and central Chile, and established populations in the south.

Colombia

Species Present

Neotropical otter, giant otter

Status and Distribution

The Neotropical otter can be found throughout the lowlands, the slopes of the Andes, the Magdalena river drainage of the intermountain region, the swampy areas between Barranquilla and Santa Marta, and the west slope of the Sierra Nevada de Santa Maria (northeastern Colombia). The status in the lowlands is probably quite good (Melquist 1984) and there still seem to be important populations.

The giant otter still has relatively important populations in Colombia; this country is perhaps one of the strongholds of this highly threatened species. Populations are reported from some areas in the llanos and lowland tropical forests east of the Andes (Melquist 1984). There are giant otters in El Tuparro and Sierra de la Macarena National Parks, Arauca Sanctuary, and Miritiparena River. No further information is available on present trends and status.

Legal Status

Both species are protected.

No detailed information yet available on specific threats, though they are likely to be similar to those in neighboring countries.

1. Surveys of the status of both species are needed.
2. Strict protection of viable populations in reserves is a high priority.

Species Present
Neotropical otter

This otter is found in suitable habitat throughout Costa Rica, except in the highest mountain streams, though it occurs up to 2,800 m. It is considered common, especially in the province of Alajuela, and the San Carlos River. Most of the many protected areas of Costa Rica have otters. Prospects for survival are very good (Melquist 1984).

Legal Status
Protected.

1. Deforestation and alteration of riparian habitat is the main threat, although good amounts of adequate habitat still remain.
2. Pollution and hunting are potential threats.

1. Extensive status surveys are needed throughout the country.
2. Protected area management should include consideration of the special needs of otters.
3. A study is needed of the biology and ecological requirements of the Neotropical otter in Costa Rica.

Neotropical otter, giant otter

The Neotropical otter is distributed throughout the entire country, including the Andean highlands (e.g. Nangaritza, Yacuambi, and Zamora Rivers). This otter is probably still fairly common in the Oriente tropical forest and perhaps in parts of the northwest. However, in the Sierra, very little riparian habitat has been preserved.

The giant otter is found only in isolated locations of the lowland tropical forests of eastern Ecuador including Bobonaza and Ishpingo Rivers near the eastern frontier, and Cuyabeno, Guapi, Lagarto Cocha, and Tarapuy Rivers in the northeast. All of these are tributaries of the Aguarico, Pastiza, and Putumayo Rivers (Melquist 1984). There are giant otters in the Cuyabeno Faunal Reserve, and the Yanumi National Park.

Both species are protected.

1. Habitat destruction (deforestation) in the Andean Sierra has left very little riparian habitat.
2. Illegal trade in pelts of unknown magnitude still persists.

1. Monitor the identified giant otter populations.
2. Survey to locate other giant otter populations.
3. Make efforts to protect and restore riparian habitat.

No recent information available, though the Neotropical otter might occur.

Neotropical otter, giant otter

The Neotropical otter is considered to be widely distributed (Broad 1987), and Melquist (1984), extrapolating from research in adjacent countries, suggested that population levels probably remain stable and healthy. Little information is available on the giant otter. Melquist (1984) presumed it to be widely distributed in the interior, though at fewer sites than the Neotropical otter.

No recent information.

None so far reported.



Figure 3. Distribution of the southern river otter (*Lutra provocax*).

Conservation Priorities

A survey is required to assess conservation needs, especially since otter populations could be quite significant.

Guatemala

No recent information available, though the Neotropical otter occurs.

Guyana

Species Present

Neotropical otter, giant otter

Status and Distribution

The Neotropical otter and the giant otter are widespread throughout the country, though the giant otters are more concentrated in fewer sites. Giant otters are reported from at least Morawhanna area, Russel Lake, Lama and Maduni Creeks (where E. Laidler studied them), Mahaica River, Abary River, Mashivean River, and Morewan River (Melquist 1984). The status of both species seems healthy and stable, Guyana being, along with Suriname and French Guiana, one of the strongholds of these species.

Legal Status

The giant otter is protected. The Neotropical otter is not specifically protected by internal laws but is subject to CITES regulations.

Threats

No information available, though potential threats are likely to be similar to those in neighboring countries.

Conservation Priorities

1. Monitor closely the identified populations, particularly of giant otters.
2. Survey the country for distribution and status of both species, with a view to assessing what conservation action is necessary.

Honduras

Species Present

Neotropical otter

Status and Distribution

The Neotropical otter occurs in the principal rivers of the eastern side of the country, some of the watersheds along the northern coast, and in a few areas in the south. Most reports are from the east in the Mosquitia region, including the Departments of Olancha, Gracias a Dios, and Colon. The species might survive in the west, but little suitable habitat survives there.

Legal Status

Protected by legal resolutions issued by the Natural Resources Directorate in the Ministry of Natural Resources, but thus far, no formal protective legislation has been approved by Congress.

Threats

The principal threat is the destruction of habitat, especially river banks, as a result of human settlements and the relocation of

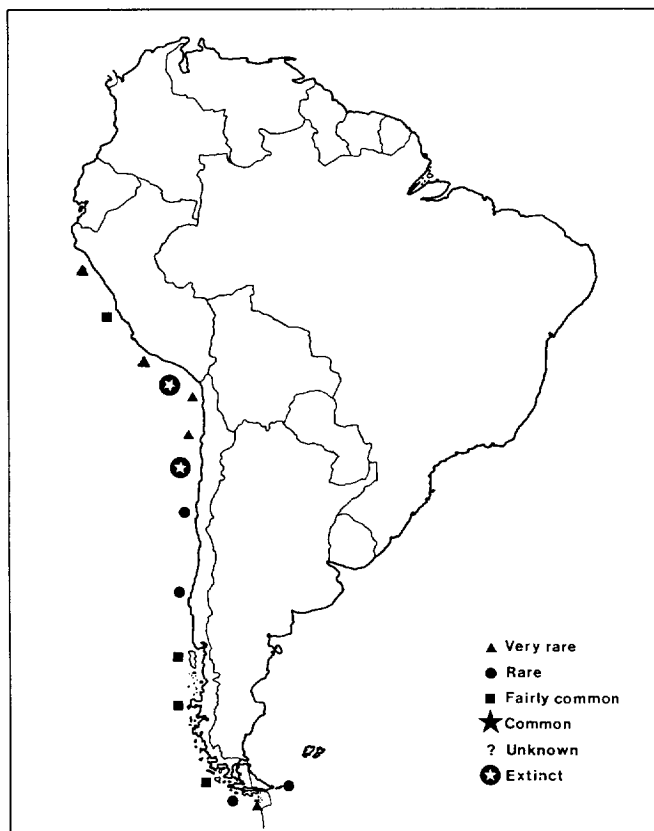


Figure 4. Distribution of the marine otter (*Lutra felina*).

people along the Rio Patuca and affluents in the Gracias a Dios Department.

Conservation Priorities

1. Formal wildlife legislation needs to be enacted by Congress.
2. Surveys are needed to establish the population status and distribution, especially in the east of the country, and to identify suitable sites for reserves.

Mexico

Note: this section was authored by Juan Pablo Gallo-Reynoso.

Species Present

Neotropical otter, North American river otter, sea otter (?)

Status and Distribution

Otters in Mexico are becoming rare and/or endangered due to habitat destruction. Fragmentation of their habitat could be the major threat in the near future. Poaching is not of sufficient magnitude to produce a decline in otter populations.

The North American river otter is known to occur in the Mexican states of Baja California and Sonora (Colorado River delta), Coahuila, Nuevo Leon, and Tamaulipas, but there are only four records, so information is very scarce.

The Neotropical otter is the best known otter in Mexico (Gallo-Reynoso in press). It is found in the high Sierras and mountain slopes facing the Pacific Ocean and the Gulf of Mexico, from 1,700 m to the coastal plains, and inhabits creeks, rivers, lakes, mangrove swamps, irrigation canals, and dams all

over the country's neotropical zone. This species occurs from 30° N to 13° N on the Pacific slopes and from 16° N to 24° N on the Gulf of Mexico slopes. It is absent over the entire Mexican highlands, even though they were once quite common there. They have been observed in the states of Tamaulipas, San Luis Potosi, Puebla, Veracruz, Tabasco, Campeche, Yucatan, Quintana Roo, Chiapas, Oaxaca, Guerrero, Morelos, Mexico, Michoacan, Colima, Jalisco, Zacatecas, Nayarit, Sinaloa, Durango, Sonora, and Chihuahua.

The sea otter is considered to be extirpated from Mexican waters and has not been recorded since 1912, except for a skull observed in 1979 in Rancho Nuevo (Baja California, 28° N), and one sighting on the very tip of Baja California Peninsula in January 1989. It is believed that several animals from the California population wandered there but did not establish reproductive colonies on the Mexican coast.

Legal Status

Article 8 of the Federal Law of Hunting lists the wildlife under permanent protection because the species in question are considered threatened or endangered. The Neotropical otter is number 9 on this list. All Mexican otters are covered by this article. Certain areas of high diversity (including rivers where otters are distributed) have been declared National Parks or Biosphere Reserves.

Threats

1. Large-scale habitat destruction is resulting from traditional cultivation methods such as the burning and clearing of tropical forests and the opening of land for cattle production.
2. Land reclamation for oil extraction and the filling of wetlands for the same purpose is also destroying otter habitats.
3. Pollution of waterways with industrial, agricultural, and municipal wastes is threatening the food chain upon which otters depend.
4. Clear river waters are being abused for the use of ever-increasing urban areas.
5. Fishing methods, such as the use of poisons from toxic plants, small amounts of TNT, quicklime, and electroshocking, are causing the disruption of entire ecosystems.
6. Otters are killed for their fur to supplement the family economy of poor areas, and also for their meat in certain areas of Mexico. Otters are sometimes taken in pup stages as pets in coastal areas of Mexico. There is no large-scale hunting and there are no black markets for their pelts. Even so, otter skins have been found in the handicraft industry and in tourist shops.

Conservation Priorities

1. More detailed surveys of the presence of the North American river otter and the sea otter should be conducted in the near future to obtain an accurate indication of their distribution and status.
2. More detailed surveys of the presence of the Neotropical otter on the mountain slopes of the Gulf of Mexico as well as in the northern Pacific mountain slopes are needed to obtain an accurate indication of its distribution and status.
3. More scientific studies are needed on the general biology, behavior, reproduction, ecology, and environmental requirements of otters in Mexico.

Nicaragua

Species Present

Neotropical otter

Status and Distribution

The Neotropical otter occurs in small populations along most of the rivers flowing into the Atlantic. The best populations are probably in the southeast of the country. In the center of the country it is reported as reduced in numbers in the Iyas and Blanco Rivers. On the Pacific coast the species has been extirpated for over 30 years due to extensive agriculture (mainly cotton) and livestock developments.

Legal Status

Protected, with internal trade in pelts prohibited in 1977.

Threats

Deforestation and the resulting sedimentation in rivers is destroying otter habitat, especially around Minas de Rosita and Bonanza y Siuna.

Conservation Priorities

A survey is required to assess conservation needs. Excessive deforestation needs to be curtailed, with strict protection being given to water catchments. Riparian habitats need to be conserved and steps should be taken to prevent soil erosion resulting from unwise land management practices.

Panama

Species Present

Neotropical otter

Status and Distribution

The Neotropical otter is distributed throughout the country, where streams in rain forest provide excellent habitat. However, it is not common, though there is apparently a good population in the undisturbed areas around the Rio Teribe.

Legal Status

Protected.

Threats

Even where substantial amounts of natural habitat remain, deforestation is proceeding rapidly and is a potential threat. Hunting is not a serious problem.

Conservation Priorities

1. A survey is needed of the status, distribution, and conservation requirements of the Neotropical otter in Panama.

Paraguay

Species Present

Neotropical otter, giant otter

Status and Distribution

The Neotropical otter is found primarily in the smaller streams of eastern Paraguay and the marshy areas and tributaries of the Pilcomayo and Paraguay Rivers. The departments of Concepcion and Amambay in the northeast, and Neembucu, Misiones, and Itapua in the south are reported as having healthy populations (Melquist 1984). Populations are probably stable, although there are no data from surveys.



Giant otters (*Pteronura brasiliensis*) (Photo by Andre Bartschi).

The giant otter lives in tributaries of the Paraguay and Parana Rivers. Remnant populations may exist in the marshes adjacent to Pilcomayo and Paraguay Rivers in the south. There is a great need for good distribution and status information (Melquist 1984).

Legal Status

Both species are protected.

Threats

1. Deforestation in the east is proceeding rapidly.
2. Trade in otters has probably declined significantly since the ban in 1975, but poaching and illegal trade of unknown magnitude persists.
3. Existing and proposed hydroelectric dams on the Parana River will force giant otters further up the headwaters of tributaries and isolate these populations (Melquist 1984).

Conservation Priorities

1. Monitor and support the protection of identified populations of the giant otter.
2. Surveys to determine precisely the status and distribution of both species.
3. Support the effective enforcement of the hunting regulations.

Peru

Species Present

Neotropical otter, marine otter, giant otter

Status and Distribution

The Neotropical otter has a widespread distribution in the country, including high Andean areas up to 3,000 meters (Grimwood 1969) and some rivers west of the Andes. Its strongholds seem to be in the Amazon region.

The marine otter is at the northern limit of its distribution (6° S latitude) in Peru. It occurs in discontinuous pockets of suitable habitat all along the Peruvian coast. Consequently, populations are probably small and isolated (Brack 1978;

Melquist 1984). The population numbers are not precisely known, but sightings are regularly reported at several localities such as Moro de Suma, Chala, Paracas National Reserve, Naplo, Paraiso, Ancon, and Pachacamac Island. The status of the species seems to be stable.

The giant otter lives east of the Andes, mainly confined to the lowland rain forests, with isolated populations occurring in secluded tributaries of the Amazon. This species has been intensively hunted in the past and now there are only remnant populations, whose status is not precisely known.

Legal Status

All three species are protected.

Threats

1. Habitat destruction through deforestation is a major threat.
2. Pollution of nearshore areas with heavy metals and other toxic substances from mining, and with sewage and garbage.
3. Oil exploration is intensifying, which provides easy human access to formerly undisturbed areas.
4. Even though trade has decreased significantly since a hunting ban in 1973, some unknown amount of illegal commerce still persists, involving the Neotropical otter and the giant otter.
5. The marine otter is not hunted for its fur, but is killed because of conflicts with fishermen and prawn harvesters.

Conservation Priorities

1. Monitor closely the main identified populations, particularly the giant otters of Manu National Park, and the main nuclei of the marine otter along the coast.
2. Develop techniques for accurate census-taking and survey the entire country extensively.
3. Study population changes over time.
4. Support the enforcement of hunting prohibitions.
5. Establish parks and reserves in areas important for remnant and established populations.

Suriname

Species Present

Neotropical otter, giant otter

Status and Distribution

The Neotropical otter is distributed throughout the country, including small streams in the Guiana highlands and the agricultural canal systems of the coastal belt (Duplaix 1980; Melquist 1984). Its status is considered healthy and stable.

The giant otter, although widely distributed as well, is more concentrated at fewer sites. Giant otters also occur in the agricultural canal systems. In the highlands they reach lower elevations than the Neotropical otter. Giant otters have been reported from Corantijn, Nickerie, Wayombo, Coppename, and Commewijne Rivers (Duplaix 1980; Suriname Forest Service 1987). The status of this species seems stable and relatively healthy. Suriname, along with French Guiana and Guyana, is one of the few remaining areas with healthy populations of giant otters.

13. Action Plan for North American Otters

Paul Polechla

Introduction

North America, defined here as Canada and the United States of America, has two otter species, the sea otter (*Enhydra lutris*, which is covered separately in Chapter 8), and the North American river otter (*Lutra canadensis*). Like its Eurasian counterpart, the North American river otter ranges widely in aquatic habitats, utilizing rivers, lakes, and freshwater marshes. It also occurs on rocky sea coasts, for example in Alaska, California, and British Columbia, and in coastal saltmarshes on the Atlantic seaboard. The species originally ranged from 25° to 70° N latitude and from 53° to 166° W longitude (Hall 1981) and occurred in virtually every major drainage basin and wetland habitat type north of the Rio Grande and Colorado river drainages (see Figure 1). The range contracted markedly during this century (see Figure 2) although otters have more recently been found over a wider area (see Figure 3).

Fossils of the North American river otter are known from the early Pleistocene in North America (Zyll de Jong 1972). Archeological remains, dating from 200 B.C. (Polechla 1987) to the mid-1400s (Wright 1987) indicate that the North American river otter has long been harvested for fur and meat. There is also documentation of the hunting and trapping of otters by Native Americans, immigrant Europeans, and their naturalized descendants from the 1500s to the present (Hutchins 1987; McGee 1987; Obbard 1987; Polechla 1987, 1989b; Ray 1987).

The diet of the North American river otter consists largely of fish, with crustaceans, amphibians, reptiles, birds, and insects generally of lesser importance (Mason and Macdonald 1986a; Melquist and Dronkert 1987). Slow-moving fish and prey unable to escape detection are selected preferentially. Otters are considered beneficial to game fisheries (Melquist and Dronkert 1987). Although there are numerous reports on diet, only a few studies have investigated the prey availability to the otter (e.g. Melquist and Hornocker 1983; Mack 1985).

Melquist and Dronkert (1987) reviewed several river otter behavior studies which used telemetry. Individual home ranges varied from 4-78 km in length. Adult males generally have the largest home ranges, especially in the spring breeding season, while the ranges of lactating females are the most restricted. Home ranges of individuals, both males and females, overlapped considerably in study areas in Idaho, Louisiana, Missouri, and Alberta, but territoriality was indicated by similar studies in Texas and coastal Alaska. It has been suggested that territoriality may occur in unexploited, well-established otter

populations in areas where food supplies are evenly distributed (Melquist and Dronkert 1987). Population density estimates range from 1 otter per 1.2-2.1 km of coastline in Alaska to 1 otter per 4-17 km in freshwater habitats (Melquist and Dronkert 1987).

Riparian vegetation is an essential component of otter habitat and waterside vegetation may also attract beavers, which create ponds and lodges that are later used by otters (Melquist and Hornocker 1983; Larsen 1983; Woolington 1984; Polechla 1987). River otters den and temporarily rest in a multitude of natural cavities. In Idaho, one animal used 88 different sites during a 16 month period and the local population of about 23 otters used 15 different sites 1,283 times. Of these repeatedly used sites, 32% were in bank dens of beaver, 18% in log jams, and 11% in riparian vegetation (Melquist and Hornocker 1983).

Polechla (1987) reviewed the studies concerning the reproductive biology of the North American river otter. The North American river otter reaches sexual maturity in one or two years. Mating occurs from winter to early spring. Delayed implantation occurs, with the development of the embryo arrested following fertilization. Timing of reproductive events varies according to latitude. Implantation occurs from November in Florida to March in Alaska, with subsequent birth dates varying from January in Florida to May in Alaska. Embryonic litter size varies from one to six, with an average of two or three.

In some areas North American river otters may be active during the day, but generally they are nocturnal or crepuscular. The basic social group consists of a female and her offspring with male otters playing little or no part in the family group (Melquist and Hornocker 1983). A population of otters in coastal northern California segregated into two distinct social groupings, one group consisting of a maternal female, her pups and adult female offspring, the other consisting entirely of males (Shannon 1989). Social behavior therefore appears to be flexible. Olfactory communication between members of social groups and between groups is important and involves scent-marking with feces, urine, and anal sac secretions (Melquist and Dronkert 1987). Scent-marking activity increases during the breeding season (Humphrey and Zinn 1982).

Despite the potential availability of tissues due to legal trapping of otters, few studies of bio-accumulating contaminants have been made. Metals are widely distributed in tissues at low concentrations and elevated levels of mercury have been reported from Georgia (Cumbie 1975). Wren (1985) reported the death from mercury poisoning of a wild otter in Ontario.

Organochlorine pesticides and PCBs have been reported in a number of studies (see review in Mason 1989). PCBs were considered to be likely causes of declines in otter populations in Oregon (Henny et al. 1981) and New York (Foley et al. 1988).

During the late 1800s and early 1900s, the synergistic effect of wetland destruction, pollution, and overexploitation for furs was devastating to North American river otter populations. Other direct causes of otter mortality include incidental take during beaver trapping, drowning in fishing nets, and road kills. Populations were reduced to the greatest extent in regions where: 1) human populations were dense; 2) agriculture or industrial practices were intense; 3) wetlands were naturally sparse (i.e. in semi-arid grasslands of the Great Plains and arid deserts of the southwestern United States); or 4) oligotrophic waters could not support an adequate prey base (e.g. the north slope of Alaska, northern Northwest Territories, and the northern Hudson Bay region).

Conservation measures implemented at the beginning of the 20th century, namely restricted trapping and hunting seasons, preserving wetlands, and public education, undoubtedly contributed to the initial recovery of the North American river otter populations. The reintroduction and restocking of beavers from the 1920s to the 1950s also had a positive influence on otter populations. Otters benefit from a facultative commensalism with beavers (Tumilson et al. 1982; Reid 1984; Polechla 1987, 1989b). Beaver dams increase wetland area (Novak 1987a) and otters take refuge in beaver lodges (Melquist and Hornocker 1983; Reid 1984; Polechla 1987, 1989b). Furthermore, prompted by low grain prices, an Act was passed by the U.S. Congress in 1985 allowing flood-prone agricultural land to revert to wetland vegetation (Polechla 1988). This is expected to have a positive influence on otter populations. However, North American wetlands have become increasingly polluted because of the relaxation in enforcement of anti-pollution legislation, and pollution may be the most severe long-term threat to otter populations (Wren 1987).

Legal Status

Sources of information

Information regarding the legal status of North American river otter populations was obtained from questionnaires mailed to furbearer or endangered species biologists (or equivalent) in the 49 continental United States and the 13 Provinces, Territories, and islands of Canada. The addresses were obtained from the National Wildlife Federation's Conservation Directory (National Wildlife Federation 1989). The prospective respondents were asked to list legal status as protected, harvest permitted, or unknown. A 100% response was obtained through follow-up telephone calls when necessary (see Table 1).

Assessment

The North American river otter is designated as an extirpated species in Indiana and Prince Edward Island, although there have been recent reports of accidental deaths in both areas (S. Johnson and R. Dibblee respectively, pers. comm.). North American river otters are protected in 21 of the United States. Trapping is permitted in 27 states and 11 Canadian Provinces and Territories. Minnesota allows a harvest in the northern part

of the state where populations reportedly are large and stable but not in the southwestern part where populations are low. Populations were reported to be stable or increasing in all states and provinces where trapping is allowed (see Table 1).

Population Status

Sources of Information

Table 1 also summarizes the response by each state or province to the questions concerning the population status of the North American river otter. Respondents were asked to describe the population of this species in their area as extirpated, declining, stable, increasing, or unknown. These determinations were based on trend estimates, parameters, indices, and density estimates for each population. Methods used by the states and provinces included questionnaires, track and scat surveys, age structure analyses, analyses of natality and recruitment rates, and density estimates based on field surveys (i.e. radio tracking and radioisotope marking). The quality of the data and the reliability of the status determinations are unknown. Harvest data are available for all the states and provinces that allow trapping.

Assessment

The population status was unknown in Utah, although Bich (1988) recently surveyed northern Utah. Colorado reported a declining population despite an ambitious reintroduction program. There were no detailed reports on population status (*per se*) in the states of Arizona, Indiana, Iowa, Kansas, Kentucky, Nebraska, North Dakota, Ohio, South Dakota, West Virginia, Wyoming, and Prince Edward Island. There is considerable concern over the status of the subspecies *sonora* in the southwestern United States. An Arizona specimen, believed to be *L. c. sonora*, was collected as late as 1970, and otter tracks were found in New Mexico during a reconnaissance trip down the Rio Grande Gorge in April 1989 (P.J. Polechla, pers. observ.). Despite the persistence of records of occurrence, there have been no intensive field surveys for *L. c. sonora*. To confound the issue, other subspecies are being released into adjacent parts of Arizona and Colorado (Britt et al. 1984; T. Beck, pers. comm.).

Beaver dams enhance the wetland habitat, and thus the conservation of beavers has facilitated the recovery of otters in some parts of the North American interior (Polechla 1987, 1989). Although beavers provide habitat for otters, they also conflict with human interests by flooding such areas as agricultural land, commercially important forests, and roadways (Novak 1987a). Trapping is done to alleviate these problems as well as to provide beaver furs. The 330 size Conibear trap, used most often to capture beavers (Novak 1987b), also captures otters incidentally, since they frequent the same habitats (Polechla 1989). Otters are also caught in Conibear traps targeting the exotic coypu or "nutria" (Mowbray et al. 1979).

To summarize, North American river otters are most abundant in wetland areas (Fremlin 1974; Tiner 1984) of the Mississippi river delta and adjacent Gulf Coast (east Texas to Florida), the Atlantic Coast (Florida to Newfoundland excluding large metropolitan areas such as New York City, Washington, D.C., and Philadelphia), the Great Lakes region, the southern Hudson

Table 1. Legal and population status of the North American river otter (*Lutra canadensis*) in the United States and Canada.

	Legal Status			Reported Population Status			
	Extirpated	Harvest Permitted	Harvest not Permitted	Declining	Stable	Increasing	Unknown
United States							
Alabama		x			x		
Alaska		x			x		
Arizona			x		x		
Arkansas		x				x	
California			x		x		
Colorado			x	x			
Connecticut		x			x		
Delaware		x			x		
Florida		x			x		
Georgia		x				x	
Idaho			x		x		
Illinois			x				x
Indiana	x						x
Iowa			x			x	
Kansas			x			x	
Kentucky			x			x	
Louisiana		x			x		
Maine		x			x		
Maryland		x				x	
Massachusetts		x			x		
Michigan		x			x		
Minnesota		x			x		
Mississippi		x			x		
Missouri			x			x	
Montana		x			x		
Nebraska			x			x	
Nevada		x			x		
New Hampshire		x				x	
New Jersey		x			x		
New Mexico			x				x
New York		x				x	
North Carolina		x				x	
North Dakota			x			x	
Ohio			x		x		
Oklahoma			x			x	
Oregon		x			x		
Pennsylvania			x		x		
Rhode Island			x			x	
South Carolina		x			x		
South Dakota			x				x
Tennessee			x			x	
Texas		x				x	
Utah			x				x
Vermont		x				x	
Virginia		x			x		
Washington		x			x		
West Virginia			x			x	
Wisconsin		x				x	
			x			x	
Total (United States)	1	27	21	1	23	20	5

Table 1. (Continued)

	Legal Status			Reported Population Status			
	Extirpated	Harvest Permitted	Harvest not Permitted	Declining	Stable	Increasing	Unknown
Canada							
Alberta		x			x		
British Columbia		x			x		
Manitoba		x			x		
New Brunswick		x			x		
Newfoundland		x			x		
Northwest Territories		x			x		
Nova Scotia		x			x		
Ontario		x			x		
Prince Edward Island	x						x
Quebec		x			x		
Saskatchewan		x			x		
Yukon Territory		x			x		
Total (Canada)	1	11	0	0	11	0	1

Bay region, and the Pacific Coast (northern California to Alaska). Their current distribution (Figure 3) reportedly is greater than it was in the 1970s (Figure 2).

The interior regions of North America (the Appalachian Mountains, Rocky Mountains, Midwest and Great Plains of the United States and Canada, and the arid southwestern United States) have remnant indigenous populations that reportedly have been increasing slowly. The North American river otter historically occurred in these regions (Hall 1981) but probably at relatively low densities due to the low density of wetlands.

Harvest management

Since 1977, all otter species, including the North American river otter, have been listed on Appendix II of the Convention on International Trade in Endangered Species (CITES) (Greenwalt 1977), with the exception of those already listed on Appendix 1. Trade in otter pelts can only be sustainable under strict trapping seasons and management programmes, as described below.

CITES stipulates that harvest of Appendix II species must not be detrimental to the survival of the species or population. It is on this basis that export permits for the North American river otter are issued. Each exported pelt must be affixed with a sealed federal tag bearing a stamped code identifying the species, the state or province where it was captured, year of capture, and a unique number (Polechla 1987). This procedure allows for tallying the number of North American river otter pelts exported during an individual trapping season. Tags are issued to qualifying states or provinces prior to each harvest season. Personnel of the U.S. Fish and Wildlife Service and the Canadian Wildlife Service, game wardens of state, and provincial wildlife agencies and customs agents enforce the tagging requirements. The Endangered Species Scientific Authority

(i.e. the Office of Scientific Authority, U.S. Fish and Wildlife Service) has adopted additional requirements developed by the "Working Group on Bobcat, Lynx, and River Otter" (C. Dane, pers. comm.). These include further restricting seasons or trapping methods, registering tagged pelts, and determining acceptable harvest levels annually (ESSA 1978 *in* Halbrook 1978). The number of CITES tags issued for the next season is based on past harvests and estimates of various population parameters. Harvests are limited to winter in all states and provinces.

The "Working Group on Bobcat, Lynx, and River Otter" set the following minimal requirements for assessment of river otter populations: information on:

1. population trend, the method(s) of determination to be a matter of state or provincial choice;
2. total harvest;
3. distribution of the harvest;
4. habitat evaluation (ESSA 1978 *in* Halbrook 1978).

These requirements are being met in most cases, although the quality of data in some instances is poor. For example, population status or "trend" information is of varying quality among the states and provinces that harvest otters. The regulation of the harvest in the North American river otter, including the sealing of pelts, may in itself provide little information on population trends, for harvests are influenced by fluctuations in pelt prices, supply and demand, and unpredictable weather conditions (Melquist and Dronkert 1987).

The CITES tagging system allows for enumeration of pelts that are traded internationally, thus providing a reliable estimate of total annual export. It also identifies the state or province where the animal was harvested (summarized in Melquist and Dronkert 1987). Some information on habitat usually is reported, at least in a cursory way. North American river otter pelts are traded "cased" and usually "leather out",

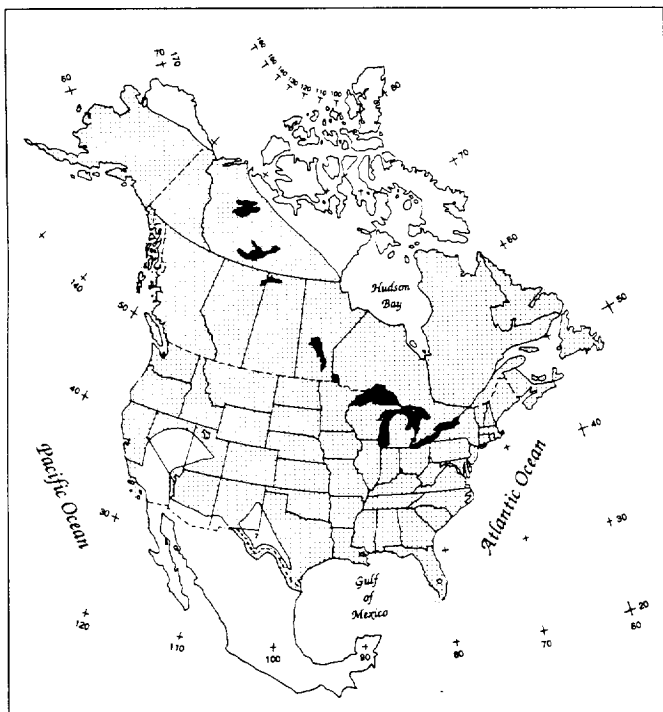


Figure 1. Original distribution of the North American river otter (*Lutra canadensis*) in the United States and Canada (from Hall (1981) and Polechla (1988)).

whereas those from other parts of the world are "open". This means that pelts originating from North America have a totally different appearance from those from all other origins. International trade in the North American river otter can therefore be regulated without the risk of rarer species being traded under its cover.

In the past decade many states and provinces have conducted studies relating to the status of otter populations. A computer and bibliographic search on the North American river otter (Tumilson and Shalaway 1985; Polechla in litt.) revealed 165 references published in the ten years between 1976 and 1985, significantly more than the 128 reports published in 100 years from 1865 to 1965.

Reintroduction and Restocking

Altogether, 991 North American river otters have been reintroduced or restocked in 15 states and provinces in the North American interior. An additional three attempts are planned. Minnesota has captured otters from the northern part of the state where populations are high and released them into the southern part of the state where populations are low. Missouri's release program has been the most ambitious and arguably the most successful (see Chapter 7). Most of these programs have documented survival of individuals of two years or more (Polechla 1989a), although reproduction of reintroduced animals has been recorded in only a limited number of instances (Erickson et al. 1984). The ultimate test of success is documentation of sustained population increases.

Threats

1. Habitat destruction, including urban and agricultural development.
2. Pollution from a variety of causes including release of heavy metals, PCBs, and pesticides into watersheds, as well as acidification due to mining operations.
3. Harvesting that is not based on adequate population data.
4. Incidental mortality during trapping for other species, especially beavers and coypu.
5. The subspecies *Lutra canadensis sonora*, which occurs in the Rio Grande, Colorado, and Canadian river drainages of the southwestern United States and possibly Mexico (J. Pablo Gallo-Reynoso, pers. comm.) (see Chapter 12) is imperiled, largely because of over-grazing and failure to maintain year-round minimum in-stream flow (Bradley 1986; Bich 1988). Scattered reports of otters inhabiting this region persist (Britt et al. 1984; Stahlecker 1986).

Conservation Priorities

1. Critical evaluations of current status determinations are of highest priority for this species, especially in states and provinces where harvest is permitted. Further take should be prohibited in any state or province that cannot scientifically demonstrate 1) that its otter population is stable or increasing, and 2) that the level of take is not jeopardizing the population. Consistent analytical procedures and decision criteria should be implemented by all states and provinces in which the species is harvested. A combination of methods, including the following, should be used in deter-

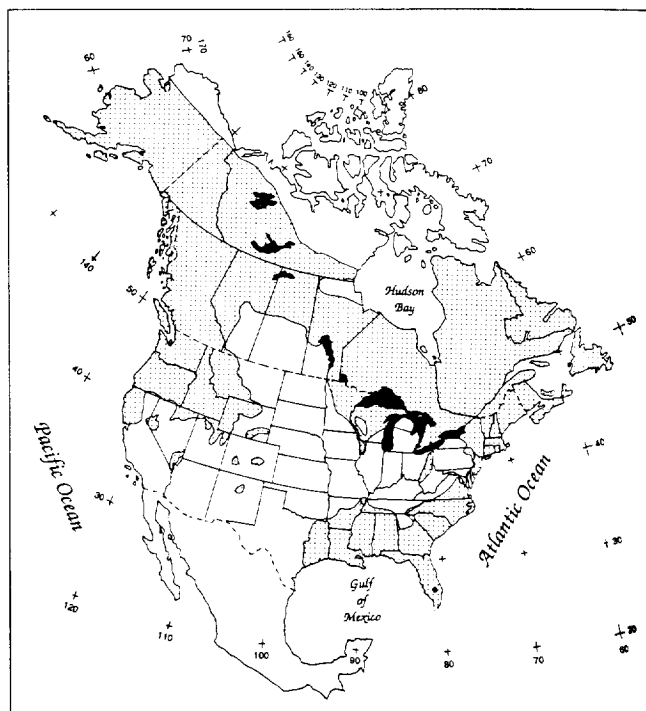


Figure 2. Distribution of the North American river otter in the United States and Canada, circa 1977 (from Deems and Pursley (1978)).

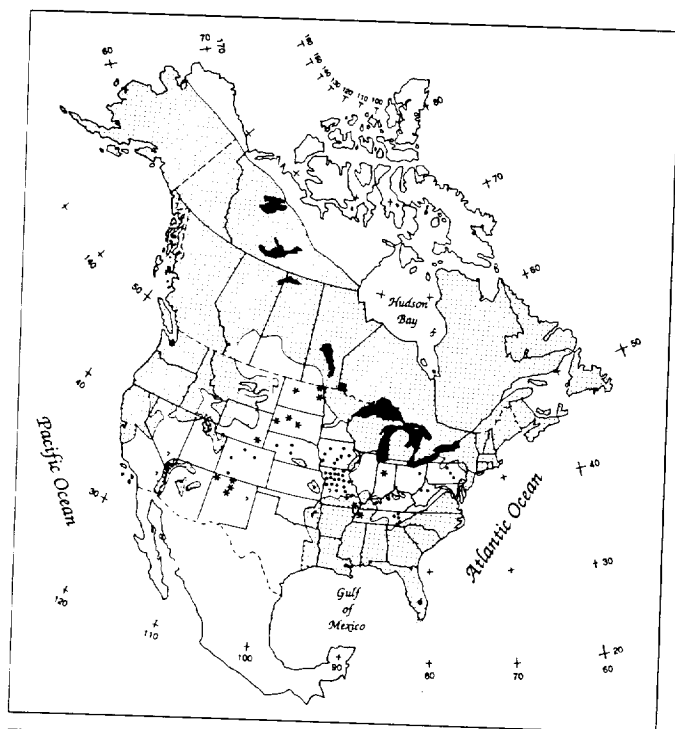


Figure 3. Distribution of the North American river otter in the United States and Canada, circa 1988. Stars represent locations of accidental deaths or reliable, recently reported sightings. Dots represent sites of reintroduction or restocking. Question marks represent locations of unverified sightings. Data were derived from questionnaire responses (see text).

mining population status: density estimates, natality and recruitment estimates, age structure analyses, track and scat surveys, questionnaires, and harvest data analyses. Where possible, radio-tracking should be used to obtain population parameters and radioisotope tagging should be tested further as a means of obtaining density estimates (Shirley et al. 1988).

2. Extensive and intensive studies of the distribution and relative abundance of *L. c. sonora* in the Rio Grande, Colorado, and Canadian River drainages of the southwestern United

States are urgently needed. In the interest of maintaining genetic diversity (Hummel 1987), release of otters from other areas should be curtailed until the status of this subspecies is fully assessed. Additional studies of the North American river otter in the North American interior (e.g. the Great Plains of southern Canada and midwestern United States) are needed.

3. Carcasses from the fur harvest and accidental deaths should be analyzed more often to increase knowledge of pollutants, reproductive biology, parasite load, diet, and taxonomy. A detailed and geographically comprehensive analysis of pollutant levels is needed.
4. Guidelines provided in Chapter 7 on reintroductions should be followed prior to release in order to avoid needless deaths of otters, waste of time and money, and genetic mixing.
5. All beaver management plans should be developed to safeguard otter populations as well. In areas where otters are endangered, the use of Conibear traps should be prohibited. Modified leg hold-traps (Shirley et al. 1983) or Hancock live traps (Northcott and Slade 1976) should be used in areas where beavers have become a nuisance and otters are endangered, taking into account any new developments in trap technology to make these more humane. Education and enforcement programs should be instituted to ensure that these guidelines are met (e.g. Anderson 1982).
6. Cooperative studies with aquatic biologists are needed to determine the North American river otter's habitat requirements, prey preferences, and role in the ecological community.
7. Cooperation is needed between neighboring states and provinces in studies of North American river otters within major drainage systems.
8. A concerted effort should be made to refine and publish final reports in order to disseminate the latest knowledge on the species.
9. A symposium on the ecology of the North American river otter is needed to synthesize current knowledge and to provide direction for future research and management. The last one was held in 1984 in Columbia, Missouri.

14. Conclusions and Priorities for Otter Conservation

Chris Mason and Sheila Macdonald

Introduction

All otter species are associated with aquatic habitats. Water, of course, is also an essential resource for man. For millennia the wetland habitat has been modified to provide water for domestic uses, for agricultural irrigation, and for industries. Wetlands have also provided foods, such as fish, and have acted as a cheap and simple way of disposing of the wastes of human civilization. Human settlements have also concentrated in river valleys, alluvial plains, or along coasts, with their important wetland habitats. The biotope of otters has always been under threat from drainage, habitat destruction, overexploitation, and pollution. However, the enormous growth in the human population during this century, together with rapid increases in industrialization, agricultural production, and overexploitation of natural resources, have had major impacts on otter populations.

Before presenting priorities for each species in turn, we first consider, in general terms, factors which need to be taken into account in developing conservation strategies for this remarkable subfamily of animals.

Pollution

Contamination of food resources with organochlorine pesticides and PCBs has led to large and widespread declines in the numbers and range of the Eurasian otter (*Lutra lutra*), the only species which has been systematically studied for pollutants. Evidence suggests that they have also had a negative impact on at least some populations of the North American river otter (*Lutra canadensis*). There have been no studies on other species. The use of organochlorine pesticides has been largely curtailed in the developed world, but they are still exported to and widely used in the developing world. Restrictions have also been placed on the use of PCBs, but they are still manufactured and are widely present in closed systems, such as transformers, and present a problem not only now, but for decades or longer to come. Organochlorine pesticides and PCBs are frequently dispersed over vast distances, thereby causing ecological problems in areas remote from their manufacture or use. We therefore strongly urge that there should be a worldwide ban on the use of persistent organochlorine pesticides. PCBs should be replaced by non-accumulative compounds as a matter of urgency, and proper facilities for the destruction of PCBs by incineration should be further developed and strictly controlled.

Habitat Destruction

As with many species, otters are under threat due to habitat destruction, in some areas on a large scale. Most otter species live naturally at low densities, so that viable populations are unlikely to be maintained in all but a few of the largest protected areas. We need more information on the habitat and resource requirements of all otter species and on the size and configuration of suitable habitats necessary to maintain viable populations. It is essential to link the conservation of otters to the conservation of other wetland species to provide an integrated approach to wetland protection. An inventory on the status of otters in all national parks and Ramsar sites would be useful first steps. Where the modification or destruction of significant wetlands is envisaged, there must be an environmental impact assessment on which rational decisions can be based, and the impact of developments on otters should be an integral part of such assessments. It is essential however, to consider the conservation of otters both in the wider landscape and the small scale, for steady attrition of riparian habitat is, in the long term, as damaging to otters as the loss of major wetlands. We must press for the conservation of riparian habitats and for the restoration of those which have been degraded. The concept of habitat corridors between protected areas is of crucial importance to the survival of otter populations, for it will prevent the fragmentation of populations. The numbers of animals in fragmented units may be too small to ensure long-term survival, while enforced inbreeding will result in the loss of genetic diversity and eventually population viability.

Overhunting

Otters have long been hunted for their pelts which, historically, resulted in major population declines of the North American river otter (*Lutra canadensis*) and the sea otter (*Enhydra lutris*), the latter almost to extinction. In recent times, trapping and hunting has had a major impact on South American species, especially the giant otter (*Pteronura brasiliensis*). At present, international trade in many otter species is prohibited. We are concerned that trade in certain species may allow the illicit exploitation of protected species, for pelts are difficult to tell apart (for instance between the Eurasian, smooth, and hairy-nosed otters). The only species for which there is a regulated trapping season is the North American river otter. Although the management of this species is generally effective, we are concerned that quotas are in some instances based on rather

inadequate independent information on population trends, especially as it is known that otter declines can occur rapidly and go largely unnoticed. The management guidelines that have been developed by the authorities in Canada and the United States need to be implemented strictly, and if any populations become depleted, exploitation of them should cease until full recovery has taken place.

Conflicts with Fishermen

Otters feed extensively on fish and/or shellfish, and therefore come into conflict with fishermen and fish farmers. Because most otter species occur naturally at low density, it is likely that much of the alleged damage is exaggerated. However, it is important to obtain more concrete information on the impact of otters on both natural and farmed fisheries and, where damage is considered significant, to develop effective methods of ameliorating it.

Education

Because otters can only be conserved in the wider environment, it is essential that effective educational programs be developed. Otters are naturally appealing animals, and where their image has been imaginatively promoted (for example the sea otter in the United States and the Eurasian otter in several European countries), the public has developed considerable empathy with the animals. In Britain, for example, some mention of the otter occurs almost every week in the media. It is therefore an important priority to raise the profile of otter conservation in other parts of the world.

Captive Breeding

Much has been learned recently about keeping and breeding otters in captivity and, provided the welfare of the animals is kept paramount, zoos have a role to play in this promotion of conservation. Studbooks should be maintained for all otter species in captivity, especially as some reintroduction programs are contemplated and more will be in the future. Captive breeding programs are probably needed for some of the rare otter species.

Reintroduction

Reintroduction programs should be seen as a last resort in otter conservation and any program should strictly adhere to IUCN guidelines. They are likely to prove extremely expensive. Nevertheless, there are occasions when reintroductions are the only possible option, and in these cases, they should be encouraged.

Research

It is clear that we still have much to learn about the biology of otters. All well-founded scientific studies into the biology of otters should have our strongest support where the results will further our aims of otter conservation. Research is needed to elucidate the effects of the factors listed above, in particular pollution, habitat management, hunting, population fragmenta-

tion, and conflicts with fisheries. Research will also be needed on breeding biology and general husbandry for maintenance in captivity, as well as on reintroduction techniques and strategies.

Specific Recommendations

Since this action plan deals with only 13 species, we present here summaries of priorities for each species in turn, based on the information provided in the preceding chapters. We have categorized otter species into three broad groups based on current information as follows:

1. **Species of Global Conservation Concern.** This category comprises those species known to be endangered and/or those limited to a restricted geographic range for which there is little or no recent information.
2. **Species of Local Conservation Concern.** This category comprises those species which are considered to be threatened locally or regionally following recent declines, but which are not yet globally threatened.
3. **Species Receiving Adequate Conservation.** This category comprises two species which, although potentially vulnerable, are confined to regions where conservation measures, and resources for their implementation, should be adequate and readily available.

Species of Global Conservation Concern

Hairy-nosed Otter (*Lutra sumatrana*)

The distribution of this species is very poorly known, and it is thought to have disappeared from wide areas from where it was formerly recorded. Nothing is known of its ecology. Conservation priorities are as follows:

1. Field surveys, using standard methods, should be conducted throughout the range of this very rare species to determine current distribution and status. Priority areas for such surveys are those areas where populations are thought to survive in Sumatra, Kalimantan, and Java (Indonesia), and Sabah and Sarawak (Malaysia). Surveys should also be conducted in parts of the former range from which there are no recent records but in which populations might survive: Brunei, Peninsular Malaysia, southern Thailand, Cambodia, and southern Vietnam.
2. Studies on the ecology and conservation requirements of this very poorly-known species should be initiated in protected areas where it is known to occur. Priority sites for such studies would probably be in Sumatra, Java, or Kalimantan in Indonesia. Such studies should seek to identify those habitat features that must be conserved if this rare species is to survive and recover its numbers.
3. Improved protected area management is needed for all reserves in which the hairy-nosed otter occurs, and management plans for these reserves should take the particular needs of this species into account. These needs should be identified by the research studies referred to above.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. The draining of wetlands in Sumatra and Kalimantan in particular should be considered in this light,



A young Congo clawless otter (*Aonyx congica*) in captivity (Photo by Elizabeth Joy).

and ways should be explored to increase agricultural output to meet human needs, while at the same time retaining the ecosystems in a satisfactory condition for this species. Likewise, the extraction of gravel from river beds in Sumatra also needs careful regulation.

5. The use of pesticides in agriculture, and the dumping of toxic wastes from factories and domestic wastes and detergents from human settlements needs to be strictly regulated. In particular, the use of certain persistent chemicals, such as organochlorines, should be phased out.
6. This species requires strict legal protection in Indonesia, where it is thought the bulk of the known populations survive. All trade in the pelts of the hairy-nosed otter should be prohibited by national laws, and there is a need for stricter compliance with the wildlife protection laws in several parts of its range.
7. There should be initial attempts to keep and breed this species in captivity, with a view to starting a coordinated captive breeding program. In the long-term, the possibility of reintroducing the species in parts of the former range might be considered.

Congo Clawless Otter (*Aonyx congica*)

This species is known only from Angola, Cameroon, Central African Republic, Congo, Gabon, Nigeria, Rwanda, Uganda, and Zaire. It might also occur in Burundi. Its ecology and conservation requirements are unknown. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted in the range of this rare species to determine current distribution and status. Priority areas for such surveys are the large protected areas within the equatorial forest belt in

Africa: Dja and Korup in Cameroon; Dzanga-Sangha in Central African Republic; Konkouati and Odzala in Congo; Lope in Gabon; Oban Hills in Nigeria; and Ituri, Kakuzi-Biega, Maiko, and Salonga in Zaire. Surveys in Zaire are of the highest priority, since it is here that the largest areas of habitat are conserved.

2. Studies on the ecology and conservation requirements of this very poorly-known species should be initiated. Such studies should seek to identify those habitat features that must be conserved if this rare species is to survive.
3. Improved protected area management is needed for all reserves in which the Congo clawless otter occurs, and management plans for these reserves should take the particular needs of this species into account. These needs should be identified by the research studies referred to above.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. This implies the management of timber concessions in the African equatorial forests on a long-term sustainable use basis, rather than clearance. There is also a need to integrate indigenous people and their needs into the conservation and sustainable management of these forests. In local situations, it might be necessary to limit excessive hunting of otters.
5. In local situations, it might prove necessary to devise means of reducing the numbers of this species being accidentally killed in fish traps.
6. There should be initial attempts to keep and breed this species in captivity, with a view to starting a coordinated captive breeding program.

Giant Otter (*Pteronura brasiliensis*)

This species is one of the most endangered of the Latin American otters, having suffered severely from overhunting for pelts. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted throughout the range of this rare species to determine current distribution and status, and degree of recovery (if any) in populations following protection and closing of the trade in pelts. Priority areas for such surveys are: the Misiones and Corrientes provinces in Argentina; the Manuripi Faunal Reserve and Amboro National Park in Bolivia; the Pantanal, Rio Negro (Matto Grosso do Sul), the Parana-Iguacu area, and appropriate sites in the Amazon basin in Brazil; El Tuparro and Sierra de la Macarena National Parks, Arauca Sanctuary, and Miritiparena River in Colombia; the Bobonaza, Ishpingo, Cuyabeno, Guapi, Lagarto Cocha, and Tarapuy Rivers in Ecuador; the interior of French Guiana; Morawhanna, Russel Lake, Lama and Maduni Creeks, and Mahaica, Abary, Mashivean, and Morewan Rivers in Guyana; tributaries of the Paraguay and Parana Rivers in Paraguay; Manu National Park and other lowland areas in eastern Brazil; the Corantijn, Nickerie, Wayombo, Coppename, and Commewijne Rivers in Suriname; and the Apure, Caura, Ventuari, Arauca, Cunaviche, Capanaparo, Claro, Aguaro, Cinaruco, and Portuguesa rivers, and the Orinoco Delta in Venezuela.

2. Studies on the ecology and conservation requirements of this remarkable species should be continued. Such studies should seek to identify those habitat features that must be conserved if this rare species is to survive.
3. Improved protected area management is needed for all reserves in which the giant otter occurs, and management plans for these reserves should take the particular needs of this species into account. These needs should be identified by the research studies referred to above.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. This implies the management of forest and wetland habitats on a long-term sustainable use basis. There is also a need to integrate indigenous people and their needs into the conservation and sustainable management of the habitats of this species. When major development projects are being considered (e.g. dam construction, mining operations), environmental impact assessments should be mandatory and should include a review of likely effects on giant otters and other threatened species.
5. In local situations, it might prove necessary to devise means of reducing conflicts between giant otters and fisheries.
6. Much stricter regulations need to be enforced to prevent the escape of toxic wastes from factories, human settlements, or agriculture into rivers and wetlands. Of immediate concern is mercury pollution in the Amazon basin arising from gold washing. It is also recommended that the use of certain

persistent chemicals, such as organochlorines, be phased out.

7. This species requires continued strict legal protection throughout its range. In many areas, enforcement needs to be improved, especially in relation to illegal hunting, and efforts to eliminate the illegal trade in pelts should be maintained.
8. Public education campaigns are needed in all countries within the range of the giant otter to draw attention to the plight of this species, and to develop support for its conservation.
9. There should be initial attempts to keep and breed this species in captivity, with a view to starting a coordinated captive breeding program.

Marine Otter (*Lutra felina*)

This species is threatened within its known range, the Pacific coasts of Argentina, Chile, and Peru. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted throughout the range of this rare species to determine current distribution and status. Priority areas for such surveys are: Staten Island in Argentina; the entire coastline of Chile; and the Peruvian coastline south of 6° S. Such surveys should be most efficient if they concentrate in the first instance on areas of suitable rocky habitat. These surveys should develop into regular monitoring programs.
2. Studies on the ecology and conservation requirements of this poorly-known species should be continued. Such studies should seek to identify those habitat features that must be conserved if this rare species is to survive and recover its numbers. Research is also needed on food requirements, and the impact of human activities (such as harvesting of marine resources, including algae) on the marine otter needs evaluation.
3. Coastal protected areas need to be established for this species in all three countries. Management plans for these reserves should take the particular needs of this species into account. These needs should be identified by the research studies referred to above.
4. Even outside protected areas, this species requires strict protection from hunting and persecution in order to prevent the fragmentation of populations. Continued efforts are needed to eliminate the illegal trade in pelts.
5. In local situations, it might prove necessary to devise means of reducing conflicts between marine otters and fisheries, most notably with prawn harvesters in Peru.
6. The effects of inshore pollution of various forms on the marine otter also need to be evaluated, and if necessary, there should be stricter controls on the discharge of pollutants into the sea. In particular, much tighter controls are needed on mining activities in northern Chile (that have been causing severe inshore heavy metal pollution).
7. Public education campaigns are needed in all three countries within the range of the marine otter to draw attention to the plight of the species, and to develop support for its conservation.



Giant otter (*Pteronura brasiliensis*) (Photo by Russell Mittermeier).

8. There should be initial attempts to keep and breed this species in captivity, with a view to starting a coordinated captive breeding program. In the long term, the possibility of reintroducing the species in parts of the former range might be considered.

Southern River Otter (*Lutra provocax*)

This species is restricted to Argentina and Chile, and is threatened in both. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted throughout the range of this rare species to determine current distribution and status. Priority areas for such surveys are: Staten Island and the Nahuel Huapi basin and surrounding areas in Argentina; and suitable areas of freshwater and marine habitat in Chile south of 36° S. Such surveys should be most efficient if they concentrate in the first instance on areas of suitable habitat. These surveys should develop into regular monitoring programs.
2. Studies on the ecology and conservation requirements of this poorly-known species should be continued. Such studies should seek to identify those habitat features that must be conserved if this rare species is to survive and recover its numbers. Research is also needed on food requirements, and the impact of human activities such as harvesting of marine and freshwater resources (including algae), on the southern river otter needs evaluation.
3. Coastal and inland protected areas need to be established for this species in both countries. Management plans for these reserves should take the particular needs of this species into account. These needs should be identified by the research studies referred to above. There should be close cooperation between Argentina and Chile in implementing conservation programs for this species.
4. Even outside protected areas, the habitat of the species needs careful management to prevent population fragmentation. The clearance of large areas of forest in southern Chile, and of riparian vegetation in central Chile, is of particular concern and needs to be carefully regulated.
5. This species requires strict protection from hunting and persecution in order to prevent the fragmentation of populations. Continued efforts are needed to eliminate the illegal domestic trade in pelts, and this is another issue which depends on close cooperation between Argentina and Chile.
6. When major development projects are being considered (e.g. hydroelectric power development and agricultural expansion around rivers), environmental impact assessments should be mandatory and should consider the effects of such schemes on otters and other species of conservation concern.
7. In local situations, it might prove necessary to devise means of reducing conflicts between southern river otters and fisheries.
8. The effects of pollution of various forms on the southern river otter also need to be evaluated, and if necessary, there should be stricter controls on the discharge of pollutants into the sea. Particular points of concern include freshwater pollution in central Chile.

9. Public education campaigns are needed in both countries to draw attention to the plight of the species, and to develop support for its conservation.

10. There should be initial attempts to keep and breed this species in captivity, with a view to starting a coordinated captive breeding program. In the long term, the possibility of reintroducing the species in parts of the former range might be considered.

Species of Local Conservation Concern

Neotropical Otter (*Lutra longicaudis*)

Though still widespread throughout its extensive range from Mexico south to Argentina, it is thought to be declining in many areas. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted in each of the 21 countries in which the Neotropical otter occurs to determine current distribution and status. These surveys should develop into regular monitoring programs.
2. Studies on the ecology and conservation requirements of this species should be continued. Such studies should seek to identify those habitat features that must be conserved if this species is to survive in good numbers.
3. Protected area management plans should take the particular needs of this species into account. These needs should be identified by the research studies referred to above.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. This implies the management of forest, wetland and riparian habitats on a long-term sustainable use basis. There is also a need to integrate indigenous people and their needs into the conservation and sustainable management of the habitats of this species. When major development projects are being considered (e.g. dam construction, mining operations), environmental impact assessments should be mandatory and should include a review of likely effects on otters and other species.
5. In local situations, it might prove necessary to devise means of reducing conflicts between otters and fisheries.
6. Much stricter regulations need to be enforced to prevent the escape of toxic wastes from factories, human settlements, or agriculture into rivers and wetlands. Of immediate concern is mercury pollution in the Amazon basin arising from gold washing. It is also recommended that the use of certain persistent chemicals, such as organochlorines, be phased out.

Asian Small-clawed Otter (*Aonyx cinerea*)

This species is widespread and common in parts of its range, but its distribution is poorly known or unknown in several countries. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted in each of the 14 countries in which the Asian small-clawed otter occurs to determine current distribution and status. These surveys should develop into regular monitor-



Asian small-clawed otters (*Aonyx cinerea*) (Photo courtesy of the New York Zoological Society).

ing programs. Information is particularly sparse from the following countries: Bhutan, Brunei, Burma, Cambodia, Laos, Nepal, and Vietnam. However, adequate data on which sound conservation strategies can be based are not available for any country.

2. Studies on the ecology and conservation requirements of this species should be continued. Such studies should seek to identify those habitat features that must be conserved if this species is to survive in good numbers. It is also necessary to determine whether or not the ecological requirements of this species vary in areas where it is sympatric with other otter species.
3. Protected area management plans should take the particular needs of this species into account. These needs should be identified by the research studies referred to above. There is probably a need to establish additional protected areas for this species, for instance in mangrove areas of Peninsular Malaysia.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. This implies the management of forest, mangrove, wetland, and riparian habitats on a long-term sustainable use basis. There is also a need to integrate indigenous people and their needs into the conservation and sustainable management of the habitats of this species. When major development projects are being considered (e.g. dam construction, mining operations), environmental impact assessments should be mandatory and should include a review of likely effects on otters and other species. Special management practices are required to ensure the survival of this species in paddyfields, where it plays a valuable role in the control of pests; this requires maintaining areas of shrubs and other dense vegetation to provide the necessary cover for the species in the paddyfields.
5. Much stricter regulations need to be enforced to prevent the escape of toxic wastes from factories, human settlements, or agriculture into rivers and wetlands. The use of pesticides should be monitored to determine their effects on this species and its food. It is also recommended that the use of

certain persistent chemicals, such as organochlorines, be phased out.

6. Education campaigns are needed to promote support for the conservation of this species, targeting in particular farmers who need to understand the role played by the Asian small-clawed otter in controlling pests in paddyfields.
7. In many countries, better enforcement is needed of existing conservation measures, illegal hunting for domestic markets being one of the principal threats to the species. The trade in pelts from this species needs to be carefully monitored.
8. Methods need to be devised to reduce conflicts between otters and fishermen, and to minimize the loss of otters in fish traps.
9. Providing that the original causes of extinction have been removed, a reintroduction program for this species should be considered in Hong Kong.

Smooth Otter (*Lutra perspicillata*)

This is the most common of the Asian otters but it is in decline and absent from parts of former range. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted in each of the 15 countries in which the smooth otter occurs to determine current distribution and status. These surveys should develop into regular monitoring programs. Information is particularly sparse from the following countries: Bhutan, Brunei, Burma, Cambodia, Iraq, Laos, Nepal, and Vietnam. Particular priority should be given to the disjunct population in Iraq. However, adequate data on which sound conservation strategies can be based are not available for any country.
2. Studies on the ecology and conservation requirements of this species should be continued. Such studies should seek to identify those habitat features that must be conserved if this species is to survive in good numbers. It is also necessary to determine whether or not the ecological requirements of this species vary in areas where it is sympatric with one of other otter species.
3. Protected area management plans should take the particular needs of this species into account. These needs should be identified by the research studies referred to above. There is probably a need to establish additional protected areas for this species, for instance in mangrove areas of Peninsular Malaysia.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. This implies the management of forest, mangrove, wetland, and riparian habitats on a long-term sustainable use basis. There is also a need to integrate indigenous people and their needs into the conservation and sustainable management of the habitats of this species. When major development projects are being considered (e.g. dam construction, mining operations), environmental impact assessments should be mandatory and should include a review of likely effects on otters and other species. Special management practices are required to ensure the

survival of this species in paddyfields, where it plays a valuable role in the control of pests; this requires maintaining areas of shrubs and other dense vegetation to provide necessary cover.

5. Much stricter regulations need to be enforced to prevent the escape of toxic wastes from factories, human settlements, or agriculture into rivers and wetlands. The use of pesticides should be monitored to determine their effects on this species and its food. It is also recommended that the use of certain persistent chemicals, such as organochlorines, be phased out.
6. Education campaigns are needed to promote support for the conservation of this species, targeting in particular farmers who need to understand the role played by the smooth otter in controlling pests in paddyfields.
7. In many countries, better enforcement is needed of existing conservation measures, illegal hunting for domestic markets being one of the principal threats to the species. The trade in pelts from this species needs to be carefully monitored.
8. Methods need to be devised to reduce conflicts between otters and fishermen, and to minimize the loss of otters in fish traps.

Spotted-necked Otter (*Lutra maculicollis*)

This species is rare or very rare throughout much of its range, though locally common in restricted areas of Angola, Central African Republic, Congo, Kenya, Liberia, Malawi, Rwanda, Tanzania, Uganda, Zaire, and Zambia. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted in the range of this uncommon species to determine current distribution and status. Priority areas for such surveys are the lakes and large river systems of central Africa, with the priority countries being listed above.
2. Studies on the ecology and conservation requirements of this poorly known species should be continued. Such studies should seek to identify those habitat features that must be conserved if this species is to survive in viable populations.
3. Improved protected area management is needed for all reserves in which the spotted-necked otter occurs, and management plans for these reserves should take the particular needs of this species into account. These needs should be identified by the research studies referred to above.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. This implies the management of the great lakes and river systems of tropical Africa through broadly-based integrated management programs. Priority areas for this approach are Lakes Victoria, Tanganyika, Malawi, Edward, Kivu, Muhazi, Bulera, and Luhondo, and the rivers of the Zaire/Congo basin.
5. In local situations, it might prove necessary to devise means of reducing the numbers of this species being accidentally killed in fish traps. Controls on hunting might also be needed for some of the more important populations.



Cape clawless otter (*Aonyx capensis*) (Photo by David Rowe-Rowe).

6. Environmental education programs within the range of the spotted-necked otter should include mention of the special problems of otter conservation, in the context of wider issues such as high human population growth, unsound agricultural practices, overgrazing, erosion and siltation of rivers and lakes.

Cape Clawless Otter (*Aonyx capensis*)

This species is rare through much of its extensive range. Conservation priorities are:

1. Field surveys, using standard methods, should be conducted in the range of this uncommon species to determine current distribution and status. Priority areas for such surveys are countries in which reasonable populations are known to occur: Guinea, Kenya, Liberia, Malawi, Mozambique, Senegal, South Africa, Tanzania, Zaire, Zambia, and Zimbabwe. In some of these countries, such monitoring could be developed as part of regular monitoring programs on the health of wetland ecosystems.
2. Studies on the ecology and conservation requirements of this species should be continued. Such studies should seek to identify those habitat features that must be conserved if this species is to survive in viable populations.
3. Improved protected area management is needed for all reserves in which the cape clawless otter occurs, and management plans for these reserves should take the particular needs of this species into account. These needs should be identified by the research studies referred to above.
4. Habitat management practices outside protected areas should also be carried out in such a way as to prevent population fragmentation. This implies the careful management of lakes, wetlands, and riparian habitats, perhaps concentrating initially on the countries listed above.
5. In local situations, it might prove necessary to devise means of reducing the numbers of this species being accidentally killed in fish traps. Controls on hunting might also be needed for some of the more important populations.

6. Environmental education programs within the range of the Cape clawless otter should include mention of the special problems of otter conservation, in the context of wider issues such as high human population growth, unsound agricultural practices, overgrazing, erosion, and siltation of rivers and lakes.

Eurasian Otter (*Lutra lutra*)

This widely distributed species has severely declined in much of western Europe, where it has recently received much conservation attention. Little is known of its status outside Europe. Conservation priorities are:

1. For the following countries basic information on current distribution is rudimentary and field surveys to determine current status and distribution are a priority: Afghanistan, Bangladesh, Bhutan, Burma, Cambodia, China, India, Indonesia (Sumatra), Iran, Iraq, Japan, Laos, Lebanon, Malaysia, Nepal, North Korea, Pakistan, Romania, South Korea, much of the Soviet Union, Syria, Taiwan, Thailand, Turkey, and Vietnam.
2. In the following countries distribution has been determined, at least in part, by field surveys. Priorities are to complete all unfinished surveys and/or to develop monitoring programs to assess future changes in status/distribution: Albania, Algeria, Austria, Belgium, Bulgaria, Czechoslovakia, Finland, France, German Democratic Republic, German Federal Republic, Greece, Hungary, Ireland, Israel, Italy, Jordan, Mongolia, Morocco, Netherlands, Norway, Poland, Portugal, parts of the Soviet Union, Spain, Sri Lanka, Sweden, Switzerland, Tunisia, United Kingdom, and Yugoslavia.
3. Coherent habitat management programs are needed for countries that are known to have viable populations. In some of these (e.g. Finland, Greece, Hungary, Indonesia, Ireland, Pakistan, Portugal, Spain, Sri Lanka, and Yugoslavia), conservation measures are inadequately defined at present, and national strategies need to be prepared and

implemented. Such strategies should ensure that areas identified as priorities for otter conservation by national governments should receive protection from harmful development by these governments. In addition, grant-aided development schemes being funded by agencies such as the EEC should take care to respect national otter conservation strategies.

4. Nature reserve management plans should take the particular needs of the Eurasian otter into account. These needs should be identified by the studies referred to above. There is a need to establish additional protected areas for this species in most countries.
5. More research needs to be carried out on the extent of contamination with accumulating pollutants, both in otters and their food-chains, and trans-national cooperation between researchers and governments is required. Special attention should be paid to emerging water pollution problems in eastern Europe.
6. All developments likely to impact otters and their habitats (i.e. hydroelectric schemes, fish farms, and wetland drainage) should only proceed after having been subjected to environmental impact assessments, and subsequently modified to minimize risks to otter populations.
7. In local situations, it might prove necessary to devise means of reducing the numbers of this species being accidentally killed in fish and mammal traps. Controls on hunting might also be needed for certain populations, as well as the development of means to reduce conflicts between otters and fishermen.
8. Environmental education programs should be promoted throughout the range of the Eurasian otter, drawing attention to the plight of this species and promoting public support for its conservation.
9. Reintroduction programs might be considered in certain countries in which the species is now extirpated, *provided that the original causes of decline have been removed*. Countries for which such programs might be developed include Belgium, Hong Kong, Japan, Netherlands, and Switzerland.



Eurasian otter (*Lutra lutra*) (Photo by Claus Reuther).

Species Receiving Adequate Conservation

North American River Otter (*Lutra canadensis*)

This species suffered population declines and loss of range, especially last century, mainly due to trapping for pelts. Conservation priorities are:

1. Critical evaluations of current status determinations are of highest priority for this species, especially in states and provinces where harvest is permitted. Exploitation should be permitted in those states or provinces that can scientifically demonstrate 1) that their otter population is stable or increasing, and 2) that the level of take is not jeopardizing the population. Consistent analytical procedures and decision criteria should be implemented by all states and provinces in which the species is harvested. A combination of

methods, including the following, should be used in determining population status: density estimates, natality and recruitment estimates, age structure analyses, track and scat surveys, questionnaires, and harvest data analyses. Where possible, radio-tracking should be used to obtain population parameters and radioisotope tagging should be tested further as a means of obtaining density estimates.

2. Extensive and intensive studies of the distribution and relative abundance of the rare subspecies *L. c. sonora* in the Rio Grande, Colorado, and Canadian River drainages of the southwestern United States, and also in nearby Mexico, are urgently needed. In the interest of maintaining genetic diversity, release of otters from other areas should be curtailed until the status of this subspecies is fully assessed. Additional studies of the North American river otter in the North American interior (e.g. Great Plains of southern Canada and midwestern United States) are needed.
3. Carcasses from the fur harvest and accidental deaths should be analyzed more often to increase knowledge of pollutants, reproductive biology, parasite load, diet, and taxonomy. A detailed and geographically comprehensive analysis of pollutant levels is needed.
4. Guidelines provided in Chapter 7 on reintroductions should be followed prior to release in order to avoid needless deaths of otters, waste of time and money, and genetic mixing.
5. All beaver management plans should be developed to safeguard otter populations as well. In areas where otters are endangered, the use of Conibear traps should be prohibited. Modified leg-hold traps or Hancock live traps should be used in areas where beavers have become a nuisance and otters are endangered, taking into account any new developments in trap technology to make these more humane. Education and enforcement programs should be instituted to ensure that these guidelines are met.
6. Cooperative studies with aquatic biologists are needed to determine the North American river otter's habitat require-

ments, prey preferences, and role in the ecological community.

7. Cooperation is needed between neighboring states and provinces in studies of North American river otters within major drainage systems.
8. A concerted effort should be made to refine and publish final reports in order to disseminate the latest knowledge on the species.
9. A symposium on the ecology of the North American river otter is needed to synthesize current knowledge and to provide direction for future research and management. The last one was held in 1984 in Columbia, Missouri.

Sea Otter (*Enhydra lutris*)

Once on the verge of extinction, this species has made a remarkable recovery due to protective legislation and considerable governmental funding for scientific studies and conservation action. More is known of the distribution and numbers of this species than any other otter. Nevertheless, the recent oil spill in Prince William Sound, Alaska, has shown how populations remain vulnerable to such catastrophes.

1. Management and recovery plans should be developed and implemented for the Asian populations.
2. Reintroduction programs should be considered for parts of the former range in which the species is still absent (i.e. Japan and Mexico). Californian populations also need strengthening through reintroductions and restocking.
3. Traditional hunting of the species in Alaska should be managed under a program of carefully regulated and scientifically defensible quotas.
4. Sea otters found dead in California should be examined for contaminants which might pose a threat to long-term population viability.
5. Means need to be found to resolve perceived conflicts between fisheries and sea otters.

Appendix 1: CITES Otter Identification Sheets

In this Appendix, the CITES Identification Sheets for otters are reproduced with the permission of the CITES Secretariat. These identification sheets are included as part of the CITES Identification Manual, which is circulated to CITES member states to assist customs officers in carrying out their obligations under CITES. The sheets are included here to assist readers to identify the various species of otter.

It should be noted that there are some differences between the names used in this action plan, and those followed by CITES. These are:

1. CITES treats the Congo clawless otter (*Aonyx congica*) as conspecific with the Cape clawless otter (*A. capensis*). This means that there is not a separate sheet for the Congo clawless otter. Readers who would like to know more about the distinguishing characteristics of these two species should contact the Chairman of the Otter Specialist Group (see Appendix 3).

2. For five of the species, different English names are used, as follows:

Name in Action Plan	Name Used by CITES
Asian Small-clawed Otter	Oriental Small-clawed Otter, Short-clawed Otter
Eurasian Otter	European River Otter
Neotropical Otter	Neotropical River Otter
Smooth Otter	India Smooth-coated Otter
Spotted-necked Otter	Spot-necked Otter

The sheets in this this Appendix (pages 90-113) are arranged in alphabetical order of scientific names. It should be noted that the otter Identification Sheets were published in 1983, and some of the information in them is now out of date (particularly regarding distributional and trade data). More up-to-date information is to be found in the main text of the action plan.

Aonyx capensis

Common names:
 engl.: Cape Clawless Otter
 esp.: Nutria africana, Nutria de cuello blanco
 fr.: Loutre à joues blanches
 de.: Weisswangenotter, Kapotter
 ital.: Lontra dalle guance bianche, Aonice capensi
 afrik.: Groototter

Scientific synonyms: *Paraonyx congica*
Paraonyx microdon
Paraonyx philippi

Aonyx microdon = Appendix I - all
 other populations = Appendix II



Characteristics:

Adult:

Size: large; HB 725–950; T 406–670; TL 1170–1625 mm
Feet: forefeet virtually unwebbed, looking like pinkish hands; hind feet similar, but with some webbing; claws absent from fingers and inner and outer toes; 3 middle toes have short, peg-like claws
Tail: typical, tapered
Throat: much lighter than back
Nose pad: naked, pinkish and arched (see fig.)
Muzzle: white to cream color
Hair texture: short, velvety
Hair length: guardhair – 9 to 10 mm; underfur – 5 to 6 mm
Color: dark brown above, sometimes frosted, white or grizzled hair tips. White cheeks and neck noticeable.

Distribution:

Most of sub-Saharan Africa south of 15 °N from Senegal to Ethiopia south to the Cape. Absent only from desert regions of South-west Africa (Namibia).

Population:

Widespread but nowhere abundant. *Aonyx microdon* is Endangered IUCN Red Data Book and U.S. Endangered Species Act 1973.

Trade:

Trade relevance low. From 1979 to 1981 two live specimens have been recorded by CITES Parties (Export from Zambia to FR Germany).

Intraspecific variation:

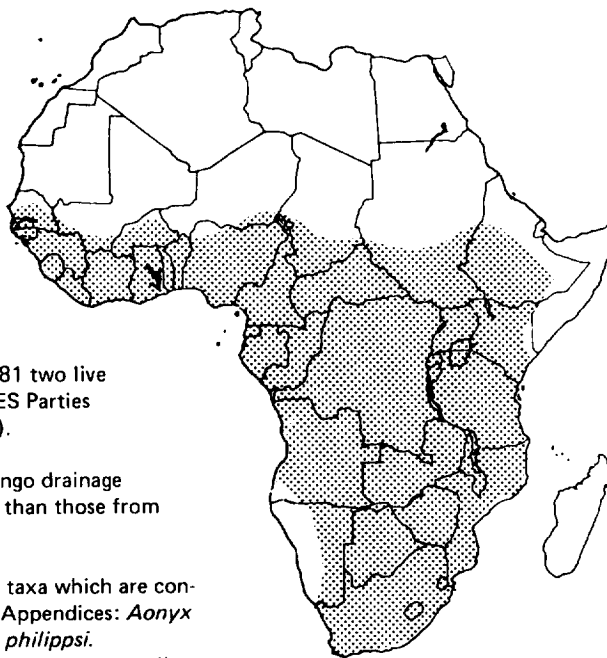
No noticeable external differences. Congo drainage individuals have a smaller upper molar than those from peripheral areas.

Similar species:

Aonyx capensis includes the following taxa which are considered distinct species by the current Appendices: *Aonyx congica*, *Aonyx microdon*, and *Aonyx philippsi*. Asiatic small-clawed otter, *Aonyx cinerea* is much smaller; throat light grey, but not white.

Bibliography:

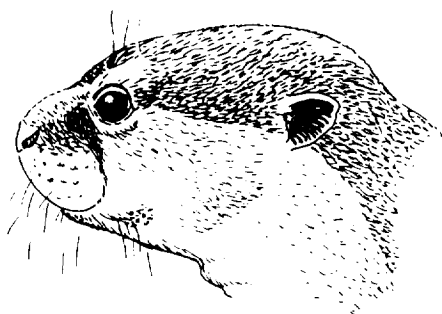
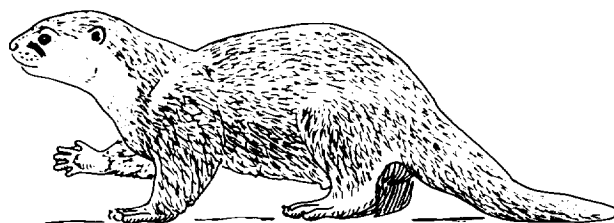
Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.
Rowe-Rowe, D. (1977) Food ecology of otters in Natal, South Africa, *Oikos* 28; 210–291.
Rowe-Rowe, D. (1977) Prey capture and feeding behavior of South African otters, *Lammergeyer* 23; 13–21.



Aonyx cinerea

Common names:
engl.: Oriental Small-clawed Otter, Short-clawed Otter
esp.: Nutria cenicienta, Nutria inerme asiatica
fr.: Loutre cendrée
de.: Zwergotter
ital.: Lontra nana, Lontra senza unghie

Scientific synonyms: *Amblonyx cinerea*
Micraonyx cinerea



Characteristics:

Adult:

Size: small; HB 406–635 mm; T 246–350 mm; TL 652–939 mm
Feet: narrow, webbed only to about last joint of toes; claws blunt, peg-like, rudimentary
Tail: tapered, not unusual
Throat: noticeably lighter, whitish to grayish, sharply separated from color of upperside, blending gradually into chest color
Nose pad: pink or dusky, upper border convex to peaked (see fig.)
Hair texture: not unusual, velvety
Hair length: guardhair — 12 to 14 mm; underfur — 6 to 9 mm
Color: burnt umber to dusky brown

Distribution:

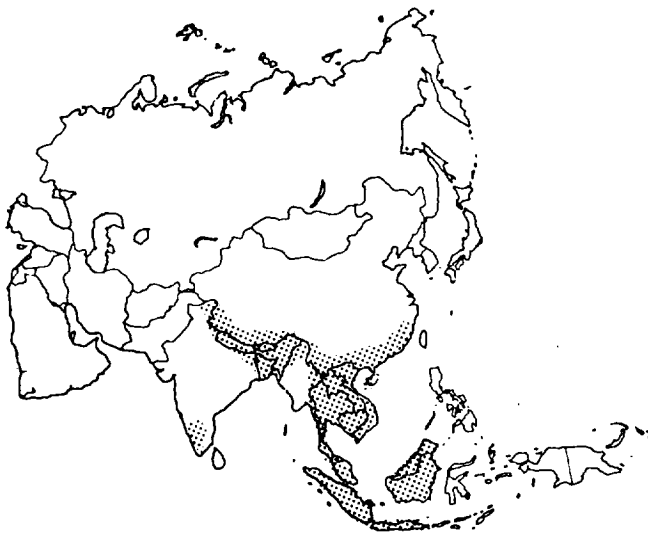
Bangladesh, Bhutan, Brunei, Burma, S China People's Rep., Hongkong (?), S India, Indonesia (Greater Sundas), Kampuchea Dem., Lao People's Dem. Rep., Malaysia, Nepal, Philippines (Palawan Isl.), Singapore (?), Sri Lanka, Thailand, Viet Nam

Population:

Still widespread.

Trade:

A certain demand for live specimens exists, but trade relevance is rather low. From 1979 to 1981 the export of six live specimens from Malaysia and Singapore, and the re-export of eight skins have been recorded by CITES Parties.



Intraspecific variation: Some geographic and/or individual variation in general coat color and degree of contrast between upper side of neck and throat color.

Similar species: *Aonyx capensis* — much larger, throat is pure white.

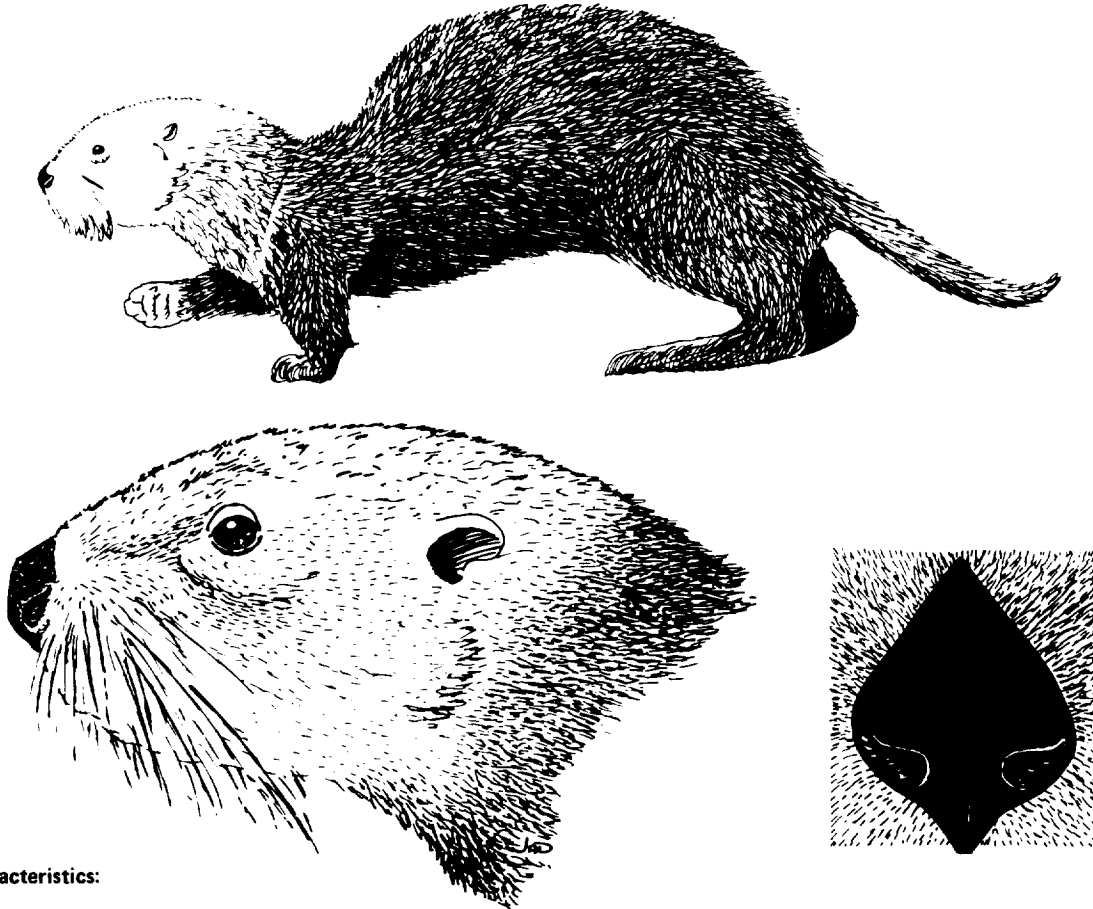
Bibliography: Harris, C.J. (1968) *Otters, a Study of the Recent Lutrinae*, London: Weidenfeld & Nicolson.
LeKagul, B. & McNeely, J. (1977) *Mammals of Thailand*, Bangkok: Kivrushna.
Medway, Lord (1969) *The Wild Mammals of Malaya*, Oxford: Oxford University Press.

Enhydra lutris

Common names: engl.: Sea Otter
 esp.: Nutria marina, Nutria del Kamtchatka
 fr.: Loutre de mer
 de.: Seeotter, Kalan
 ital.: Lontra di mare
 russ.: Kalan

Scientific synonyms: none

Enhydra lutris nereis = Appendix I,
Enhydra lutris lutris = Appendix II



Characteristics:

Adult:

Size: very large; HB 550–1300; T 125–330; TL 675–1630 mm
Feet: forefeet small, no visible digits; hind feet very large, flipper-like
Tail: very short for an otter, not markedly tapered
Throat: buffy cream head and throat in adults
Nose pad: bare, lozenge-shaped, very high peak. Dark, but often with pink scar tissue in females (see fig.)
Muzzle: thick vibrissae
Hair texture: silky and velvety
Hair length: very long; guardhair — 34 to 36 mm; underfur — 19 to 20 mm
Color: Adults — dark brown above, head straw-colored
Juveniles: uniform dark brown

Distribution:

Kurile & Aleutian Islands,
California Coast introduced into portions of
former range along
Pacific Coast of
N. American countries
– USA, Canada, USSR.



Population:

Increasing in Alaska. About 2'000 *E. l. nereis* in California.
Threatened under U.S. Endangered Species Act, 1973.

Trade:

Trade relevance low, although a demand for furskins exists. From 1979 to 1981 the export of 32 skins (from Canada to Italy), and the re-export of one skin (from Switzerland to Japan) have been recorded by CITES Parties.

Intraspecific variation:

No readily discernable difference between northern (*Enhydra lutris lutris*) and southern (*Enhydra lutris nereis*) races.

Similar species:

No other otter resembles the sea otter closely enough to permit confusion.

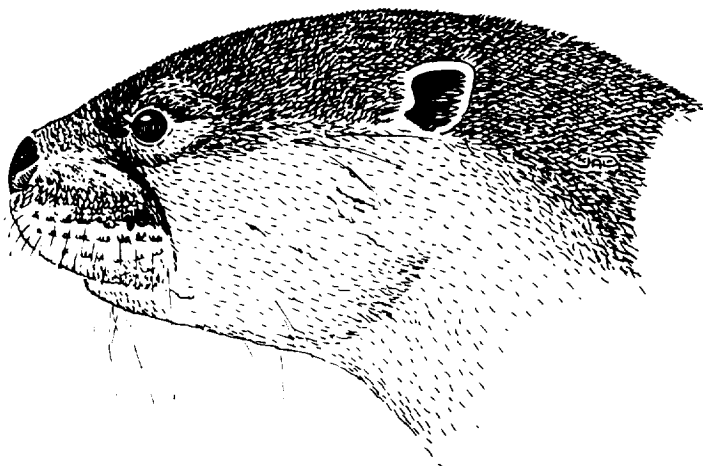
Bibliography:

Barabash-Nikiforov, I.I. (1947) The Sea Otter (Kalan). Translated from Russian by
A. Birron & Z.S. Cole, Israel Program for Scientific translation, 227 p. (1962).
Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.
Kenyon, K.W. (1969) The Sea Otter in the Eastern Pacific Ocean, U.S. Bureau of Sport
Fisheries & Wildlife; 68, 352 p.

Lutra canadensis

Common names: engl.: North American River Otter
 esp.: Nutria del Canada, Nutria norteamericana
 fr.: Loutre du Canada
 de.: Kanada-Otter, Nordamerikanischer Fischotter
 ital.: Lontra canadese

Scientific synonyms: *Lontra canadensis*



Characteristics:

Adult:

Size: medium to large; HB 660–1070; T 315–460; TL 1000–1530 mm
Feet: well-webbed, claws strong
Tail: tapered
Throat and cheeks: silvery to yellowish gray, not clearly demarked from dusky brown of upperparts
Nose pad: naked, black, very extensive; Ace of Spades in shape; surface often granular in appearance (see fig.)
Muzzle: light buff, seldom spotted
Hair texture: velvety, thick
Hair length: guardhair – thick, 17 to 20 mm; underfur – 8 to 9 mm
Color: above very dark, dusky brown – almost black to reddish or occasionally grayish brown. Lighter, silvery, or grayish on belly

Distribution: *Canada, United States*
including Alaska

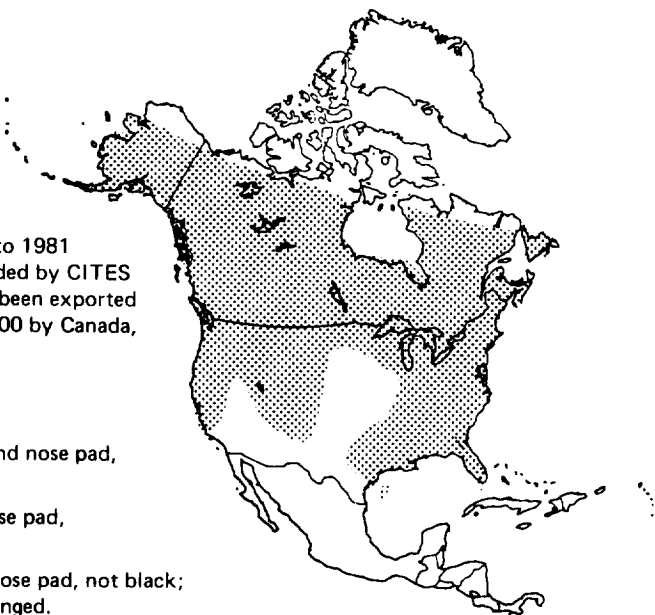
Population: Widespread in Canada,
Alaska, and midwestern
and southwestern United
States; lower numbers
elsewhere.

Trade: Trade relevance high. From 1979 to 1981
73 live specimens have been recorded by CITES
Parties, and ca. 37'000 skins have been exported
by the United States, and ca. 18'000 by Canada,
mainly to European countries.

Intraspecific variation: Very little intraspecific variation.

Similar species: *Lutra longicaudis* — smaller feet and nose pad,
generally lighter color
L. provocax — smaller feet and nose pad,
color usually dark
Lutrogale perspicillata — smaller nose pad, not black;
feet larger, fleshier; tail slightly flanged.

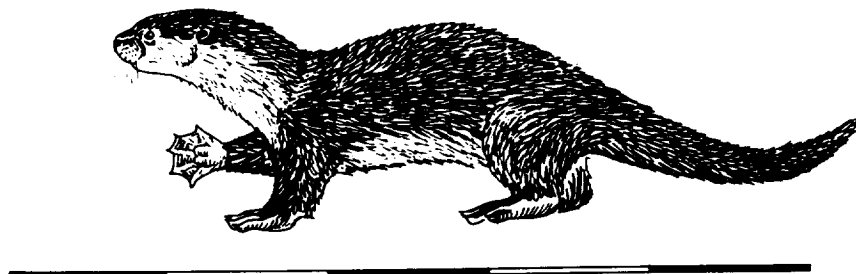
Bibliography: Davis, J.A. (1978) A classification of the Otters; in Otters, N. Duplaix ed., Proceedings IUCN
Otter Specialist Group Meeting; IUCN Publication, New Series.
Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.
TRAFFIC (USA) (1980) River Otter Export and International Trade, a report. (available from
TRAFFIC (USA) at address below).
Van Zyll de Jong, C.J. (1972) A systematic review of the Nearctic and Neotropical River
otters; Royal Ontario Museum 80; 1-104.



Lutra felina

Common names:
engl.: Marine Otter
esp.: Gato del mar, Nutria de mar, Chungungo, Chinchimen
fr.: Loutre de mer
de.: Meerotter
ital.: Lontra felina

Scientific synonyms: *Lontra felina*



Characteristics:

Adult:

Size:	small to medium; HB 570–787; T 300–362; TL 870–1149 mm
Feet:	moderate size, well-webbed, claws strong
Tail:	tapered, typical
Throat and lips:	not spotted
Nose pad:	naked, black, no peak or dip (see fig.)
Muzzle:	not spotted
Hair texture:	coarse and rough in appearance
Hair length:	guardhair – 20 mm, underfur – 12 mm
Color:	dark brown above, underside a lighter, drab, or fawn color

Distribution: Coast and coastal islands of *Chile, Peru*; extirpated from *Argentina*

Population: IUCN Red Data Book: Endangered, and in U.S. Endangered Species Act 1973

Trade: No trade reported by CITES Parties from 1978 to 1981.
Fur trade: Historically high trade relevance, now virtually absent.

Intraspecific variation: Little or none. Nose pad variations (?).

Similar species: *Lutra provocax* — larger, darker, finer hair, peaked nose pad.



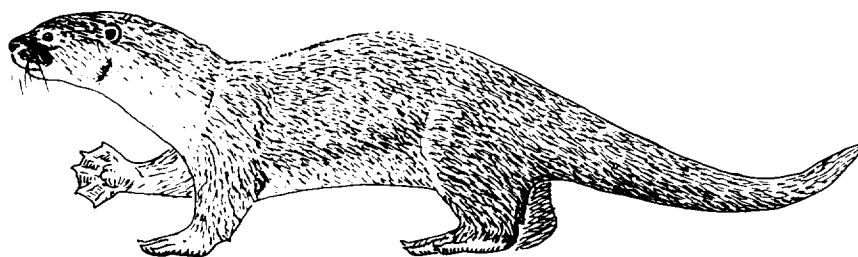
- Bibliography:**
- Brownell, R.L. (1978) Ecology and conservation of the Marine otter *Lutra felina*, in Otters, N. Duplaix ed., Proceedings IUCN Otter Specialist Group Meeting; IUCN Publication, New Series.
- Cabello, C.C. (1978) La Nutria de mar en la Isla de Chiloe, Chile, in Otters, N. Duplaix ed., Proceedings IUCN Otter Specialist Group Meeting; IUCN Publication, New Series.
- Harris, C.J. (1968) Otters, a Study in the Recent Lutrinae, London: Weidenfeld & Nicolson.

Lutra longicaudis

Common names:

- engl.: Neotropical River Otter
- esp.: Lobito de Rio, Nutria, Gato de agua
- fr.: Loutre d'Amérique du Sud, Loutre à longue queue
- de.: Südamerikanischer Fischotter
- ital.: Lontra di fiume (Sud America)
- N.B.: Common names may refer to the "species" listed under the synonyms, eg.: La Plata otter, Peruvian otter, Brazilian river otter, Amazonian otter, Colombian otter

Scientific synonyms: The taxonomy is in the process of revision which may lead to some confusion in the proper common and scientific name to be used. *Lutra longicaudis* includes: *Lutra annectens*, *L.a. colombiana*, *L. platensis*, *L. incarum*, *L. enudris*, *L.e. mitis*, *L. insularis*, *L. repanda*, *L. latidens*. Considered by some authors (Hershkovitz, 1972; Davis, 1978) as part of *Lutra canadensis*. The name *Lontra longicaudis* (Van Zyll de Jong, 1972) is frequently seen.



Characteristics:

Adult:

Size: medium; HB 500–790; T 375–570; TL 900–1360 mm

Feet: small, claws strong, webbing present

Tail: tapered

Throat: not spotted, demarcation line on neck not sharply defined

Nose pad: black and highly variable in shape (see fig.)

Muzzle: upper lips and chin usually whitish

Hair texture: like plush – not coarse

Hair length: guardhair – 12 to 14 mm; underfur – 7 to 9 mm

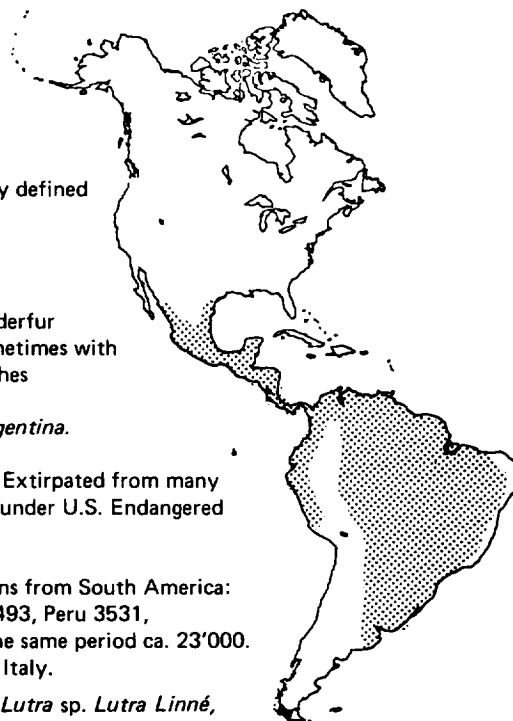
Color: cinnamon brown to grayish brown dorsally – underfur silvery gray to cream tipped with raw umber, sometimes with one or more lighter (buff or cream) spots or patches

Distribution: All Latin-American countries from *Mexico* to *Argentina*.

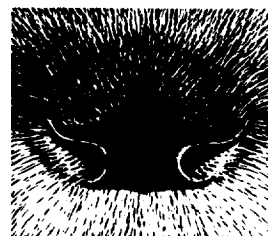
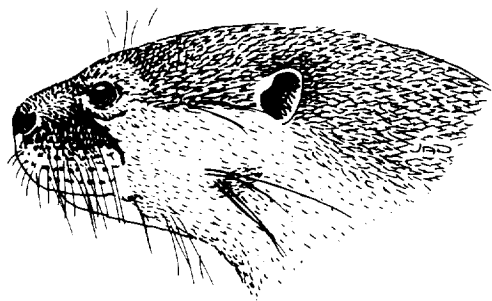
Population: Heavily trapped and shot over much of its range. Extirpated from many areas. Present population levels low. Endangered under U.S. Endangered Species Act, 1973.

Trade: Trade relevance high. 1979 to 1981 export of skins from South America: Belize 51, Colombia 1, Honduras 639, Panama 3493, Peru 3531, Paraguay 66'891 (!). Re-export of skins during the same period ca. 23'000. Main importing countries: FR Germany, France, Italy.

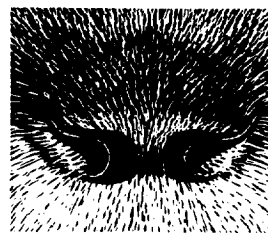
Skins may be labelled *Lutrinae* spp., *Lutra lutra*, *Lutra* sp. *Lutra* Linné, *Lutra incarum*, *Lutra enudris*, Lontra, Nutria.



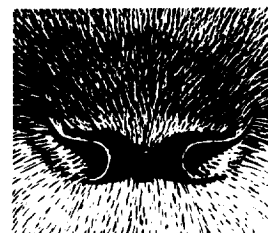
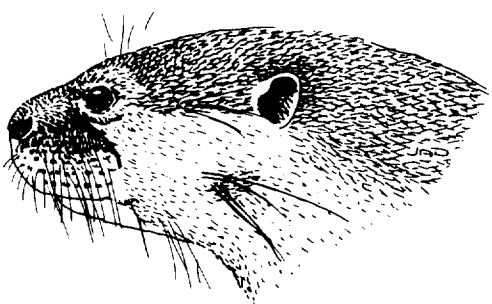
Intraspecific variation: Extraordinarily variable. See also under Scientific synonyms.



Lutra longicaudis annectens



Lutra longicaudis enudris



Lutra longicaudis platensis

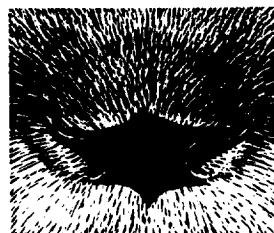
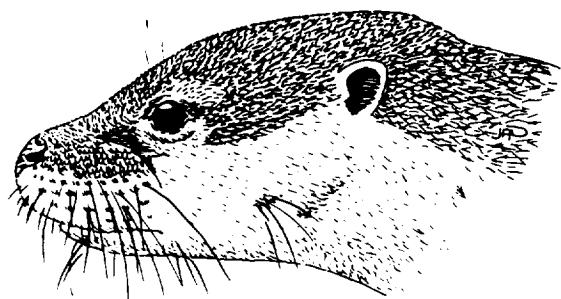
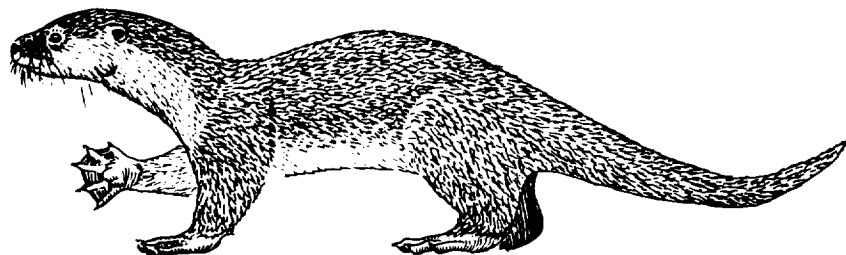
Similar species: *Lutra canadensis*, *Lutra provocax* — generally larger, fur darker, nose pad more extensive.
Lutra felina — generally smaller, fur darker, harsher.

Bibliography: Davis, J.A. (1978) A classification of the Otters; in Otters, N. Duplaix ed., Proceedings IUCN Otter Specialist Group Meeting: IUCN Publication, New Series.
Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.
Hershkovitz, P. (1972) Recent mammals of the neotropical region: a zoogeographical and ecological review: 311–421. In Evolution, Mammals and Southern Continents. A. Keast, F.O. Erk, B. Glass, editors. New York State University Press.
Van Zyll de Jong, C.G. (1972) A systematic review of the Nearctic and Neotropical River Otters. Royal Ontario Museum, 80: 1–104.

Lutra lutra

Common names: engl.: European River Otter
 esp.: Nutria, Nutria común
 fr.: Loutre de rivière
 de.: Eurasischer Fischotter
 ital.: Lontra comune

Scientific synonyms: *Lutra vulgaris*
 Lutra whitleyi



Characteristics:

Adult:

Size: HB 570–700; T 350–400; TL 1020–1370 mm
Feet: well-webbed, claws strong
Tail: thick at the base, tapered
Throat: buff to cream in color with noticeable demarcation to dorsal side
Nose pad: naked, large, shield-shaped (see fig.)
Muzzle: may be spotted with cream spots, lighter in color generally
Hair texture: moderately coarse
Hair length: long: guardhair – 17 to 18 mm; underfur – 8 to 9 mm
Color: fuscous to dusky brown in color, lighter in Asian races

Distribution:

Africa:

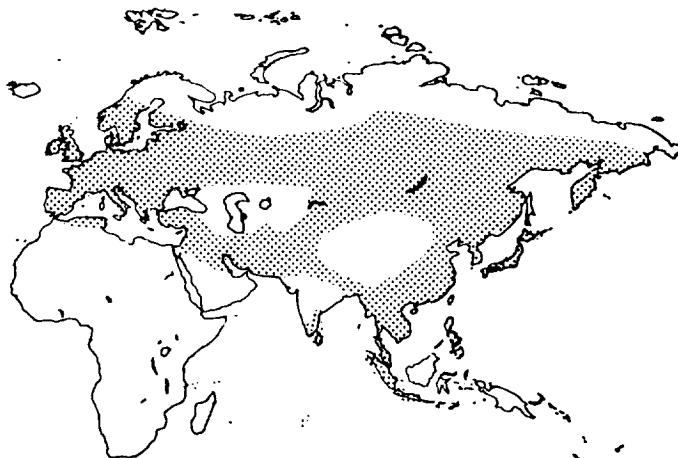
Algeria, Tunisia

Asia:

Afghanistan, Bangladesh, Bhutan, Burma, PR China, India, Indonesia (Sumatra, Java), Iran, Iraq, Israel, Japan, Jordan, Kampuchea Dem., Korea DPR, Korea Rep., Lao PDR, Lebanon, Malaysia, Mongolia, Nepal, Pakistan, Singapore (?), Sri Lanka, Syrian Arab Rep., Thailand, Turkey, USSR, Viet Nam

Europe:

Albania, Austria, Belgium, Bulgaria, CSSR, Denmark, Finland, France, GDR, FR Germany, Greece, Hungary, Ireland, Italy, Liechtenstein (p.e.), Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey, USSR, United Kingdom, Yugoslavia



Population:

Rare in Europe and probably largely extirpated from N Africa and Japan. More widespread in remoter areas of Eurasia. IUCN Red Data Book: Vulnerable.

Trade:

Trade relevance rather small today. Formerly considerable trade in furskins (Bulgaria, PR China, USSR). European zoos show a great interest in the species. From 1979 to 1981 52 live specimens and the re-export of 712 skins have been recorded by CITES Parties. Main exporting countries (live specimens): Austria, Bulgaria, Finland, Norway, United Kingdom, Hungary.

Intraspecific variation: *Lutra lutra* from Asia are usually smaller, with lighter fur (particularly throat) and with shorter hair than European counterparts.

Similar species:

Lutra (Lutrogale) perspicillata — larger otter, larger feet, more velvety coat, sharp throat demarcation.

Lutra sumatrana — darker, hairy nose pad, smaller feet.

Lutra canadensis — darker, larger nose pad, smaller feet.

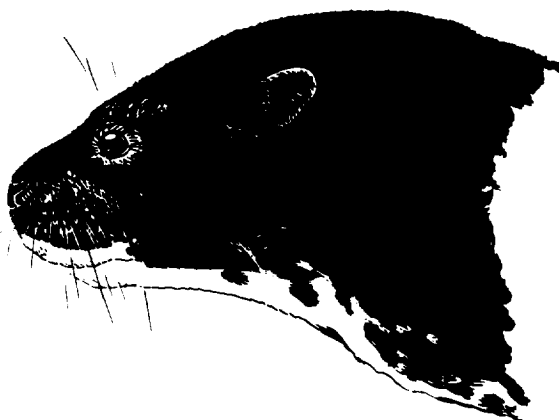
Bibliography:

Harris, C.J. (1968) Otters, a Study of Recent Lutrinae. London: Weidenfeld & Nicolson.
LeKagul, B. & McNeely, J. (1977) Mammals of Thailand. Bangkok: Kivrushna.
Medway, Lord (1969) The Wild Mammals of Malaya. Oxford: Oxford University Press.

Lutra maculicollis

Common names:
engl.: Spot-necked Otter
esp.: Nutria de cuello manchado
fr.: Loutre à cou tacheté
de.: Fleckenhalsotter
ital.: Lontra dal collo macchiato
kis.: Fisi maji

Scientific synonyms: *Hydrictis maculicollis*



Characteristics:

Adult:

Size: moderate to small; HB 575–690, T 330–445, TL 950–1170 mm
Feet: webbing to near tips of toes, claws strong
Tail: tapered, not unusual
Throat: and/or groin usually with irregular patches and spots of cream white (buff yellow in juveniles), some individuals have no spots or markings
Nose pad: bare, black, narrowest in middle (see fig.)
Muzzle: upper lip chin and may be white or brown
Hair texture: thick and velvety
Hair length: guardhair – 13 to 16 mm; underfur – 7 mm
Color: very dark or raw umber above; slightly lighter underside

Distribution: Only Africa: all countries south of Sahara from Senegal to Ethiopia and south to the Cape province. Absent only from desert areas, such as Namibia.

Population: Widely distributed but nowhere abundant.

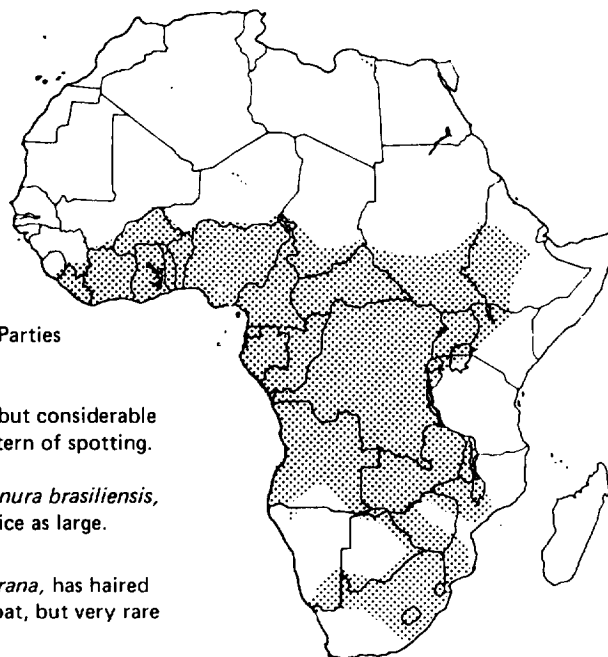
Trade: Trade relevance marginal. From 1979 to 1981 one skin has been recorded by CITES Parties (from Zambia to Switzerland).

Intraspecific variation: No clearcut subspecific variation, but considerable individual range in extent and pattern of spotting.

Similar species: South American giant otter, *Pteronura brasiliensis*, has spotted throat, but otter is twice as large. See sheet A-112.004.025.001.

Sumatran river otter, *Lutra sumatrana*, has haired nose pad and spotted lips and throat, but very rare in trade.

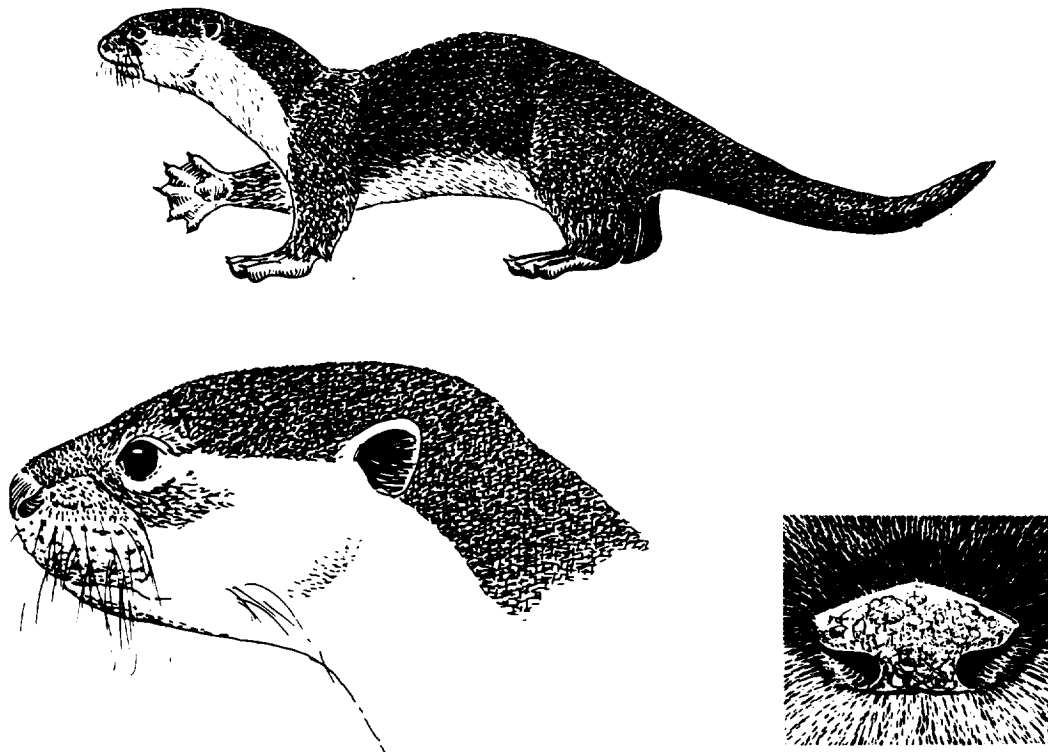
Bibliography: Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.
Mortimer, M.A.E. (1963) Notes on the biology and behavior of the Spotted-necked otter, Puku 1; 192–206.
Proctor, J. (1963) A contribution to the natural history of the Spotted-necked otter in Tanganyika, E. African Wildlife Journal Vol. 1; 93–102.
Rowe-Rowe, D. (1977) Food ecology of otters in Natal, South Africa, Oikos 28; 210–219.
Rowe-Rowe, D. (1977) Prey capture and feeding behavior of South African otters, Lammergeyer 23; 13–21.



Lutra perspicillata

Common names:
engl.: India Smooth-coated Otter
esp.: Nutria lisa, Nutria simung
fr.: Loutre d'Asie
de.: Glattotter, Indischer Fischotter
ital.: Lontra liscia

Scientific synonyms: *Lutrogale perspicillata*
Lutra tarayensis



Characteristics:

Adult:

Size: medium to large; HB 655–790; T 406–505; TL 1067–1300 mm
Feet: quite large; webbing well-developed and thick; claws strong
Tail: tapered, but with slight flattening at sides (see fig.)
Throat: cheeks and very light gray — almost white in some specimens, and sharply de-marked from color of upperparts
Nose pad: bare, dusky (not black) — upper margin peaked (see fig.)
Muzzle: not spotted
Hair texture: velvety
Hair length: short; guardhair — 12 to 14 mm; underfur — 6 to 8 mm
Color: upperparts raw umber to smokey gray-brown; underside a lighter drab color

Distribution:

Discontinuous:

Bangladesh, Bhutan, Brunei, Burma, SW China People's Rep., India, Indonesia (Sumatra, Borneo), Iraq (Tigris River), Kampuchea Dem., Lao People's Dem. Rep., Malaysia, Nepal, Singapore (?) , Viet Nam

Population:

Unknown

Trade:

From 1978 to 1981 7616 skins have been recorded by CITES Parties, main exporting country Bangladesh, main importing country FR Germany.

Intraspecific variation: 3 subspecies:

L.p. perspicillata — dark or chestnut brown above, belly with reddish tint.

L.p. maxwelli (Iraq) — very dark chocolate brown.

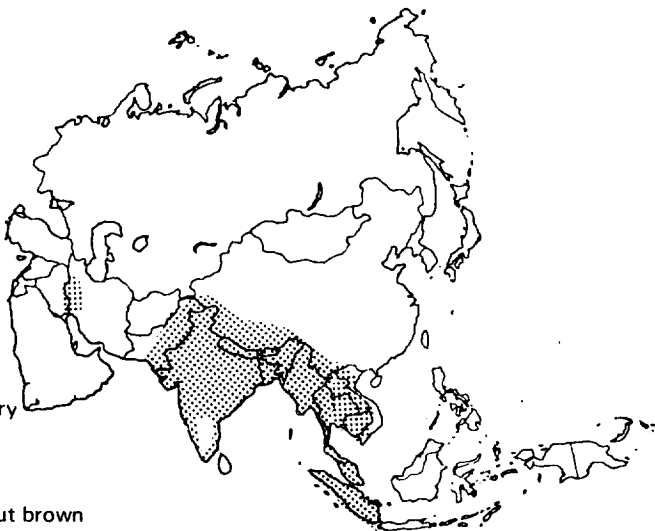
L.p. sindica (lower Indus River) — drab, tawny or sandy brown above.

Similar species:

Eurasian otter, *Lutra lutra* — longer fur, coarser hair; nose pad black, thinner webbing and claws.

Bibliography:

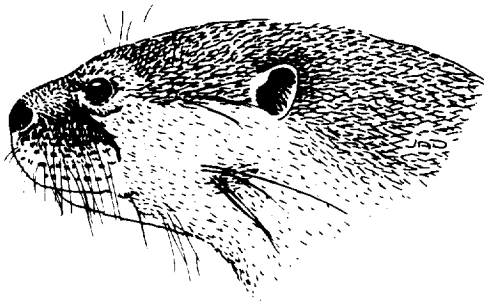
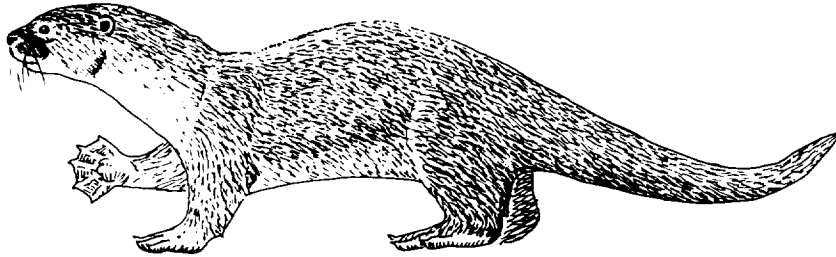
Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.
LeKagul, B. & McNeely, J. (1977) Mammals of Thailand, Bangkok: Kivrushna.



Lutra provocax

Common names:
engl.: Southern River Otter
esp.: Huillín, Lobito patagonico, Nutria de Chile
fr.: Loutre du Chili
de.: Südlicher Flusssotter
ital.: Lontra di fiume del Cile

Scientific synonyms: *Lontra provocax*



Characteristics:

Adult:

Size: medium; HB 570–700; T 350–460; TL 1000–1160 mm
Feet: claws strong, webbed
Tail: tapered, typical
Throat: and lips – not spotted
Nose pad: naked, black, strong, high peak (see fig.)
Hair texture: typical, velvety, not coarse
Hair length: guardhair – 15 to 17 mm; underfur – 7 to 8 mm
Color: dark to very dark, burnt above; underside a lighter, cinnamon color

Distribution: *Argentina, Chile*

Population: Very low. IUCN Red Data Book: Endangered,
and U.S. Endangered Species Act 1973

Trade: Trade Relevance: Historically high, now unknown.
Main exporting states: unknown.
Main importing states: probably W. Germany, but species not
recorded in CITES 1978 or 1979 reports.
Trade volume: might be traded as *Lutra* sp.,
L. longicaudis or *L. incarum* illegally via
Paraguay, Argentina, or Peru.

Intraspecific variation: none

Similar species: *Lutra felina* — smaller, coarse hair, unpeaked nose pad.
Lutra canadensis — different nose pad.
Lutra longicaudis — lighter color, different nose pad.

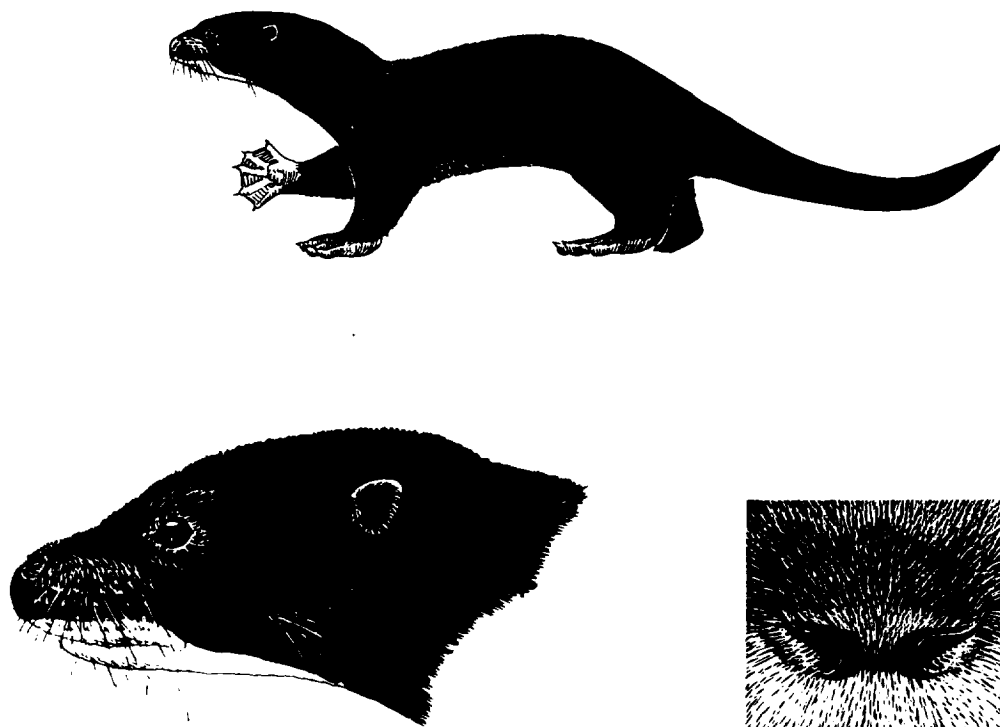
Bibliography: Garcia-Mata, R. (1978) Nota Sobre el Status de *Lutra provocax* en la Argentina. In Otters,
N. Duplaix ed., Proceedings IUCN Otter Specialist Group Meeting, IUCN Publi-
cation, New Series.
Harris, C.J. (1968) Otters, a Study of the Pecent Lutrinae, London: Weidenfeld & Nicolson.



Lutra sumatrana

Common names:
engl.: Hairy-nosed Otter
esp.: Nutria de Sumatra
fr.: Loutre de Sumatra
de.: Haarnasenotter
ital.: Lontra del naso peloso

Scientific synonyms: *Barangia sumatrana*



Characteristics:

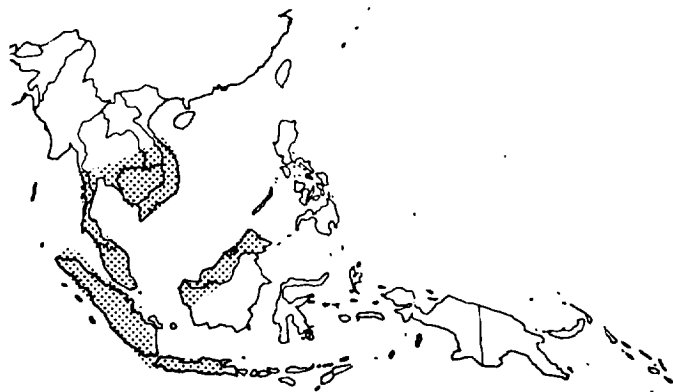
Adult:

Size: medium; HB 500–820; T 350–500; TL 1050–1330 mm
Feet: well-webbed, claws strong
Tail: typical, tapered
Throat: sometimes part is white
Nose pad: haired (see fig.)
Muzzle: upper lip and chin usually white
Hair texture: fine, velvety
Hair length: guardhair — 12 to 14 mm; underfur — 7 to 8 mm
Color: very dark brown above, underside very slightly paler; on side of neck — demarcation between the two tones is evident and sharp

Distribution: Brunei, Indonesia
(Greater Sundas),
Kampuchea Dem., Lao
People's Dem. Rep.,
Malaysia, Thailand,
Viet Nam

Population: Unknown.

Trade: Trade relevance probably
rather low. From 1979
to 1981 329 skins have
been exported from
Thailand to Hongkong,
and re-exported from
Hongkong to FR
Germany. A few live
specimens were exported
in the 1960's, none in
captivity in zoos at present.



Intraspecific variation: Some evidence of interbreeding with *L. lutra* — some specimens intermediate. Probably not a full species, but a race of *L. lutra*.

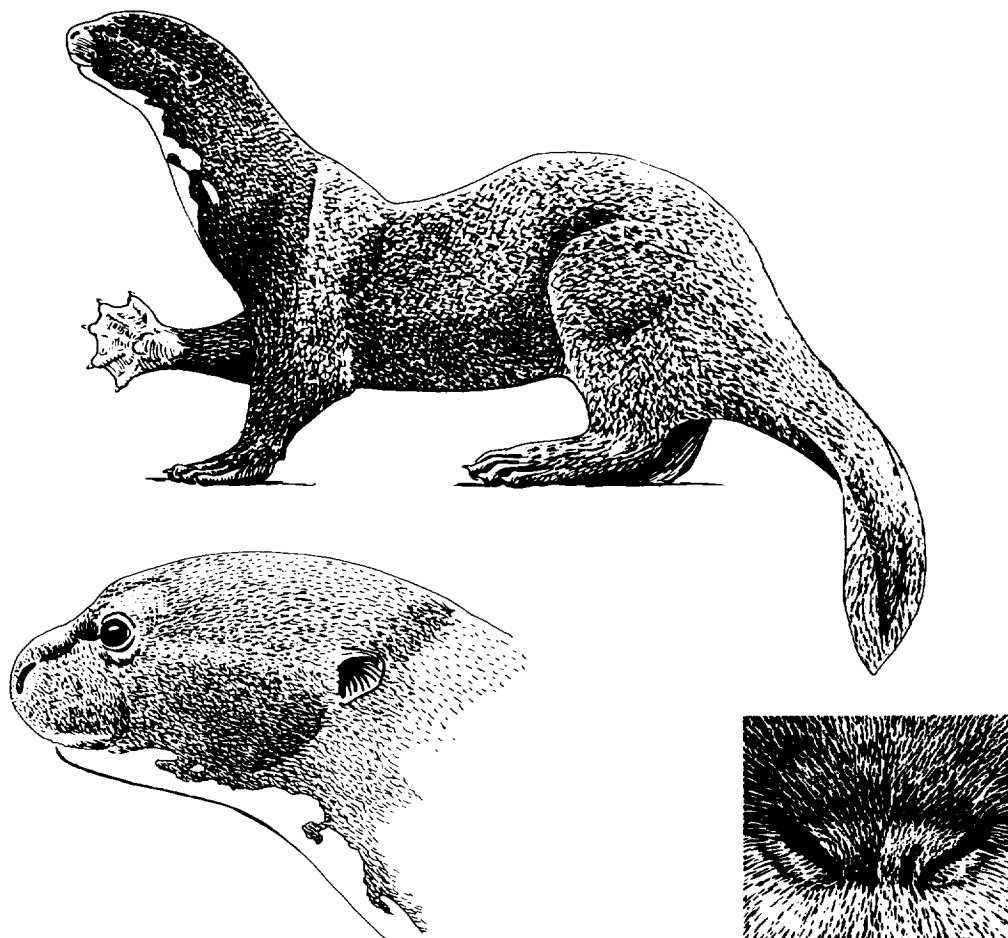
Similar species: Spot-necked otter, *Lutra (Hydriclis) maculicollis* — no sharp distinction between upper part and lower part colors.

Bibliography: Davis, J.A. (1978) A Classification of the Otters; In Otters, N. Duplaix ed., Proceedings IUCN Otter Specialist Group Meeting, IUCN Publication, New Series.
Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.

Pteronura brasiliensis

Common names:
engl.: Giant Otter, Brazilian Otter
esp.: Lobo del Río, Lobito de Cola Ancha, Arirai, Lobo gargantilla
fr.: Loutre géante du Brésil
de.: Riesenotter
ital.: Lontra gigante del Brasile
port.: Ariranha

Scientific synonyms: *Lutra brasiliensis*

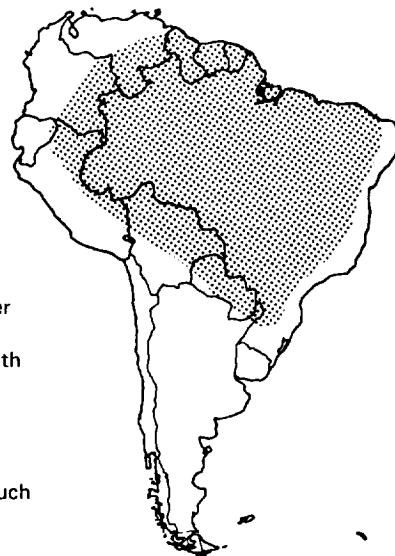


Characteristics:

Adult:

Size: large; HB 960–1230; T 450–650; TL 1450–1800 mm
Feet: claws and webbing very well developed – webs reach to tips of toes and fingers; feet very large, fleshy
Tail: not uniformly tapered; lance-shaped, widest at middle point
Throat: usually marked with cream-colored patches, blotches or spots
Nose pad: totally haired (see fig.)
Muzzle: lips and chin often whitish or spotted white
Hair texture: virtually no underfur, thick skin
Hair length: short, velvety; guardhair – 8 mm; underfur – 4 to 4,5 mm
Color: very dark burnt umber, groin never spotted

- Distribution:** Only South America: *Argentina* (?), *Bolivia*, *Brazil*, *Chile* (?), *Colombia*, *French Guiana*, *Guyana*, *Paraguay*, *Peru*, *Suriname*, *Uruguay* (?), *Venezuela*
- Population:** IUCN Red Data Book: Endangered, and US Endangered Species Act 1973. Common only in Guyana, Suriname, and French Guiana. Virtually extirpated from Amazon basin.
- Trade:** Occasionally in zoo trade. Heavy fur trade in 1950–1960. Now protected in all countries. Trade volume, therefore, rather low; from 1978 to 1981 1001 skins have been recorded by CITES Parties. Main exporting states: Paraguay and Bolivia with illegal permits. Main importing states: Europe (Italy).
- Intraspecific variation:** none
- Similar species:** African spot-necked otter, *Lutra (Hydrictis) maculicollis* — much smaller, darker, nose pad naked.
- Bibliography:** Donadio, A. (1978) Some comments on otter trade and legislation in Colombia, in Otters, N. Duplaix ed., Proceedings IUCN Otter Specialist Group Meeting; IUCN Publication, New Series.
 Duplaix, N. (1980) Observations on the ecology and behavior of the Giant river otter in Suriname, *La Terre et Vie* 34: 495–620.
 Harris, C.J. (1968) Otters, a Study of the Recent Lutrinae, London: Weidenfeld & Nicolson.



Appendix 2: Acknowledgements

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References

- Ames, J.A. 1987. The current status of the sea otter population in California (December 1986). *IUCN Otter Specialist Group Bulletin* 2:21-23.
- Ames, J.A., R.A. Hardy, F.E. Wendell, and J.J. Geibel. 1983. Sea otter mortality in California. Unpubl. rep., Marine Resources Branch, California Department of Fish and Game, Monterey, California. 49 pp.
- Anderson, E.A. 1982. Status and distribution of the river otter (*Lutra canadensis*) in Illinois. Masters thesis. Southern Illinois Univ., Carbondale, Illinois. 78 pp.
- Andrews, E. and A.K. Crawford. 1986. Otter survey of Wales 1984-85. Vincent Wildlife Trust, London.
- Arden-Clark, C.H.G. 1986. Population density, home range size and spatial organization of the Cape clawless otter, *Aonyx capensis*, in a marine habitat. *Journal of Zoology, London*. 109:201-211.
- Aulagnier, S. 1985. Morocco. *IUCN Otter Specialist Group European Bulletin* 2:4-5.
- Bailey, E.P., and J.L. Trapp. 1986. A reconnaissance of breeding marine birds and mammals in the east-central Aleutian Islands, Kasitochi Island to the Islands of Four Mountains, summer 1982, with notes on other species. Unpublished Report, U.S. Fish and Wildlife Service, Anchorage, Alaska.
- Baker, J.R., A.M. Jones, T.P. Jones, and H.C. Watson. 1981. Otter (*Lutra lutra*) mortality and marine oil pollution. *Biological Conservation* 20:311-321.
- Beja, P.R. 1989. Coastal otters in southwest Portugal. *IUCN Otter Specialist Group Bulletin* 4:2-7.
- Belkin, A.N. 1966. On the population abundance of sea otter on the Kuril Islands [in Russian]. *Transactions of the Pacific Research Institute of Marine Fisheries and Oceanography* 58:2-13.
- Bergman, A. and M. Olsson. 1986. Pathology of Baltic grey seal and ringed seal females with special reference to adrenocortical hyperplasia: is environmental pollution the cause of a widely distributed disease syndrome? *Finnish Game Research* 44:47-62.
- Berta, A., and G.S. Morgan. 1985. A new sea otter (Carnivora: Mustelidae) from the late Miocene and early Pliocene (Hemphillian) of North America. *Journal of Paleontology* 59:805-819.
- Best, R. and C. Chehébar. 1985. Conservación de Nutrias y Manatíes; conclusiones y recomendaciones de una Mesa Redonda. I Reunión de Trabajo de Expertos en Mamíferos Acuáticos de América del Sur. Buenos Aires, Argentina.
- Bich, J.P. 1988. The feasibility of river otter reintroduction in northern Utah. Masters thesis. Utah State Univ., Logan, Utah. 59 pp.
- Bigg, M.A., and I.B. MacAskie. 1978. Sea otters reestablished in British Columbia. *Journal of Mammalogy* 59:874-876.
- Blacher, C. 1987. Occurrence e preservação de *Lutra longicaudis* (Mammalia: Mustelidae) no litoral de Santa Catarina. *Fundacao Brasileira para a Conservacao da Natureza, Boletim* 22:105-117.
- Bouchardy, C. 1986. *La loutre*. Editions Sang de la terre, Paris. 174 pp.
- Brack, A. 1978. Situación actual de las nutrias (Lutrinae, Mustelidae) en el Perú. Pp. 76-84 in Duplaix (ed.), *Otters: Proceedings 1st Working Meeting IUCN/SCC Otter Specialist Group Paramaribo, Suriname*.
- Bradley, P.V. 1986. Ecology of river otters in Nevada. Masters thesis. Univ. of Nevada, Reno, Nevada. 112 pp.
- Bräutigam, A. 1989. *CITES: A conservation tool: a guide to amending the appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora*. IUCN/SSC Trade Specialist Group, Washington D.C.
- Broekhuizen, S. and E.M. de Ruiter-Dijkman. 1988. Otters *Lutra lutra* met PCBs: de zeehondjes van het zoete water. *Lutra* 31:68-78.
- Britt, T.L., R. Gerhart, and J.S. Phelps. 1984. River otter stocking. Proj. No. W-53-R-34. Arizona. Pp. 125-134.
- Broad, S. 1987. The harvest of and trade in Latin American spotted cats (Felidae) and otters (Lutrinae). Wildlife Trade Monitoring Unit, Cambridge.
- Brownell, R. L., Jr. and G. B. Rathbun. 1988. California sea otter translocation: a status report. *Endangered Species Technological Bulletin* 13(4):1 & 6.
- Broyer, J., S. Aulagnier, R. Destre, and O. Gaschignard. 1984. La loutre *Lutra lutra splendida* dans le sud du Maroc. *Bulletin Group Loutres* 18:12-20.
- Brueggeman, J.J., G.A. Green, R. Grotefendt, and D. Chapman. 1987. Aerial surveys of sea otters in the northwestern Gulf of Alaska and southeastern Bering Sea. Draft rept. to U.S. Dept. of Commerce, NOAA, Alaska Office. 67 pp.
- Cabello, C. 1983. La Nutria de mar en la Isla de Chiloe. CONAF, Santiago de Chile. 37 pp.
- Calkins, D.G., K.W. Pitcher, and K.B. Schneider. 1975. Distribution and abundance of marine mammals in the Gulf of Alaska. Unpubl. Rep., Alaska Dept. Fish and Game, Anchorage, Alaska. 39 pp.
- Cassola, F. 1986. La Lontra in Italia. Serie Atti e Studi No. 5, WWF-Italia, Rome. 135 pp.
- Castilla, J. and I. Bahamondes. 1979. Observaciones conductuales y ecológicas sobre *Lutra felina* (Molina 1782) (Carnivora: Mustelidae) en la zona central y centro-norte de Chile. *Arch. Biol. Med. Exper.* 12:119-132.
- Chanin, P., 1985. *The natural history of otters*. Facts on File, New York.
- Chanin, P.R.F., and D.J. Jefferies. 1978. The decline of the otter *Lutra lutra* L. in Britain: an analysis of hunting records and discussion of causes. *Biological Journal of the Linnean Society* 10:305-328.
- Chapman, P.J. and L.L. Chapman. 1982. Otter survey of Ireland 1980-81. Vincent Wildlife Trust, London.
- Chehébar, C.E. 1985. A survey of the southern river otter *Lutra provocax* Thomas in Nahuel Huapi National Park, Argentina. *Biological Conservation* 32:299-307.
- Chehébar, C. and I. Benoit. 1988. Transferencia de conocimientos para la identificación de signos de actividad y habitats del huillín o nutria del río, *Lutra provocax*. FAO, Santiago de Chile. 30 pp.
- Chehébar, C.E., A. Gallur, G. Giannico, M.D. Gottelli, and P. Yorío. 1986. A survey of the southern river otter *Lutra provocax* in Lanín, Puelo and Los Alerces National Parks, Argentina, and evaluation of its conservation status. *Biological Conservation* 38:293-304.
- Clark, C.W. 1973. The economics of overexploitation. *Science* 181:630-634.
- Coetzee, C.G. 1971. Order Carnivora. In J.A.J. Meester and H.W. Setzer (eds.), *The mammals of Africa: an identification manual*. Smithsonian Institution Press, Washington.
- Colares, E. P. 1988. Lontras de Bacia do Rio Uatuma, Amazonia. III Reunión de Trabajo de Especialistas en Mamíferos acuáticos de América del Sur. Montevideo.
- Conroy, J.W.H. and D.D. French. 1987. The use of spraints to monitor populations of otters (*Lutra lutra* L.). *Symposium of the Zoological Society of London* 58:247-262.
- Corbet, G.B. and J.E. Hill. 1980. *A world list of mammalian species*. British Museum and Cornell University Press.

- Costa, D.P., and G.L. Kooyman. 1982. Oxygen consumption, thermoregulation, and the effect of fur oiling and washing on the sea otter, *Enhydra lutris*. *Canadian Journal of Zoology* 60:2761-2767.
- Coulombe, A.D., ed. 1982. *Webster's new world atlas*. Kimberlee Press, Miami, Florida.
- Crandall, L.S. 1964. *The management of wild mammals in captivity*. University of Chicago Press, Chicago.
- Crawford-Cabral, J. 1989. Distributional data and notes on Angolan carnivores (Mammalia: Carnivora). *Garcia de Orta, Ser. Zool., Lisboa* 14(2):3-27.
- Cumbie, P.M. 1975. Mercury levels in Georgia otter, mink and freshwater fish. *Bulletin of Environmental Contamination and Toxicology* 14:193-197.
- Davis, J.A. 1969. *Beever and company*. Harper and Row, New York.
- Davis, J.A. 1981. Breeding the spot-necked otter. Abstract, Second International Otter Colloquium, Norwich, England, September, 1981.
- Defler, R. 1986. The giant river otter in El Tuparro National Park, Colombia. *Oryx* 20:87-88.
- Delibes, M. (in press). The national field survey for otters in Spain.
- Desai, J.H. (in press). Breeding of the Indian smooth otter (*L. perspicillata*) in captivity-some important regulatory factors. In J. Estes and C. Santiapillai (eds.), *Proceedings of the International Asian Otter Symposium*, Bangalore, India. October, 1988.
- Dunstone, N. and R. Strachan. 1988. Status and distribution of otters in Amboro National Park, Bolivia. *IUCN Otter Specialist Group Bulletin* 3:24-31.
- Duplaix, N. 1980. Observations on the ecology and behaviour of the giant river otter *Pteronura brasiliensis* in Surinam. *Revue Ecologique (Terre Vie)* 34:495-620.
- Duplaix, N. 1984. Otters. Pp. 124-129 D. Macdonald (ed.), *The encyclopaedia of mammals*, George Allen and Unwin, London and Sydney.
- Duplaix-Hall, N. 1975. River otters in captivity: a review. Pp. 315-327 in R.D. Martin (ed.), *Breeding endangered species in captivity*, Academic Press, London.
- Elliot, K. 1983. The otter (*Lutra lutra* L.) in Spain. *Mammal Review* 13:25-34.
- Erickson, D. W. and D. A. Hamilton. 1988. Approaches to river otter restoration in Missouri. Unpubl. ms.
- Erickson, D.W. and C.R. McCullough. 1987. Fates of translocated river otters in Missouri. *Wildlife Society Bulletin* 15:511-517.
- Erickson, D.W., C.R. McCullough, and W.R. Poranth. 1984. Evaluation of experimental river otter reintroductions. Final Report of Missouri Department of Conservation. Federal Aid Project. No. W-13-R-38. 47 pp.
- Estes, J.A. 1977. Population estimates and feeding behavior of sea otters. Pp. 526-571 in M.C. Merritt and R.G. Fuller (eds.), *The environment of Amchitka Island, Alaska*. Springfield, Virginia.
- Estes, J.A. 1990. Growth and equilibrium in sea otter populations. *Journal of Animal Ecology* 59:385-401.
- Estes, J.A., K.E. Underwood, and M.J. Karmann. 1986. Activity-time budgets of sea otters in California. *Journal of Wildlife Management* 50:626-636.
- Estes, J.A., D.O. Duggins, and G.B. Rathbun. 1989. Ecology of extinctions in kelp forest communities. Unpubl. ms.
- Florence, A. 1986. Small emerald, uncut. *BBC Wildlife* 4(4):174-178.
- Foley, R.E., S.J. Jackling, R.J. Sloan, and M.K. Brown. 1988. Organochlorine and mercury residues in wild mink and otter: comparison with fish. *Environmental Toxicology and Chemistry* 7:363-374.
- Foster-Turley, P. (in press). The status of otters in Asia. In *Proc. Fifth International Otter Colloquium*, Hankensbuttel, West Germany. September, 1989.
- Foster-Turley, P. and S. Engfer. 1988. The Species Survival Plan for the Asian small-clawed otter (*Aonyx cinerea*). *International Zoo Yearbook* 27:79-84.
- Foster-Turley, P. and H. Markowitz. 1982. A captive behavioral enrichment study with Asian small-clawed river otters (*Aonyx cinerea*). *Zoo Biology* 1:29-43.
- Fremelin, G., ed. 1974. *The National Atlas of Canada*, Macmillan Company of Canada, Ltd., 254 pp.
- Furuya, Y. 1977. Otters in Padas Bay, Sabah, Malaysia. *Journal of the Mammal Society of Japan* 7:39-43.
- Gaethlich, M. 1988. Otters in western Greece and Corfu. *IUCN Otter Specialist Group Bulletin* 3:17-23.
- Gallo-Reynoso, J. P. (in press). The status and distribution of river otters (*Lutra longicaudis annectens* Major, 1897) in Mexico. *Proceedings of the Vth International Otter Colloquium*, Hankensbuttel, Federal Republic of Germany.
- Garshelis, D.L., and J.A. Garshelis. 1984. Movement and management of sea otters in Alaska. *Journal of Wildlife Management* 48:665-678.
- Geibel, J.J. and D.J. Miller. 1984. Estimation of sea otter, *Enhydra lutris*, population, with confidence bounds, from air and ground counts. *California Fish and Game* 70(4):225-233.
- Green, J. and R. Green. 1980. Otter survey of Scotland 1977-79. Vincent Wildlife Trust, London.
- Green, J. and R. Green. 1987. Otter survey of Scotland 1984-85. Vincent Wildlife Trust, London.
- Green, J., R. Green, and D.J. Jefferies. 1984. A radio-tracking survey of otters *Lutra lutra* on a Perthshire river system. *Lutra* 27:85-145.
- Greenwalt, L.A. 1977. International trade in endangered species of wild fauna and flora. *Federal Register* 42:10462-10488.
- Griffith, B., J. M. Scott, J. W. Carpenter, and C. Reed. 1988. Translocation and reintroduction as species conservation tools: results of a survey. Unpubl. ms.
- Grimwood, I. 1969. Notes on the distribution and status of some Peruvian mammals. American Commission on International Wildlife Protection and New York Zoological Society, Special Publication 21.
- Halbrook, R.S. 1978. Status and distribution of otters around the world. Pp.154-165. In Odom, R.R., and L. Landers, (eds.) *Proceedings of the Rare and Endangered Wildlife Symposium*. Georgia Department Natural Resources, Game and Fish Division, Athens, Georgia. Technical Bulletin WLA.
- Hall, E.R. 1981. *The mammals of North America*. Second edition. 2 vols. John Wiley & Sons, New York, New York. 1181 pp.
- Hamilton, R.M. 1985. Discharges of pesticides to the Rivers Mole and Taw, their accumulation in fish flesh and possible effects on fish stocks. *Journal of Fisheries Biology* 27 (Supplement A):139-149.
- Harris, C.J. 1968. *Otters: a study of recent Lutrinae*. Weidenfeld and Nicholson, London. 397 pp.
- Heidemann, G. 1981. Fischotter (*Lutra lutra* L.) in Schleswig-Holstein. *Zoologische Anzeiger* 207:210-221.
- Heidemann, G. and U. Riecken. 1988. Zur Situation des Bestandes und der Lebensraume des Fischotters (*Lutra lutra* L.) in Schleswig-Holstein. *Natur und Landschaft* 63(7-8):318-322.
- Helder, J., H. Andrade, and S. Mendes (no date). Habitats alimentares de Lontra (*Lutra longicaudis*). Resumos XV Congresso Brasileiro de Zoologia. Curitiba, Brazil.
- Henny, C.J., L.J. Blus, S.V. Gregory, and C.J. Stafford. 1981. PCB's and organochlorine pesticides in wild mink and river otters from Oregon. *Proceedings of the Worldwide Furbearer Conference* 3:1763-1780.

- Hone, E.B. 1984. Tales of the sea otter. *Pacific Discovery* 37:10-15.
- Hummel, M. 1987. Foreword (p. ix) in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Humphrey, S.R., and T.L. Zinn. 1982. Seasonal habitat use by river otters and everglades mink in Florida. *Journal of Wildlife Management* 46:375-381.
- Hutchins, P.W. 1987. The law applying to the trapping of furbearers by aboriginal peoples in Canada: a case of double jeopardy. Pp. 31-48 in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Irons, D.B., D.R. Nysewander, and J.L. Trapp. 1988. Prince William Sound sea otter distribution in respect to population growth and habitat. Unpubl. rep., U.S. Fish and Wildlife Service, Anchorage, Alaska.
- IUCN. 1987a. The IUCN policy statement on captive breeding. IUCN. Gland, Switzerland.
- IUCN. 1987b. The IUCN position statement on translocation of living organisms: introductions, re-introductions, and re-stocking. IUCN, Gland, Switzerland.
- IUCN. 1988. *1988 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland.
- IUCN/UNEP. 1987. *The IUCN directory of Afrotropical protected areas*. IUCN, Gland, Switzerland.
- Jameson, R.J., K.W. Kenyon, A.M. Johnson, and H.M. Wight. 1982. History and status of translocated sea otter populations in North America. *Wildlife Society Bulletin* 10:100-107.
- Jameson, R.J., K.W. Kenyon, S. Jefferies, and G.R. Van Blaricom. 1986. Status of a translocated sea otter population and its habitat in Washington. *Murrelet* 67:84-87.
- Jefferies, D.J., J. Green, and R. Green. 1984. Commercial fish and crustacean traps: a serious cause of otter *Lutra lutra* (L.) mortality in Britain and Europe. Vincent Wildlife Trust, London.
- Jefferies, D. J. and H. M. Hanson. 1987. The Minsmere otter release and information gained from a detailed examination and analysis of the two casualties. *Otters, Journal of the Otter Trust* 2:19-29.
- Jefferies, D. J., P. Wayre, R. M. Jessop, and A. J. Mitchell-Jones. 1986. Reinforcing the native otter *Lutra lutra* population in East Anglia: an analysis of the behaviour and range development of the first group. *Mammal Review* 16:65-79.
- Jensen, S., J.E. Kihlstrom, M. Olsson, C. Lundberg, and J. Orberg. 1977. Effects of PCB and DDT on mink (*Mustela vison*) during the reproductive season. *Ambio* 6:239.
- Jones, R.D. 1965. Sea otters in the Near Islands, Alaska. *Journal of Mammalogy* 46:702.
- Kenyon, K.W. 1969. The sea otter in the eastern Pacific Ocean. U.S. Fish and Wildlife Service, North American Fauna, No. 69, Washington, D.C.: Govt. Printing Office.
- Keymer, I. F., G. A. H. Wells, C. F. Mason, and S. M. Macdonald. 1988. Pathological changes and organochlorine residues in tissues of wild otters (*Lutra lutra*). *The Veterinary Record* 122:153-155.
- Khromovskikh, B.V. 1984. Recent numbers and distribution of sea otter on Kamchatka. Unpubl. rept. presented at US/USSR meeting concerning research and conservation of sea otters, Nakhodka, USSR, September, 1984 (available from author).
- Kingdon, J. 1977. *East African mammals: an atlas of evolution in Africa*. Academic Press, London.
- Kleiman, D. G. 1989. Reintroduction of captive mammals for conservation. Guidelines for reintroducing endangered species into the wild. *Bioscience* 39:152-161.
- Klumov, S.K. 1957. Breeding places of the fur seal (*Callorhinus ursinus*) and areas inhabited by sea otter (*Enhydra lutris*) in the Kurils and a tentative estimation of their numbers. *Doklady Akademii Nauk SSSR* 117(1-6):153-156 (in Russian). Translated and published by the American Institute of Biological Sciences.
- Kruuk, H., J.W.H. Conroy, and A. Moorhouse. 1987. Seasonal reproduction, mortality, and food of otters (*Lutra lutra* L.) in Shetland. *Symposium of the Zoological Society of London* 58:263-278.
- Lancaster, W.E. 1975. Exhibiting and breeding the Asian small-clawed otter *Amblonyx cinerea* at Adelaide Zoo. *International Zoo Yearbook* 15:63-65.
- Larsen, D.N. 1983. Habitats, movements and foods of river otters in coastal southeastern Alaska. Ms. thesis. Univ. of Alaska, Fairbanks, Alaska. 149 pp.
- Leatherwood, S., L.J. Harrington-Coulombe, and C.L. Hubbs. 1978. Relict survival of the sea otter in central California and evidence of its recent redispersal south of Point Conception. *Bulletin of Southern California Academy of Sciences* 77(3):109-115.
- Lejeune, A. (in press a). Ethologie des loutres au lac Muhazi. *Mammalia*.
- Lejeune, A. (in press b). Ecologie alimentaire de la loutre au lac Muhazi. *Mammalia*.
- Lejeune, A. 1989. Les loutres, *Lutra maculicollis* Lichtenstein, et la Pêche artisanale au Rwanda. *Revue Zoologique Africaine* 103:215-223.
- Lekagul, B. and J.A. McNeely. 1977. *Mammals of Thailand*. Association for the Conservation of Wildlife, Bangkok.
- Lensink, C.J. 1958. Predator investigations and control. Pp. 91-94 in 1958 Annual Reports, Alaska Fish and Game Commission and Alaska Dept. Fish and Game, Juneau, Alaska.
- Lensink, C.J. 1962. The history and status of sea otters in Alaska. Ph.D. Thesis, Purdue Univ., Lafayette, Indiana. 186 pp.
- Lenton, E.J., P.R.F. Chanin, and D.J. Jefferies. 1980. Otter survey of England 1977-79. Nature Conservancy Council, London.
- Leslie, G. 1971. Further observations on the oriental short-clawed otter *Amblonyx cinerea* at Aberdeen Zoo. *International Zoo Yearbook* 11:112-113.
- Liers, E.E. 1951. Notes on the river otter (*Lutra canadensis*). *Journal of Mammalogy* 32:1-9.
- Liers, E.E. 1960. Notes on breeding the Canadian otter. *International Zoo Yearbook* 2:84-85.
- MacAskie, I.B. 1987. Status of the sea otter (*Enhydra lutris*) in Canada. Unpublished report. (available from author).
- Macdonald, S.M. 1983. The status of the otter (*Lutra lutra*) in the British Isles. *Mammal Review* 13:11-23.
- Macdonald, S.M. and C.F. Mason. 1982. Otters in Greece. *Oryx* 16:240-244.
- Macdonald, S.M. and C.F. Mason. 1983a. Some factors influencing the distribution of otters (*Lutra lutra*). *Mammal Review* 13:1-10.
- Macdonald, S.M. and C.F. Mason. 1983b. The otter (*Lutra lutra*) in Tunisia. *Mammal Review* 13:35-37.
- Macdonald, S.M. and C.F. Mason. 1984. Otters in Morocco. *Oryx* 18:157-159.
- Macdonald, S.M. and C.F. Mason. 1987. Seasonal marking in an otter population. *Acta Theriologica* 32:449-461.
- Macdonald, S.M. and C.F. Mason. 1988. Observations on an otter population in decline. *Acta Theriologica* 33:49-68.
- Macdonald, S.M., C.F. Mason, and K. de Smet. 1985. The otter (*Lutra lutra*) in north-central Algeria. *Mammalia* 49:215-219.
- Macdonald, S.M., C.F. Mason, and B. Shalmon. 1986. A survey for otters in Israel. *Oryx* 20:233-236.

- Mack, C.M. 1985. *River otter restoration in Grand County, Colorado*. Colorado State Univ., Fort Collins, Colorado. 133 pp.
- Madsen, A.B. 1989. *Odderen*. Natur og Museum 28. argang nr. 1. Naturhistorisk Museum, Arhus. 31 pp.
- Maminov, M.K. 1984. Main trends and results of investigations of biology of sea otter in the Kuril Islands population. Unpubl. rept. presented at US/USSR meeting concerning research and conservation of sea otters, Nakhodka, USSR, September, 1984 (available from author).
- Mason, C.F. 1989. Water pollution and otter distribution: a review. *Lutra* 32:97-131.
- Mason, C.F., T.C. Ford, and N.I. Last. 1986a. Organochlorine residues in British otters. *Bulletin of Environmental Contamination and Toxicology* 36:656-661.
- Mason, C.F., N.I. Last, and S.M. Macdonald. 1986b. Mercury, cadmium, and lead in British otters. *Bulletin of Environmental Contamination and Toxicology* 37:844-849.
- Mason, C.F. and S.M. Macdonald. 1986a. *Otters: ecology and conservation*. Cambridge University Press, Cambridge. 236 pp.
- Mason, C.F., and S.M. Macdonald. 1986b. Levels of cadmium, mercury and lead in otter and mink faeces from the United Kingdom. *Science of the Total Environment* 53:139-146.
- Mason, C.F., and S.M. Macdonald. 1987. Acidification and otter (*Lutra lutra*) distribution on a British river. *Mammalia* 51:81-87.
- Mason, C.F., and S.M. Macdonald. 1988a. Metal contamination in mosses and otter distribution in a rural Welsh river receiving mine drainage. *Chemosphere* 17:1159-1166.
- Mason, C.F., and S.M. Macdonald. 1988b. Radioactivity in otter scats in Britain following the Chernobyl reactor accident. *Water, Air and Soil Pollution* 37:131-137.
- Mason, C.F., and S.M. Macdonald. 1989. Acidification and otter (*Lutra lutra*) distribution in Scotland. *Water, Air and Soil Pollution* 43:365-374.
- Mason, C.F., S.M. Macdonald, and A. Hussey. 1984. Structure, management, and conservation value of the riparian woody plant community. *Biological Conservation* 29:201-216.
- Mason, C.F. and P. Reynolds. 1988. Organochlorine residues and metals in otters from the Orkney Islands. *Marine Pollution Bulletin* 19(2):80-81.
- Maxwell, G. 1960. *Ring of bright water*. Longman, London.
- McGee, H.F. 1987. The use of furbearers by native North Americans after 1500. Pp. 13-20 in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Medway, L. 1978. *The wild mammals of Malaya (Peninsular Malaysia) and Singapore*, Second edition. Oxford University Press, Oxford.
- Meester, J.A.J., J.L. Rautenbach, N.J. Dippenaar, and C.M. Baker. 1986. *Classification of southern African mammals*. Transvaal Museum Monograph 5. Transvaal Museum, Pretoria.
- Melquist, W.E. 1984. Status of otters (Lutrinae) and spotted cats (Felidae) in Latin America. Report to IUCN. College of Forestry, Wildlife, and Range Sciences, University of Idaho. 267 pp.
- Melquist, W.E., and A.E. Dronkert. 1987. River otters. Pp. 626-641 in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Melquist, W.E., and M.G. Hornocker. 1983. Ecology of river otters in west central Idaho. *Wildlife Monograph* 83:1-60.
- Ministerie van Landbouw en Visserij 1989. De otter in perspectief; een perspectief voor de otter. EK's-Gravenhage, The Netherlands.
- Mortimer, M.A.E. 1963. Notes on the biology and behavior of the spotted-necked otter (*Lutra maculicollis*). *Puku* 1:192-206.
- Mowbray, E.E., D. Pursley, and J.A. Chapman. 1979. The status, population characteristics, and harvest of the river otter in Maryland. Publications in Wildlife Ecology No. 2, Maryland Wildlife Administration. 16 pp.
- National Wildlife Federation. 1989. *1989 Conservation Directory*. 34th ed. National Wildlife Federation, Washington, D.C. 331 pp.
- Nikolaev, A.M. 1961. O. rasprostraneni chislenosti i biologii kalanov. [The biology and population spread of the sea otter]. *Trudy Soveshchaniy Ikhtiol. Kommiss. Akad. Nauk SSSR* 12:214-271.
- Nolet, B.A., and V. Martens. 1989. De achteruitgang van de Otter in Nederland. *De Levende Natuur* 90:34-37.
- Northcott, T.H. and D. Slade. 1976. A live trapping technique for river otters. *Journal of Wildlife Management* 40:163-164.
- Novak, M. 1987a. Beaver. Pp. 282-312 in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Novak, M. 1987b. Traps and trap research. Pp. 941-969 in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Nowak, R.M. and J.L. Paradiso. 1983. *Walker's mammals of the world 2*. The Johns Hopkins University Press, Baltimore and London.
- Obbard, M.E. 1987. Fur grading and pelt identification. Pp. 717-826 in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Canada. 1150 pp.
- Olsson, M., J.E. Kihlström, S. Jensen, and J. Orberg. 1979. Cadmium and mercury concentration in mink (*Mustela vison*) after exposure to PCBs. *Ambio* 8:25.
- Ostfeld, R.S., L. Ebensperger, L. Klosterman and J.C. Castilla. 1989. Foraging, activity budget and social behavior of the South American marine otter (*Lutra felina*). *National Geographic Research* 5(4):422-438.
- Parera, A. and Masariche (no date). Proyecto Arirai; Informe de los resultados de la Primera Campana. Buenos Aires. Unpublished manuscripts.
- Pitcher, K.W. 1987. Studies of southeast Alaska sea otter populations: distribution, abundance, structure, range expansion, and potential conflicts with shellfisheries. Alaska Dept. Fish and Game Cooperative Agreement (No. 14-16-0009-954) with U.S. Fish and Wildlife Services, Unpublished report. 29 pp.
- Polechla, P.J. 1987. Status of the river otter (*Lutra canadensis*) population in Arkansas with special reference to reproductive biology. Ph.D dissertation. Univ. of Arkansas, Fayetteville, Arkansas. 383 pp.
- Polechla, P.J. 1988. The Nearctic river otter. Pp. 668-682 in Chandler, W.J., and L. Labate (eds.), *Audubon Wildlife Report 1988/1989*. National Audubon Society, New York, New York. 817 pp.
- Polechla, P.J. 1989a. A review of the techniques of radiotelemetry of the nearctic river otter. Pp. 14-22 in Amlaner, C.J. (ed.), *Biotelemetry X: Proceedings of the Tenth International Symposium on Biotelemetry*. Univ. of Arkansas Press, Fayetteville, Arkansas. 733 pp.
- Polechla, P.J. 1989b. More evidence of a commensal relationship between the river otter and the beaver. Pp. 217-236 in Amlaner, C.J. (ed.), *Biotelemetry X: Proceedings of the Tenth International Symposium on Biotelemetry*. Univ. of Arkansas Press, Fayetteville, Arkansas. 733 pp.

- Pollard, L. 1984. Return of the river otter. *Outdoor Oklahoma* 40:2-7.
- Prigioni, C., G. Bogliani, and F. Barbieri. 1986. The otter *Lutra lutra* in Albania. *Biological Conservation* 36:375-383.
- Proctor, J. 1963. A contribution to the natural history of the spotted-necked otter (*Lutra maculicollis* Lichtenstein) in Tanganyika. *East African Wildlife Journal* 1:93-102.
- Radinsky, L.B. 1968. Evolution of somatic sensory specialisation in otter brains. *Journal of Comparative Neurology* 134:495-506.
- Ralls, K., and D.B. Siniff. 1988. Time budgets and activity patterns of California sea otters. Pp. 90-127 in D.B. Siniff and K. Ralls (eds.), Population status of California sea otters, Final Report to Minerals Mgmt. Serv., U.S. Dept. of the Interior, Contract No. 14-12-0001-30033.
- Ray, A.J. 1987. The fur trade in North America: an overview from a historical geographical perspective. Pp. 21-30 in Nowak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Red Book of the USSR. 1984. 2nd edition. Ministry of Agriculture of the USSR, Academy of Sciences of the USSR, Moscow.
- Reid, D.G. 1984. Ecological interactions of river otters and beavers in a boreal ecosystem. Masters thesis. University of Alberta, Calgary, Alberta. 199 pp.
- Repenning, C.A. 1976. *Enhydra* and *Enhydriodon* from the Pacific coast of North America. *Journal of Research of the U.S. Geological Survey* 4:305-315.
- Ridding, M. O. and H. D. Smith. 1987. Post-release monitoring of the second group of otters. *Otters, Journal of the Otter Trust* 2:30-36.
- Rios, U. G. 1987. Proyecto para evaluacion de las poblaciones de nutria o perro de agua (*Pteronura brasiliensis*) en los llanos de Portuguesa.
- Roberts, T.J. 1977. *The mammals of Pakistan*. Ernest Benn Ltd., Tonbridge, Kent, UK.
- Rotterman, L.M., and T. Simon-Jackson. 1988. Sea otter. Pp. 237-275 in J.W. Lentfer (ed.), *Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations*. U.S. Marine Mammal Commission, Washington, D.C.
- Rowe-Rowe, D.T. 1977a. Food ecology of otters in Natal, South Africa. *Oikos* 28:210-219.
- Rowe-Rowe, D.T. 1977b. Prey capture and feeding behavior of South African otters. *Lammergeyer* 23:12-21.
- Rowe-Rowe, D.T. 1977c. Variations in the predatory behavior of the clawless otter. *Lammergeyer* 23:22-27.
- Rowe-Rowe, D.T. 1986. African otters—is their existence threatened? *IUCN Otter Specialist Group Bulletin* 1:9-11.
- Salas, J.B. 1978. Informe sobre las actividades que desarrolla el Departamento de Vida silvestre en Nicaragua. In: Morales, R., Macfarland, C., Incer, J. and Hobbs, A. (eds.) *Memorias de la Primera Reunion Regional Centroamericana sobre Vida Silvestre*. Metagalpa, Nicaragua 25-29 Julio 1978. Unidad de areas silvestres y cuencas del cañe, pp. 99-108.
- Salter, R.E. 1983. Summary of currently available information on internationally threatened wildlife species in Burma. FAO Field Document 7/83 FO: BUR/80/006.
- Santos Reis, M. 1983. Status and distribution of the Portuguese mustelids. *Acta Zoologica Fennica* 174:213-216.
- Schmidt, W.T. 1983. Aerial survey of sea otters in the Cordova vicinity. Unpubl. rep., U.S. Fish and Wildlife Service, Anchorage, Alaska. 9 pp.
- Schneider, K.B. 1979. Sea otter distribution and abundance, southern Kodiak Archipelago and the Semidi Islands. Unpubl. Rep., Alaska Dept. Fish and Game, Anchorage, Alaska. 44 pp.
- Schneider, K.B., and J.B. Faro. 1969. Aerial count of sea otters—Aleutian Islands, Alaska Peninsula and Shumagin Islands. Unpubl. rep., Alaska Dept. Fish and Game, Anchorage, Alaska. 22 pp.
- Schneider, K.B., and J.B. Faro. 1975. Effects of sea ice on sea otters, *Enhydra lutris*. *Journal of Mammalogy* 56:91-101.
- Schreiber, A., R. Wirth, M. Riffel and H. Van Rompaey. 1989. *Weasels, civets, mongooses and their relatives: an action plan for the conservation of mustelids and viverrids*. IUCN, Gland, Switzerland.
- Semenov-Tyan-Shansky, O.E. 1982. *Wild animals of the Murmansk Region*. Murmansk Publishing House, Murmansk. 175 pp.
- Shannon, J.S. 1989. Social organization and behavioral ontogeny of otters (*Lutra canadensis*) in a coastal habitat in northern California. *Bulletin of the IUCN Otter Specialist Group* 4:8-13.
- Shirley, M.G., R.G. Linscombe, and L.R. Sevin. 1983. A live trapping and handling technique for river otter. *Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies* 37:182-189.
- Shirley, M.G., R.G. Linscombe, N.W. Kinler, R.M. Knaus, and V.L. Wright. 1988. Population estimates of river otters in a Louisiana coastal marshland. *Journal of Wildlife Management* 52:512-515.
- Sielfeld, W. 1983. *Mamíferos marinos de Chile*. Ediciones de la Universidad de Chile, Santiago. 199 pp.
- Simenstad, C.A., J.A. Estes, and K.W. Kenyon. 1978. Aleuts, sea otters, and alternate stable-state communities. *Science* 200:403-411.
- Simon-Jackson, T. 1985. Fishermen opinions of sea otter/fisheries issues in Alaska. Unpubl. rep., U.S. Fish and Wildlife Service, Anchorage, Alaska. 6 pp.
- Simon-Jackson, T. 1986. Sea otter survey, Cordova, Alaska-1986 (Orca Inlet to Cape Suckling). Unpubl. rep., U.S. Fish and Wildlife Serv., Anchorage, Alaska. 32 pp.
- Simon-Jackson, T. 1988. Take of sea otters by Alaska natives (through 1986). Unpubl. rep., U.S. Fish and Wildlife Service, Anchorage, Alaska. 6 pp.
- Simon-Jackson, T., and J. Hodges. 1986. Sea otter survey, Gulf of Alaska-1987 (Cape Spencer to Point Martin). Unpubl. rep., U.S. Fish and Wildlife Service, Anchorage, Alaska. 16 pp.
- Smith, N.J.H. 1981. Caimans, capybaras, otters, manatees and man in Amazonia. *Biological Conservation* 19:177-187.
- Stahlecker, D.W. 1986. A survey for river otter (*Lutra canadensis*) in Taos and Colfax Counties, New Mexico. Contract No. 519-75-01. Rept. submitted to New Mexico Department of Game and Fish, Santa Fe, New Mexico. 10 pp.
- Stubbe, M. 1989. Verbreitung und Ökologie des Fischotters *Lutra lutra* (L. 1758) in der DDR. In *Populationsökologie marderartiger Säugetiere*, vol. 1, pp. 13-33. Martin-Luther Universität, Halle (Salle).
- Stubbe, M., N. Chotolchu, N. Dawaa. 1989. Der Fischotter *Lutra lutra* in der Mongolischen Volksrepublik. *Populationsökologie marderartiger Säugetiere*, 71-76.
- Suriname Forest Service. 1987. Interim Report Otter Survey. Paramaribo. 4 pp.
- Tanabe, S. 1988. PCB problems in the future: foresight from current knowledge. *Environmental Pollution* 50:5-28.
- Timmis, W.H. 1971. Observations on breeding the oriental short-clawed otter *Amblonyx cinerea* at Chester Zoo. *International Zoo Yearbook* 11:109-111.
- Tiner, R.W. 1984. Wetlands of the United States: Current status and recent trends. U.S. Government Printing Office, Washington, D.C. 59 pp.

- Tumilson, R., M. Karnes, and A. W. King. 1982. The river otter in Arkansas: Indications of a beaver-facilitated commensal relationship. *Proceedings of the Arkansas Academy of Science* 36:73-75.
- Tumilson, R., and S. Shalaway. 1985. An annotated bibliography on the North American river otter. Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State Univ., Stillwater, Oklahoma. 32 pp.
- Turan, N. 1984. *Turkyénir Avve Yaban Hayvanlari Memeliler*. Ongun Kardesler Matbaacilik Sanayii, Ankara. 178 pp.
- U.S. Fish and Wildlife Service. 1987. Translocation of sea otters to San Nicolas Island, California. Final Environmental Impact Statement.
- Van Blaricom, G.R., and J.A. Estes, eds. 1988. The community ecology of sea otters. *Ecological Studies*, vol. 65. Springer-Verlag. Berlin, Heidelberg, New York. xvi + 247 pp.
- Van der Zee, D. 1981. Prey of the Cape clawless otter (*Aonyx capensis*) in the Tsitsikama Coastal National Park, South Africa. *Journal of Zoology, London* 194:467-483.
- Van der Zee, D. 1982. Density of Cape clawless otters *Aonyx capensis* (Schinz 1821) in the Tsitsikama Coastal National Park. *South African Journal of Wildlife Reserves* 12:8-13.
- Wayre, P. Undated. *Return of the otter*. The Otter Trust, Earsham, Bungay, Suffolk, England.
- Wendell, F.C., R.A. Hardy, and J.A. Ames. 1985. Assessment of the accidental take of sea otters, *Enhydra lutris*, in gill and trammel nets. Unpubl. rep., California Department of Fish and Game, Marine Resources Branch, Sacramento, California 30 pp.
- Wendell, F.C., R.A. Hardy, and J.A. Ames. 1986. A review of California sea otter, *Enhydra lutris* surveys. California Department of Fish and Game, Marine Resources Technical Report 51, 42 pp.
- Willett, B. 1987. *Philips' new world atlas*. George Philip and Sons, London.
- Woolington, J.D. 1984. Habitat use and movements of river otters at Kelp Bay, Baranof Island, Alaska. MSc thesis. Univ. of Alaska, Fairbanks, Alaska. 147 pp.
- Wren, C.D. 1985. Probable cause of mercury poisoning in a wild otter, *Lutra canadensis*, in northwestern Ontario. *Canadian Field Naturalist* 99(1):112-114.
- Wren, C.D. 1987. Toxic substances in furbearers. Pp. 930-936 in Novak, M., J.A. Baker, M.E. Obbard, and B. Malloch (eds.), *Wild furbearer management and conservation in North America*. Ontario Ministry of Natural Resources, Toronto, Ontario. 1150 pp.
- Wright, C. (in press). Otters in Captivity. In J. Estes and C. Santiapillai (eds), *Proceedings of the International Asian Otter Symposium*, Bangalore, India. October 1988.
- Zyll de Jong, C.G. van. 1972. A systematic review of the nearctic and neotropical river otters (Genus *Lutra*, Mustelidae, Carnivora). *Royal Ontario Museum, Life Science Contributions* 80:1-104.
- Zyll de Jong, C.G. van. 1987. A phylogenetic study of the Lutrinae (Carnivora; Mustelidae) using morphological data. *Canadian Journal of Zoology* 65:2536-2544.