The Global Otter Conservation Strategy

Nicole Duplaix and Melissa Savage

IUCN SSC Species Survival Commission

RED LIST THE IUCN RED LIST OF THREATENED SPECIES™

Otter Specialist Group

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Otter Specialist Group

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Sawfish: A Global Strategy for Conservation, written by Lucy R. Harrison and Nicholas K. Dulvy of the IUCN/SSC Shark Specialist Group, and Damon Richardson's beautiful lay-out inspired us and we followed their example. Thank you for creating the model that made our work so much easier.

We also acknowledge the support of the many home institutions and organizations of the contributors for allowing them the time to carry out this work.

The final draft was presented at the Southeast Asian Otter Conservation Planning Meeting, 9-13 September 2018, hosted by the Singapore Zoo. Animated discussions by participants improved the content significantly, and we owe each of them a debt of gratitude.

The Strategy's Vision, Goals, Objectives and Actions section is a good place to start to develop direct conservation actions in your own country, region and community, to achieve a Vision of "a world where otter populations thrive, co-exist with, and are valued by people thanks to conservation efforts, understanding and respect."

Participants of the SE Asian Otter Conservation Planning Meeting, September 2018, Singapore Zoo
Top row: Max Khoo De Yuan, Will Duckworth, Lalita Gomez, Jennifer Van Brocklin, Benjamin Lee, Wanlop Chutipong, Daniel Wilcox, Philip Johns, Victor Augustine, Chung-Hao, Le Van Dung **Fourth row:** Kanitha Krishnasamy, Meryl Theng, Meaghan Harris, Camille Coudrat, Reza Lubis, Carol Bennetto, Amanda Mayhew, Tina Liow, Leona Wai, Katrina Fernandez, Rekha Mohan, Alexandra Kalher, Atul Borker
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About IUCN

IUCN, International Union for Conservation of Nature,
helps the world find pragmatic solutions to our most pressing environment and development challenges by supporting scientific research; managing field projects all over the world; and bringing governments, NGOs, the UN, international conventions and companies together to develop policy, laws and best practice. The world's oldest and largest global environmental network, IUCN is a democratic membership union with more than 1,000 government and NGO member organizations, and over 13,000 volunteer scientists and experts as members of the IUCN commisions in some 160 countries. IUCN's work is supported by over 1,000 professional staff in 60 offices and hundreds of partners in public, NGO and private sectors around the world. IUCN's headquarters are located in Gland, near Geneva, in Switzerland.

The IUCN Species Survival Commission (SSC) is a science-based network of more than 7,500 volunteer experts from almost every country of the world, all working together towards achieving the vision of, "A just world that values and conserves nature through positive action to reduce the loss of diversity of life on earth".

Most members are deployed in more than 145 Specialist Groups, Red List Authorities, Task Forces and Sub-Committees. Some groups address conservation issues related to particular groups of plants, fungi or animals while others focus on topical issues, such as reintroduction of species into former habitats or wildlife health.

SSC members also provide scientific advice to conservation organizations, government agencies and other IUCN members, and support the implementation of multilateral environmental agreements.

Working in close association with IUCN's Global Species Program, SSC's major role is to provide information to IUCN on biodiversity conservation, the inherent value of species, their role in ecosystem health and functioning, the provision of ecosystem services, and their support to human livelihoods. This information is fed into **The IUCN Red List of Threatened Species.**

Established in 1964, the International Union for Conservation of Nature's Red List of Threatened Species has evolved to become the world's most comprehensive information source on the global conservation status of animal, fungi and plant species.

The IUCN Red List is a critical indicator of the health of the world's biodiversity. Far more than a list of species and their status, it is a powerful tool to inform and catalyze action for biodiversity conservation and policy change and is critical to protecting the natural resources we need to survive. It provides information about range, population size, habitat and ecology, use and/or trade, threats, and conservation actions that will help inform necessary conservation decisions.

The IUCN/SSC Otter Specialist Group
The Otter Specialist Group (OSG) is one of the IUCN Species Survival Commission's specialist groups.

Its goals since 1974 are to:

1. provide leadership for the conservation of all 13 otter species
2. determine, review and share on a continuing basis the status, threats and needs of otters worldwide and update the IUCN Red List
3. promote the wise management of otters in the wild and in captivity through ongoing collaboration with zoos and the publication of studbooks and husbandry manuals
4. undertake the new research, conservation and management programs necessary to insure the recovery of threatened and endangered otter populations
5. train and mentor a new generation of otter researchers
6. present and promote actions to curb the illegal trade and decrease otter-fishermen conflict

IUCN SSC Species Survival Commission RED LIST THE IUCN RED LIST OF THREATENED SPECIES™ Otter Specialist Group


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Introduction
Changing the Future of Otters

1. **Giant otter**
   Pteronura brasiliensis
   South America
   ***Endangered**
2. **North American River otter**
   Lontra canadensis
   North America
   ***Least concern**
3. **Neotropical otter**
   Lontra longicaudis
   South America
   ***Near threatened**
4. **Marine otter**
   Lontra felina
   South America
   ***Endangered**
5. **Southern river otter**
   Lontra provocax
   South America
   ***Endangered**
6. **Sea otter**
   Enhydra lutris
   North America
   ***Endangered**
7. **Spotted-necked otter**
   Hydrictis maculicollis
   Africa
   ***Near threatened**
8. **Hairy-nosed otter**
   Lutra sumatrana
   Asia
   ***Endangered**
9. **Eurasian otter**
   Lutra lutra
   Eurasia
   ***Near threatened**
10. **African clawless otter**
    Aonyx capensis
    Africa
    ***Near threatened**
11. **Congo clawless otter**
    Aonyx ongicus
    Africa
    ***Near threatened**
12. **Short-clawed otter**
    Aonyx cinereus
    Asia
    ***Vulnerable**
13. **Smooth-coated otter**
    Lutrogale perspicillata
    Asia
    ***Vulnerable**

The thirteen otter species spread around the world belong to the subfamily Lutrinae. As mustelids, they are low-slung, agile, and resemble their relatives, the badger, mink and ferret. Some species are more aquatic than others but all otters are strong swimmers, well adapted to both marine and freshwater habitats.

Otters are incredibly resilient animals. Give them protection and healthy rivers with fish, and they will make a comeback. We have seen this happen in huge cities like Singapore where otter family groups parade through the parks from one fishing hole to another, surrounded by people. We have watched their return to the United Kingdom where otters were scarce in the 1970s, but now live in every county. We witnessed the return of sea otters to the Pacific Rim, from the brink of extinction in the 1900s to large populations living along the North American coast.

Yet otter populations everywhere remain fragile and at risk. When wetlands shrink and fisheries dwindle conflicts arise between people and otters, and the otters lose. Threats take many forms. For instance, China's new wealth spurs the illegal trade in precious furs and curios, otters included. As countries prosper and urban areas seemingly appear overnight, the wildlife departs.

The IUCN-SSC Otter Specialist Group has produced otter conservation programs since 1974. We have seen successes when otters returned to their former haunts but we are also witnessing the sharp acceleration of environmental threats that affect otters everywhere: pollution, deforestation, overpopulation, illegal trade, limited protection, and the escalating effects of climate change. As you read the *Global Otter Conservation Strategy*, you will notice the litany of similar threats for each species and the urgent need for programs that can stem the tide. We identify and discuss the significant factors that influence habitat quality and the presence of otters in each region where they occur. Some species have already been studied in great detail, like the Eurasian otter and sea otter, others hardly at all, like the Hairy-nosed otter. The goal of this Strategy is to be both aspirational and inspirational: for biologists to aspire to know more about otters and go do it, and to inspire foundations to fund their efforts. The future of otters depends on this.

Most important are the local communities that share their rivers with otters. We must work side by side and understand their concerns and their needs. By involving adults and children in our projects, by sharing our knowledge and enthusiasm about why otters play an important role in our wetlands, we can overcome conflicts and create new otter ambassadors in places where otter numbers are dwindling. Without their support we will not succeed.

We know what needs to be done, we have launched conservation programs before and the otters returned to their former haunts, but we must expand these efforts significantly if we are to ensure that otters have a secure future on the planet.

Nicole Duplaix and Anna Loy
Co-Chairs, IUCN-SSC Otter Specialist Group

Vision

Recognizing the various positive roles (such as flagship, indicator, and umbrella species) that otters can play in aquatic systems; and

Recognizing that when provided with protection from killing and the pet trade, and with suitable habitats and environmental conditions, otters are resilient species and can return and flourish; and

Recognizing that 'suitable habitats' for otters can include a wide range of natural, near-natural and human-made habitats;

The IUCN-SSC Otter Specialist Group envisages a world where otter populations thrive, co-exist with, and are valued by, people thanks to conservation efforts, understanding and respect.

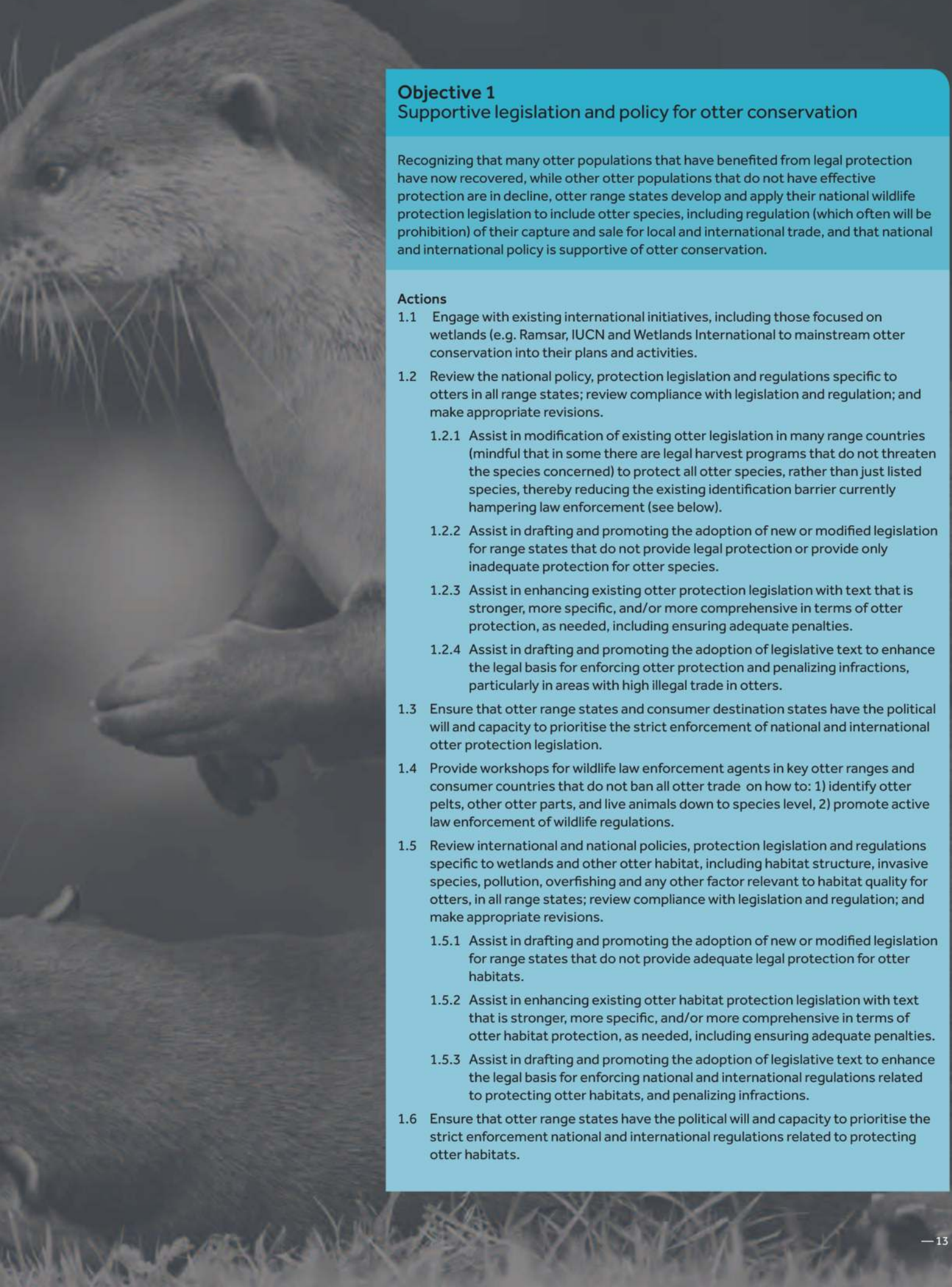
Goal 1

To rebuild and maintain healthy populations of all otter species across all parts of each species' range as held before major human-induced declines.

Goal 2

To promote a global otter community to achieve effective otter conservation and restoration through a 'One-Plan' approach integrating interventions in the wild with captive populations, including a supportive legal and policy base, location-based habitat conservation, elimination of illegal trade, strategic research, education and outreach, collaborative capacity-building and support from all sectors of society including the local communities who share otter habitats.

Objectives 1 –9



Objective 1
Supportive legislation and policy for otter conservation

Recognizing that many otter populations that have benefited from legal protection have now recovered, while other otter populations that do not have effective protection are in decline, otter range states develop and apply their national wildlife protection legislation to include otter species, including regulation (which often will be prohibition) of their capture and sale for local and international trade, and that national and international policy is supportive of otter conservation.

Actions

1.1 Engage with existing international initiatives, including those focused on wetlands (e.g. Ramsar, IUCN and Wetlands International to mainstream otter conservation into their plans and activities.

1.2 Review the national policy, protection legislation and regulations specific to otters in all range states; review compliance with legislation and regulation; and make appropriate revisions.

- 1.2.1 Assist in modification of existing otter legislation in many range countries (mindful that in some there are legal harvest programs that do not threaten the species concerned) to protect all otter species, rather than just listed species, thereby reducing the existing identification barrier currently hampering law enforcement (see below).
- 1.2.2 Assist in drafting and promoting the adoption of new or modified legislation for range states that do not provide legal protection or provide only inadequate protection for otter species.
- 1.2.3 Assist in enhancing existing otter protection legislation with text that is stronger, more specific, and/or more comprehensive in terms of otter protection, as needed, including ensuring adequate penalties.
- 1.2.4 Assist in drafting and promoting the adoption of legislative text to enhance the legal basis for enforcing otter protection and penalizing infractions, particularly in areas with high illegal trade in otters.

1.3 Ensure that otter range states and consumer destination states have the political will and capacity to prioritise the strict enforcement of national and international otter protection legislation.

1.4 Provide workshops for wildlife law enforcement agents in key otter ranges and consumer countries that do not ban all otter trade on how to: 1) identify otter pelts, other otter parts, and live animals down to species level, 2) promote active law enforcement of wildlife regulations.

1.5 Review international and national policies, protection legislation and regulations specific to wetlands and other otter habitat, including habitat structure, invasive species, pollution, overfishing and any other factor relevant to habitat quality for otters, in all range states; review compliance with legislation and regulation; and make appropriate revisions.

- 1.5.1 Assist in drafting and promoting the adoption of new or modified legislation for range states that do not provide adequate legal protection for otter habitats.
- 1.5.2 Assist in enhancing existing otter habitat protection legislation with text that is stronger, more specific, and/or more comprehensive in terms of otter habitat protection, as needed, including ensuring adequate penalties.
- 1.5.3 Assist in drafting and promoting the adoption of legislative text to enhance the legal basis for enforcing national and international regulations related to protecting otter habitats, and penalizing infractions.

1.6 Ensure that otter range states have the political will and capacity to prioritise the strict enforcement national and international regulations related to protecting otter habitats.

Objective 2
Locality-based implementation of conservation

Maintain and enhance habitats in conditions suitable for otters by attention to substrate, vegetation, hydrodynamics, pollution, prey stocks, invasive species and all other factors affecting otter habitat suitability.
Conserve extant otter populations by reducing killing and live off-take of otters to non-threatening levels.
Encourage and support range states to develop and implement regional plans/ agreements to harmonize and strengthen national and subnational efforts to identify, maintain enhance and protect critical salt and freshwater otter habitats (including, increasingly, urban and other heavily modified areas), and their otter populations.

Actions

2.1 Control illegal offtake, initially in key otter localities, progressively broadening to cessation of poaching in all otter localities range-wide.

2.2. Reduce human–otter conflict to non-threatening levels, initially in key otter localities, progressively broadening to all otter localities range-wide.

2.3 Reduce any other locally acting threat to non-threatening levels, recognizing that the threat profile in any given locality evolves, that some new threats may appear (e.g. diseases), and that locally specific knowledge of threats is essential to successful locality-based conservation (see Research).

2.4 Conserve and enhance critical otter habitats, by preventing the degradation of those habitats still suitable for otters and, for those currently unsuitable, achieve their regeneration by changing conditions of bankside and channel substrate and vegetation; restore appropriate hydrodynamics; reduce pollution, problematic invasive species and inappropriate debris; construct over- or underpasses where road mortality is a threat; and other locally appropriate actions.

- 2.4.1 Promote region-specific, concerted efforts by the wide range of interest groups that share the common goal of conserving and improving rivers, other wetlands and coastal areas threatened by pollution, overfishing, hydrodynamic change, invasive species, climate change and/or any other relevant factor.
- 2.4.2 Enhance national wetland protected area networks, consistent with the Aichi Biodiversity Targets.

2.5 Identify extant or proposed long-term effective locality-based conservation projects into which otter-specific interventions could be added, allowing cost and administrative efficiencies, and partner with these projects to support the inclusion of these otter-specific interventions (see also fund-raising section).

2.6 Build local community capacity for a range of otter-related projects in key otter habitats.

Objective 3
Eliminating illegal trade

Reduce and eliminate the illegal trade in otters by increasing law enforcement effectiveness in range and consumer countries, ensuring compliance with CITES obligations and national regulatory frameworks and reduce demand for otters, their parts, and products.

Actions

3.1 Strengthen law enforcement effort in range and consumer countries.

- 3.1.1 Continue to monitor the illegal trade in otters in all ranges and consumer states, including seizures and trade occurring in physical and online markets. Ensure the provision of such information to relevant authorities and bodies for action, including publishing relevant findings.
- 3.1.2 Research and investigate the trade in otters in Africa and the Americas.
- 3.1.3 Maintain an up-to-date database of information on national and international trade dynamics, including through close working relationships with TRAFFIC to provide them with updates to maintain information on the illegal otter trade.
- 3.1.4 Build capacity and knowledge of law enforcement agencies, particularly in Asia, to investigate and take action on illegal otter trade. Including the development of otter identification cards and reports to law enforcement agencies in Asia, Africa and South America.
- 3.1.5 Work with law enforcement agencies and online trade portals to prevent the listing of otters for sale online and identify and prosecute the trade of otters online.
- 3.1.6 Work with law enforcement agencies and other partners (including those that work to reduce illegal trading in other species) to ensure effective implementation of CITES Decisions.

3.2 Ensure adequate international protection for otters in trade.

- 3.2.1 Draft, develop, and secure range state proponent/s for a proposal to uplist three Asian otter species that are currently under Appendix II of CITES (Convention on the International Trade in Endangered Species), to Appendix I for consideration at the next CITES CoP (Conference of Parties) in 2019.
- 3.2.2 Promote adoption of the proposal to uplist Asian otters to Appendix I under CITES at the next CoP, including through CITES-specific fact sheets and active participation at CITES CoP 2019.

3.3 Reduce demand for otters and otter products.

- 3.3.1 Understand the drivers and dynamics of the demand, and situational circumstances facilitating trade such as weak law enforcement.
- 3.3.2 Develop and implement targeted awareness campaigns aimed at reducing demand for pet otters, pelts and products used for traditional medicine.

Objective 4
Strategic research

Ensure that appropriate research guides the development of programs and projects to conserve otters and their habitats, taking into consideration the local context and constraints.

Actions

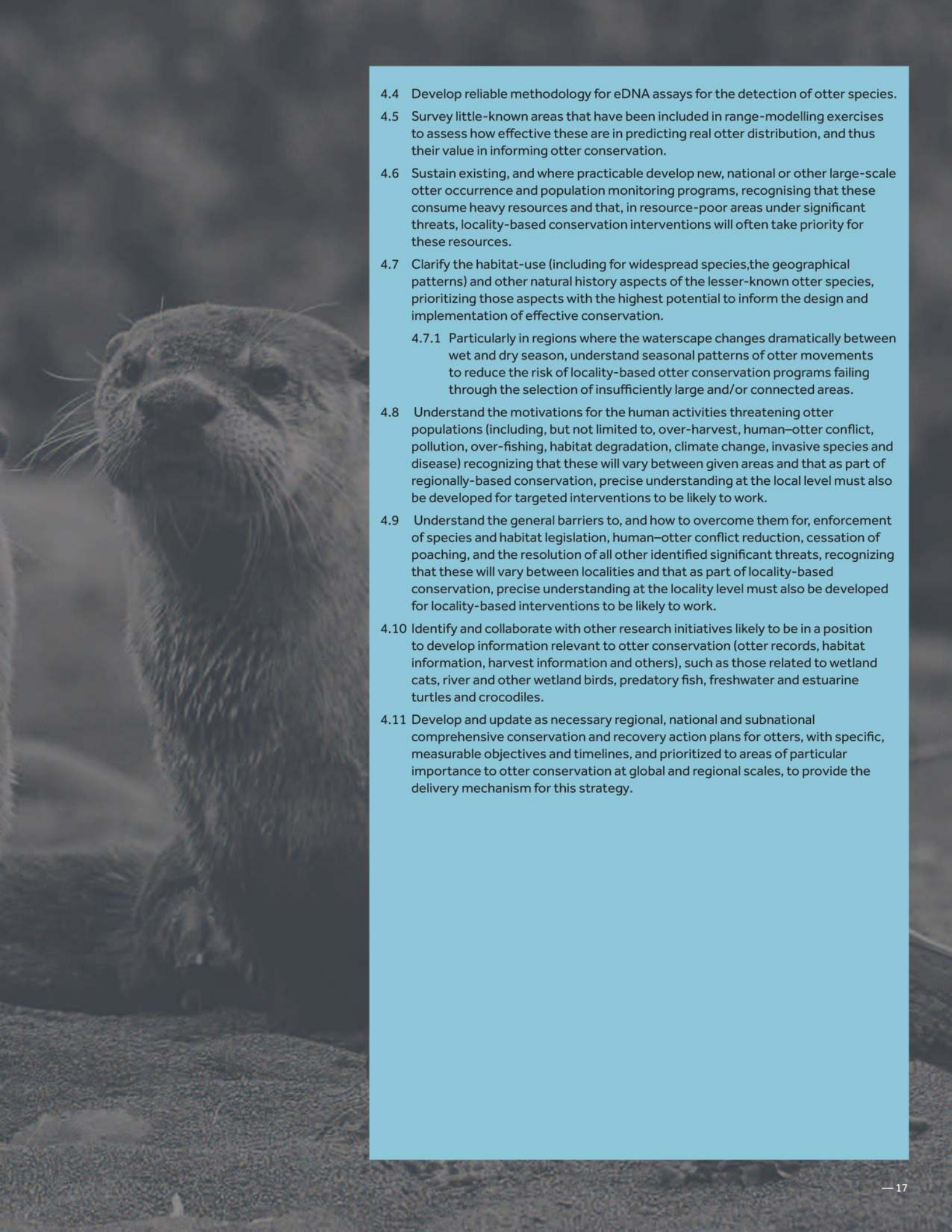
4.1 Review and, where necessary, revise otter taxonomy using information from all relevant aspects (morphological, ecological, genetic and possibly vocal), to ensure otter conservation is based on the most appropriate taxonomic units and in particular that it does not overlook taxonomically cryptic highly threatened species or subspecies.

4.2 To aid conservation, recovery and potential re-establishment throughout their historical ranges, particularly for otters listed as globally threatened on the IUCN Red List of Threatened Species, collate and synthesize all available otter records (mindful of the high risk of species-level mis-identification in many sources) to:

- 4.2.1 determine historical and current, total and core, distributions of otter species.
- 4.2.2 propose key localities or Hotspots for each otter species.
- 4.2.3 identify regions where information is insufficient to assess whether otter populations occur (or persist) but are high priorities for survey because if they do, these populations might be of high global significance.
- 4.2.4 identify regions where current status is poorly known.
- 4.2.5 identify key threats to otters at the population level, including geographical patterns.

4.3 Throughout otter range but particularly in areas where current status and conservation needs are poorly known, generate new, reliable information on otter status (where feasible to the species level) and conservation needs, using locally apt methodology such as:

- 4.3.1 documentation of local communities' perceptions of current and historical otter local status.
- 4.3.2 assembly of camera trap and other photos of live animals, road-kills and signs, appropriately documented sight-records, and other credible evidence.
- 4.3.3 surveys using methodologies leading to verifiable records (such as camera-trapping, environmental DNA [eDNA] and, in many circumstances, signs), targeted to localities and regions where collation of local information and of others' credible records is insufficient to understand status at sufficient resolution.
- 4.3.4 development and promotion of a global real-time citizen-science reporting system for otter records and information about trade and other threats, using insight from a review of existing pilot Otter ID programs (e.g. India and Malaysia), and considering modifications for the replicability of such programs in other countries.
- 4.3.5 for northern South-east Asia and potentially other regions where large numbers of otter fecal samples have been stockpiled for DNA-based species identification, and idenfy hese samples.
- 4.3.6 identify the types and intensities of population-level threat (including, but not limited to, over-harvest, human–otter conflict, pollution, over-fishing, habitat degradation, climate change, invasive species and disease) to the otter populations of global or regional significance, recognizing that these will vary between localities and that as part of locality-based conservation, precise locality-level understanding must also be developed for locality-based interventions to be likely to work.



4.4 Develop reliable methodology for eDNA assays for the detection of otter species.

4.5 Survey little-known areas that have been included in range-modelling exercises to assess how effective these are in predicting real otter distribution, and thus their value in informing otter conservation.

4.6 Sustain existing, and where practicable develop new, national or other large-scale otter occurrence and population monitoring programs, recognising that these consume heavy resources and that, in resource-poor areas under significant threats, locality-based conservation interventions will often take priority for these resources.

4.7 Clarify the habitat-use (including for widespread species,the geographical patterns) and other natural history aspects of the lesser-known otter species, prioritizing those aspects with the highest potential to inform the design and implementation of effective conservation.

4.7.1 Particularly in regions where the waterscape changes dramatically between wet and dry season, understand seasonal patterns of otter movements to reduce the risk of locality-based otter conservation programs failing through the selection of insufficiently large and/or connected areas.

4.8 Understand the motivations for the human activities threatening otter populations (including, but not limited to, over-harvest, human–otter conflict, pollution, over-fishing, habitat degradation, climate change, invasive species and disease) recognizing that these will vary between given areas and that as part of regionally-based conservation, precise understanding at the local level must also be developed for targeted interventions to be likely to work.

4.9 Understand the general barriers to, and how to overcome them for, enforcement of species and habitat legislation, human–otter conflict reduction, cessation of poaching, and the resolution of all other identified significant threats, recognizing that these will vary between localities and that as part of locality-based conservation, precise understanding at the locality level must also be developed for locality-based interventions to be likely to work.

4.10 Identify and collaborate with other research initiatives likely to be in a position to develop information relevant to otter conservation (otter records, habitat information, harvest information and others), such as those related to wetland cats, river and other wetland birds, predatory fish, freshwater and estuarine turtles and crocodiles.

4.11 Develop and update as necessary regional, national and subnational comprehensive conservation and recovery action plans for otters, with specific, measurable objectives and timelines, and prioritized to areas of particular importance to otter conservation at global and regional scales, to provide the delivery mechanism for this strategy.

Objective 5
Education and outreach

Increase societal awareness of and support for otters and their environment. Reduce negative community perceptions of otters. Where possible create otter support, particularly local human communities, to help with effective conservation, including government action. Create education/outreach materials to aid regional conservation efforts and encourage citizen participation in otter research and conservation.

Actions

5.1 Increase the number of otter research and conservation articles published in reputable scientific publications, and ensure the transfer of important findings into media used by the public.

5.2 Develop a global education campaign using targeted and locally relevant social media and local outreach to engage the public about the need for otter conservation.

5.3 Inform the public through social media, press releases, popular articles, and other means about otter related news and conservation successes and failures.

5.4 Develop downloadable information packets and study materials for educators based on well-founded scientific and conservation understanding about otters, taking note of recent advances. Disseminate educational and outreach material among relevant stakeholders of all ages via physical and downloadable content.

- 5.4.1 Encourage all captive holding facilities that house otters to develop otter awareness and conservation programs.
- 5.4.2 Encourage and provide information packets to schools in key otter habitats.

5.5 Prepare and distribute otter identification and information manuals in local languages for enforcement officials and their government and civil-society partners in countries where a total ban on otter trade does not exist or is not enforced.

- 5.5.1 Translate existing otter identification and information manuals, such as those originally prepared for Southeast Asian countries in 2018. Expand and adapt them for use by national and international law enforcement agencies to help identify otter species and otter products in trade, and understand the conservation needs of otters and the urgency for their implementation.

5.6 Develop information and education kits for educators (physical and downloadable) in regional languages and regions as appropriate.

5.7 Develop educational and outreach material to aid conflict resolution.

5.8 Educate pet owners on pet trade ethics, legalities and welfare, taking appropriate care that this does not result in increased demand to keep otters as pets.

5.9 Foster otter friendly corporate relationships and help make corporations aware of the importance of otters as ambassadors and their importance to ecosystems as well as educate them regarding regulations related to otters and ecosystems.

Objective 6
Conflict resolution

Facilitate peaceful co-existence between otters and people by decreasing human-otter conflict throughout otter ranges. Provide IUCN SSC guidelines to aid local stakeholders in addressing otter – human conflict.

Actions

6.1 Identify and preempt probable otter-human conflict scenarios; provide timely solutions.

6.2 Develop and facilitate regional training programs to better address conflict resolution.

6.3 Study the socio-economic impacts of otters on local communities.

6.4 Foster multidisciplinary actions to improve perceptions of local communities in conflict areas towards otters.

6.5 Develop innovative conflict mitigation strategies to address ongoing conflict scenarios at local and regional level.

6.6 Evaluate and facilitate opportunities for the development of additional sources of livelihoods for communities perceived to be negatively impacted by otters.

6.7 Educate recreational users of otter habitats who face problems with otters.

Objective 7
Captive populations

Ensure that all otter species are assessed for their captive conservation needs and that all captive otters are professionally cared for and managed in a state of positive welfare and good genetic health. Also ensure that all existing and future captive breeding is linked to or part of ex-situ collaborative conservation programs.

Actions

7.1 Promote and implement the "One-Plan" approach to achieve a continuum of effective otter conservation measures in situ and ex situ.

7.2 Ensure that all action plans for otters include comprehensive ex-situ conservation needs assessments following the IUCN ex-situ guidelines.

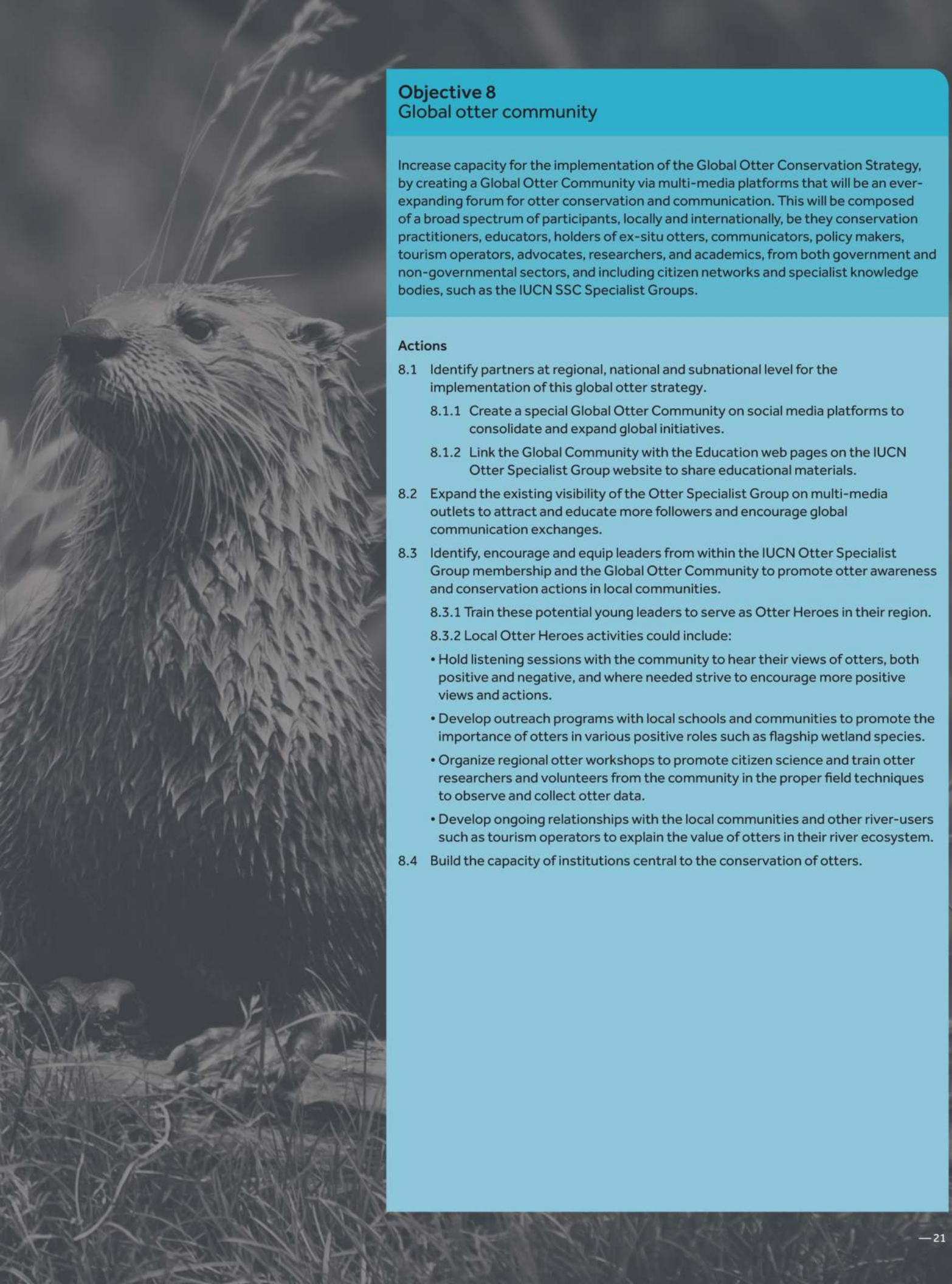
- 7.2.2 Conduct Integrated Collection Assessment and Planning (ICAP) for all otter species.

7.3 Ensure that good record systems are in place in captive holding institutions (e.g. Species 360).

- 7.3.1 Encourage involvement in established species management programs (e.g. GSMPs [Global Species Management Programmes], EEPs [European Endangered Species Programmes], SSPs [Species Survival Plans], and TAGs [Taxon Advisory Groups]).
- 7.3.2 Encourage information exchange and collaboration between otter holding facilities and the IUCN Otter Specialist Group.

7.4 Develop and disseminate husbandry manuals/guidelines (available through the Otter Specialist Group website) for all otter species and translate them to range and ex-situ countries' languages.

- 7.4.1 Continuously improve existing husbandry guidelines through research and collaboration.
- 7.4.2 Develop and disseminate existing veterinary guidelines for the medical management of all otter species in captivity.
- 7.4.3 Build capacity for holding institutions requiring assistance in improving captive otter management including husbandry, exhibit design and record keeping.
- 7.4.4 Develop relevant protocols for sample collection and storage (e.g. blood, tissue) for all otter species to contribute to genetic preservation and research.



Objective 8
Global otter community

Increase capacity for the implementation of the Global Otter Conservation Strategy, by creating a Global Otter Community via multi-media platforms that will be an ever-expanding forum for otter conservation and communication. This will be composed of a broad spectrum of participants, locally and internationally, be they conservation practitioners, educators, holders of ex-situ otters, communicators, policy makers, tourism operators, advocates, researchers, and academics, from both government and non-governmental sectors, and including citizen networks and specialist knowledge bodies, such as the IUCN SSC Specialist Groups.

Actions

8.1 Identify partners at regional, national and subnational level for the implementation of this global otter strategy.

8.1.1 Create a special Global Otter Community on social media platforms to consolidate and expand global initiatives.

8.1.2 Link the Global Community with the Education web pages on the IUCN Otter Specialist Group website to share educational materials.

8.2 Expand the existing visibility of the Otter Specialist Group on multi-media outlets to attract and educate more followers and encourage global communication exchanges.

8.3 Identify, encourage and equip leaders from within the IUCN Otter Specialist Group membership and the Global Otter Community to promote otter awareness and conservation actions in local communities.

8.3.1 Train these potential young leaders to serve as Otter Heroes in their region.

8.3.2 Local Otter Heroes activities could include:

- Hold listening sessions with the community to hear their views of otters, both positive and negative, and where needed strive to encourage more positive views and actions.
- Develop outreach programs with local schools and communities to promote the importance of otters in various positive roles such as flagship wetland species.
- Organize regional otter workshops to promote citizen science and train otter researchers and volunteers from the community in the proper field techniques to observe and collect otter data.
- Develop ongoing relationships with the local communities and other river-users such as tourism operators to explain the value of otters in their river ecosystem.

8.4 Build the capacity of institutions central to the conservation of otters.

Objective 9
Fundraising

Providing a steady stream of funding is essential to ensure the timely delivery of the Actions described in this Global Otter Conservation Strategy, as well as for those relevant to individual species conservation action plans

Actions

9.1 Secure funds from a wide variety of sources to facilitate the implementation of the Global Otter Conservation Strategy and other related strategic otter conservation plans.

- 9.1.1 Assist and advise members of the Otter Specialist Group in their efforts to secure funding for their conservation programs and field research.
- 9.1.2 Develop and secure funding for student research programs to contribute to research objectives as outlined by the Global Otter Conservation Strategy.
- 9.1.3 Develop and secure funding to inspire, train and foster the next generation of otter conservation leaders.

9.2 Identify, cultivate and maintain a list of funding sources which can address the different types of Conservation Actions needed in the different regions of the world.

- 9.2.1 Meet with specific donors to discuss the special urgency, needs, and challenges of global and local otter conservation, and develop funding streams specifically for otters.
- 9.2.2 Explore funding support for incorporating otter-specific interventions into extant or proposed effective long-term locality-based conservation projects (see above).

9.3 Identify and promote collaborative fundraising efforts between the Otter Specialist Group, the Global Otter Community, Zoological Parks and Aquaria, other SSC Specialist Groups, and other otter interest groups more efficiently to secure funding and other resources for otter conservation.

9.3.1 Create awareness campaigns to help raise funding through public donations.

The 13 otter species: status and threats

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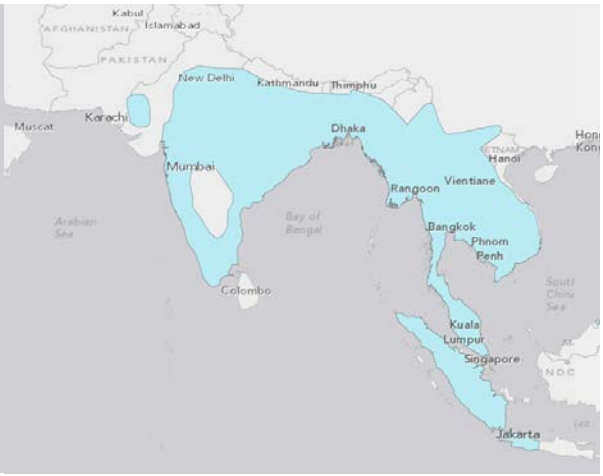
List of the thirteen extant otter species

1. **Giant otter**
   Pteronura brasiliensis
   South America
   ***Endangered**
2. **North American River otter**
   Lontra canadensis
   North America
   ***Least concern**
3. **Neotropical otter**
   Lontra longicaudis
   South America
   ***Near threatened**
4. **Marine otter**
   Lontra felina
   South America
   ***Endangered**
5. **Southern river otter**
   Lontra provocax
   South America
   ***Endangered**
6. **Sea otter**
   Enhydra lutris
   North America
   ***Endangered**
7. **Spotted-necked otter**
   Hydrictis maculicollis
   Africa
   ***Near threatened**
8. **Hairy-nosed otter**
   Lutra sumatrana
   Asia
   ***Endangered**
9. **Eurasian otter**
   Lutra lutra
   Eurasia
   ***Near threatened**
10. **African clawless otter**
    Aonyx capensis
    Africa
    ***Near threatened**
11. **Congo clawless otter**
    Aonyx ongicus
    Africa
    ***Near threatened**
12. **Short-clawed otter**
    Aonyx cinereus
    Asia
    ***Vulnerable**
13. **Smooth-coated otter**
    Lutrogale perspicillata
    Asia
    ***Vulnerable**

Asia
Smooth-coated Otter
Lutrogale perspicillata

The Smooth-coated otter, once common in the wetlands and low-lying areas of South Asia and Southeast Asia, is now restricted to a few protected areas. In former times, this species was widely used by fishermen especially in the Sunderbans of India and Bangladesh, who trained the otters to herd fish into their nets.



IUCN Red List Status
The Smooth-coated otter is listed as Vulnerable due to an inferred population decline of more than 30% over the past 30 years (Pacifici *et al*. 2013). CITES Appendix II.

Distribution
The Smooth-coated otter is found in Java, Sumatra and Borneo, northward to southwestern China, east through Nepal and Bhutan and India to Pakistan, excluding the Indus Valley. There is an isolated population in the marshes of Iraq (*L. p. maxwelli*), indicating the range must once have been wider (Pocock 1941, Hussain 1993). Its presence has been confirmed from Nepal, India, Bangladesh, Bhutan, Southwest China, Myanmar, Singapore, Thailand, Singapore, Viet Nam, Malaysia, Sumatra, Java, Borneo, Indonesia (Mason and Macdonald 1986, Hussain 1993, Melisch *et al*. 1994) and southern Iraq (Al-Sheikhly, *et al*. 2015). The Smooth-coated otters in Singapore are *L. perspicillata*, x *A. cinereus* hybrids with *A. cinereus* mtDNA, the first reported case of hybridization in wild among otters based on molecular studies (Moretti *et al*. 2017).

Habitat and Ecology
The Smooth-coated otter is an otter of lowlands and floodplains and uses a wide variety of habitats (Hussain and Choudhury 1997). The species likes large rivers, lakes, peat swamp forests, coastal mangroves, estuaries and rice fields (Foster-Turley 1992), provided there is ample riverbank vegetation for cover and escape, and rocky areas or deep soil for digging natal dens. They have been seen swimming out to sea, but these otters need adequate fresh water to wash the salt from their fur. In certain areas, such as Singapore, the species uses highly disturbed urban sites, with some populations showing a remarkable resilience in the presence of human activity (Theng and Sivasothi 2016, Khoo and Sivasothi 2018).

In the Indian subcontinent, the species is adapted to live in the semi-arid region of northwestern India and the Deccan Plateau (Prater 1971). In the Punjab plains of India, it occurs along some stretches of the Beas, Sutlej and Ravi Rivers and the Harike wetlands (Khan 2015). In Pakistan, it occurs in the floodplains of Sindh, some parts of Pakistan Punjab and a few places in Khyber-Pakhtunkhwa along the Indus River (Rais 2009, Khan *et al*. 2010).

In Nepal, Smooth-coated otters are found along the braided channels of Narayani River, with its slow current and shallow depth (Acharya and Lamsal 2010). Along the large rivers in India, the species prefers rocky stretches, which provide sites for denning and resting (Hussain 1993, Hussain and Choudhury 1995, 1997).

In the terai areas of the upper Gangetic plain, Smooth-coated otters use seasonally flooded swamps during monsoon season and early winter. In the winter breeding season, swamps are extensively used as natal den sites and nurseries.

In Southeast Asia, rice fields appear to be one of the most suitable habitats (Foster-Turley 1992, Melisch *et al*. 1996). Smooth-coated otters are more abundant in mangroves than rainforest rivers in Kuala Gula, Malaysia (Shariff 1984). In the inner

Gulf of Thailand, otters also use the cover of traditional aquaculture ponds, but not agricultural or urban cover. In west Java, Smooth-coated otters prefer mangroves, tidal stretches of the rivers, and rice fields (Melisch *et al*. 1996). Remaining natural patches seem to be critical refuges for otter, allowing them to persist in an otherwise heavily transformed landscape.

In urban Singapore, in addition to natural sites, otters use human-made, concretized structures such as reservoirs and canals, and have adapted to use concrete and grass for grooming. Latrines, resting sites, and dens are present in areas with high human accessibility such as small gaps and crevices under bridges, and under metal beams and roads. They have been observed using stairs and ladders to access dry land in concrete canals with steep sloping walls (Khoo and Sivasothi 2018).

Smooth-coated otters are gregarious. They often live in large groups of different age and sex, hunt in groups and defecate in common latrine sites which are used traditionally over many years (Hussain 1996, Hussain and Choudhury 1997). The basic family group consists of an adult female and her offspring, the father of the offspring, and older siblings (Lekagul and McNeely 1988, Hussain 1996). Along the Chambal River in central India the group size ranges from 1 to 9 animals, and the home range of otters overlapped substantially (Hussain and Choudhury 1995); the home range of females with cubs was estimated to be 5.5 km of river, and about 17 km for adult males.

The Smooth-coated otter is mainly a fish eater, taking larger prey than other otter species that share its range. It also eats shrimp, crayfish, crabs, frogs, mudskippers, and birds (Foster-Turley 1992, Hussain and Choudhury 1998, Anoop and Hussain 2005). The percentage of fish in the diet range from 75-100% (Melisch *et al*.1996, Hussain and Choudhury 1998, Anoop and Hussain 2005). Foraging mainly occurs in water near obstructions such as fallen trees, rocks, fishing nets and rapids (Shariff 1984).

In the Periyar Tiger Reserve, India, the exotic European carp constitutes the major prey, while in Singapore exotic cichlids are the major prey in freshwater reservoirs (Theng *et al*. 2016). By consuming large amounts of exotic fish species, otters may contribute to the control of their rapid expansion in water bodies (Anoop and Hussain 2005). In Singapore, along the mangrove habitats, prawn consisted 35% of their diets (Theng *et al*. 2016).

Smooth-coated otters may compete for resources with Small-clawed otters where they co-exist. Small-clawed otters, however, mostly forage in rice fields and small muddy streams, eating primarily crabs, whereas Smooth-coated otters mostly use large bodies of water, eating primarily fish (Sabrina 1985). They have also been observed exhibiting coordinated group-hunting strategies (Kruuk *et al*. 1994). The Smooth-coated otter is also sympatric with the Eurasian otter, which consumes smaller fish and more amphibians (Kruuk *et al*. 1994).

Smooth-coated otter mating takes place in water, with prolonged playful bouts between partners (Desai 1974, Naidu and Malhotra 1989). In northern India, mating occurs in August and September, and litters of 2 to 5 are born several months later (Desai 1974, Hussain 1993). Dens are dug under tree roots, between piles of boulders, or in dense vegetation (Shariff 1984).

Threats

The major threat to Asian otters is the burgeoning human population across Asia, leading to loss of wetland habitats, decline in prey biomass, dam construction, pollution, and poaching. In many Asian countries, the problems of poverty have not been adequately addressed, forcing people to be increasingly dependent on natural resources. Consequently, most water systems do not have a sufficient prey base for sustaining otter populations. In the last decade, loss of mangroves to aquaculture, reclamation of wetlands, stone quarrying and sand mining, and other habitat alterations outside protected areas have increased, leading to reduced habitat for Smooth-coated otters.

A priority is the identification of specific local threats, so that strategies can be designed for resource and habitat protection.

The illegal wildlife trade poses a direct threat to the Smooth-coated otter. From 1980 to 2015, 5,881 otter pelts were seized across 15 countries in Asia, with about half of the pelts coming from India and most cases involving the Smooth-coated and

Eurasian otters (Gomez *et al*. 2016). Otters are also coveted by the online pet trade, particularly in Southeast Asia (Gomez and Bouhuys 2018) and for use in traditional medicine in some countries of Southeast Asia and China (Poole 2003).

Wetlands and waterways are polluted by eutrophication and accumulation of persistent agricultural pesticides, such as chlorinated hydrocarbons and organophosphates. Fortunately, the overall use of insecticides has decreased since 1996, but chlorinated hydrocarbons are still indiscriminately used (CPCB 1994). Increased pesticide use is regarded as a major obstacle to the development of rice-fish culture (Koesoemadinata and Costa-Pierce 1992) and poses a danger to all predators feeding on affected aquatic prey (Melisch 1995).

Across South and Southeast Asia, increased aquaculture activities lead to indiscriminate killing of otters. Small-scale fishermen are quite tolerant of otters, but commercial fishermen kill them as pests. The practices of dynamite fishing in the Nepal foothills (Prakash 2013), and electrofishing in Iraq (Al-Sheikhly and Nader 2013) kill otters. Otters entangled in fishing nets drown. And although technically protected throughout its range, laws are laxly enforced, with some local authorities even actively encourage otter killing by fishery interests.

There is inadequate data on the trends of otter mortality due to road kills, but there are records of frequent road kills in India and Southeast Asian countries. An insufficient reporting system hampers an understanding of the level of otter mortality from vehicles. Captive and wild populations of otters are susceptible to diseases such as rabies, canine distemper, canine hepatitis, and parvovirus, which may be contracted by Smooth-coated otters from feral dogs or other species of otters.

Climate change will take a serious toll on otter populations worldwide. Smooth-coated otters depend on rivers, lakes and streams, which face dramatic alteration under a warming scenario, reducing water levels in long-term droughts and affecting prey densities.

Threat mitigation measures

The creation of networks of Protected Areas and identification of sites as wetlands of national and international importance under Ramsar Convention has to some extent halted the degradation of the species' habitat. For the long-term survival of the species, policy-based actions, research on factors affecting its survival, habitat-based action, expansion of protected areas, and communication and awareness building actions are needed.

The creation of a network of Protected Areas, including identification of sites as wetlands of national and international importance under the Ramsar Convention, will help to halt the degradation of its habitat.

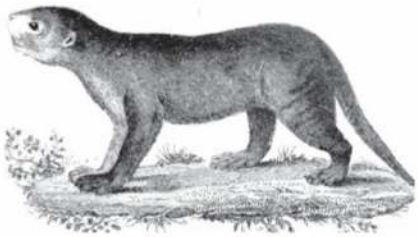
To control the illegal trade in Smooth-coated otter pelts, enforcement of laws, higher rates of conviction and real penalties are needed, as well as effective control of transborder trafficking.

Intensified efforts are needed to reduce the use of pesticides, and to control the discharge of industrial effluent and sewage into wetlands and river ecosystems (Hussain 2000). Environmental impact assessments of development projects near wetlands and rivers of conservation importance should also assess impacts on otters and other aquatic species.

In areas of conflict, educating and engagement with fishermen/fishing communities is needed as it is in urban areas with fish ponds. Restoration of otter-friendly habitats such as riparian vegetation (or even at least the provision of stairs) along urbanised waterways instead of vertical slopes will enable clean urbanized waterways to become a refuge for otters.

Further research and standardized surveys will help to clarify the remaining Smooth-coated otter population trends, distribution and conservation needs. A priority is the identification of specific local threats, so that strategies can be designed for resource and habitat protection.

The appearance of Smooth-coated otters with pups in Singapore is a testimony to the efforts made by various agencies in the restoration of wetland habitats and coastal areas.



Captive populations
The Smooth-coated otter breeds in many zoos across South and Southeast Asia. Early breeding records are from National Zoological Garden Delhi and Jaipur Zoo in India. They are also known to breed in zoos in Thailand, Cambodia, and Viet Nam. Few European or American zoos hold or breed Smooth-coated otters. In 1972, the Twycross Zoo in the United Kingdom was the first to breed Smooth-coated otters in the Western Hemisphere. Breeding for re-introduction purposes has not been attempted. There is a need to collate the existing stocks of Smooth-coated otter for future ex situ conservation planning.

Site-specific Conservation Locations
The first ever sanctuary dedicated to otters, the Tungabhadra Otter Reserve Sanctuary, was created in 2016 in Hospet in Karnataka State in the south of India. This refuge must be supported and its success assessed to see if the model is useful elsewhere.

Singapore, with its thriving and popular Smooth-coated otter population, is a conservation location of special interest. It presents an unusual opportunity to understand how an urban population of otters manages to live in close proximity with people and thrive.

In India, the Smooth-coated otter is given protection in the many areas that were created for umbrella species such as tiger, elephant, crocodiles and river dolphins. In the Jim Corbett and Dudhwa Tiger Reserves in northern India (Nawab and Hussain 2012), Periyar, Parambukulum and Kalakad-Mundanthurai Tiger Reserves (Raha and Hussain 2016), Koringa and Bhitarkanika Wildlife Sanctuary, and Kaziranga and Pakke Tiger Reserves, the Smooth-coated otter deserves the same conservation attention as charismatic megafauna.

The species is highly vulnerable and needs protection in the marshes of southern Iraq, in India in the Punjab plains, Himalayan foothills, and Northeast India including Assam and Arunachal Pradesh, in Southern China, and in Southeast Asian countries, including Myanmar, Thailand (in the Hua Khai Kheng Wildlife Sanctuary), Lao PDR, Cambodia, Viet Nam and Indonesia.

Success Stories
Smooth-coated otter populations in Singapore have increased since the 1990s with breeding populations in the western and eastern Johor Straits on the north shore, and in Singapore, especially in Sungei Buloh Wetland Reserve, Pulau Ubin, and Serangoon Reservoir (Theng and Sivasothi 2016). The appearance of Smooth-coated otters with pups in Singapore is a testimony to the efforts made by various agencies in the restoration of wetland habitats and coastal areas that suggest that the natural colonization of otters in degraded habitat is possible through effective habitat improvement measures.

Projects and Funding Opportunities
The Smooth-coated otter is the most studied otter in Asia, but the status surveys conducted for this species cover only patches scattered across the whole of its range. Occupancy based surveys need to be carried out in protected and unprotected areas to monitor its population trends. Studies should also focus on phylogeography and conservation genetics, foraging ecology and habitat use. This species has greatly suffered due to indiscriminate poaching for its pelt, particularly in South and Southeast Asia. Sensitization workshops need to be organized for enforcement agencies such as custom officials, forest rangers and for university students.

In west Asia, the conservation action should focus on Iraq where the status of *L. p. maxwelli* is still not known. In South Asia the focus on Smooth-coated otters should be directed to the foothills of the Himalayas including Nepal and Bhutan, Western Ghats and coastal areas of Gujarat, Maharashtra, Andhra Pradesh and Odisha. In Southeast Asia the focus should Myanmar, Southern China, Cambodia, Lao PDR, Malaysia and Indonesia, covering coastal habitats such as mangrove forests.

Regional
West Asia
The marshes of southern Iraq are part of the Palearctic Tigris–Euphrates ecoregion covering an area of 15–20,000 km^2. According to the United Nations Environmental Program, 84-90% of these marshes have been destroyed. These marshes are the stronghold of both *L.p. maxwelli* and *Lutra lutra*, and their restoration of should be a high priority. Fortunately, the Central Marshes and the Central, Hawizeh and Hammer Marshes are Ramsar sites and are under international conservation management. Occupancy

based surveys need to be carried out at the Central and Hawizeh Marshes to determine the status of otters in the region.

Apart from loss of habitats, otters are indiscriminately killed as they are considered to be pests in the region. Conservation education and awareness workshops in this war-torn area will sensitize the people to the value of otters and wetland conservation. A small nature interpretation center should be established, close to Central and Hawizeh Marshes, to highlight the role of wetlands and its obligate species for human well-being and sustainable development. Capacity building of local researchers in otter surveys and wetland conservation should be conducted in training workshops. The conservation of Smooth-coated otter in West Asia should be linked to the conservation of Eurasian otters. Iraq is the priority country for conservation actions. An overall budget of $ 150,000 over three years should be allocated to a West Asia program.

South Asia

In most of its range, the Smooth-coated otter occurs sympatrically with the Eurasian otter and Small-clawed otter especially in the Western Ghats, Northeast India, and in Myanmar and eastward to southeast Asia. Poaching of otters and habitat loss are the most important factors affecting otter populations in South Asia. In view of these, it is imperative to sensitize the law enforcement agencies such as border police, custom officials and the staff of the Forest Department by organizing workshops in collaboration with TRAFFIC, Wildlife Crime Control Bureau, WWF and other NGOs in Nepal, Bhutan and India. Legal instruments should be put in place to protect otters from poaching, trade of pelts and body parts and live animals for the pet trade pets. Training programs are needed for species identification and filing of cases in court for culprits. Public awareness programs, especially for the fishermen and riverside communities, should be undertaken for wetland conservation by promoting otters as ambassador of the wetlands. Community involvement in otter conservation is needed, especially in coastal areas where conflicts between otters and human are more severe.

Smooth-coated otter conservation in South Asia should be linked with the conservation of the Eurasian otter and Small-clawed otter where they occur sympatrically. The priority countries for Smooth-coated otter conservation are Pakistan, India, Nepal and Bangladesh. An overall budget of $ 100,000 over three years should be allocated to a South Asia program.

Southeast Asia

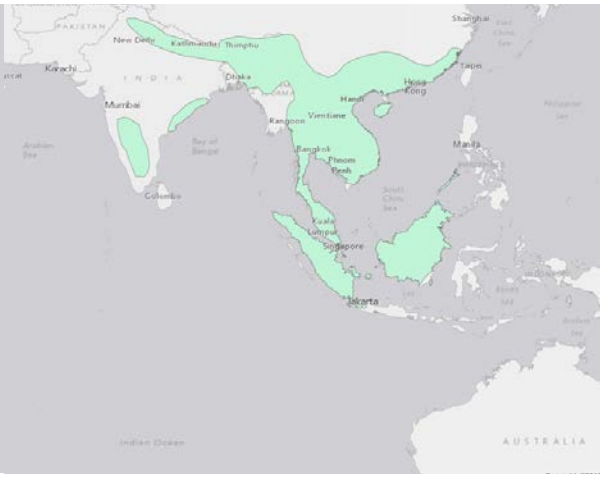
In Southeast Asia, otters are widely poached for their pelt and for the illegal pet trade. It is imperative to train law enforcement agencies such as border police, custom officials and Forest Department staff by organizing workshops in collaboration with TRAFFIC, Wildlife Crime Control Bureau, WWF and other NGOs. There is strong need for community involvement in otter conservation especially in coastal areas where conflicts between otters and human are more severe. The conservation action of Smooth-coated otter in Southeast Asia should be linked with the conservation of Eurasian otter, Hairy-nosed otter and Small-clawed otter wherever they occur sympatrically. The priority countries for Smooth-coated otter conservation in Southeast Asia are Myanmar, Thailand, Lao PDR, Cambodia, Viet Nam, Malaysia and Indonesia. An overall budget of $ 150,000 over three years should be allocated to the Southeast Asia program.

Small-clawed Otter *Aonyx cinereus*
Projects and Funding Opportunities

Region	Actions	Costs
West Asia	Full-time researcher position to work on otter conservation in the region	$ 60,000 $ 1,000/month for 60 months
	Organize five capacity-development workshops to train researchers in otter survey, feeding habit study and wetland conservation strategies	$ 50,000
	Support existing labs to confirm subspecies status in Iraq, Iran and Israel	$ 25,000
Iraq	Determine status of *Lutrogale p. maxwelli* in Central marshes and Hawizeh Marshes	$ 25,000
	Organize five conservation education and awareness workshops in areas close to Central Marshes and Hawizeh Marshes	$ 25,000
	Establish a nature interpretation centre in a college, university or institution close to Central and Hawizeh Marshes to highlight the role of otters and wetlands	$ 25,000
South Asia	Full-time otter research and conservation position	$ 60,000 $1,000/month for 60 months
Pakistan, India, Nepal, Bhutan, Bangladesh	Monitor population status of Smooth-coated otters in select protected and non-protected habitats	$ 50,000
	Support existing labs to analyze samples of each genetic group to confirm subspecies status	$ 30,000
	Organize five workshops for enforcement agencies dealing with otter trade, conservation education and awareness	$ 50,000
	Organize five capacity development workshops for local researchers for monitoring otter populations, food habit studies, and wetland conservation	$ 50,000
Southeast Asia	Full-time otter research and conservation position	$ 60,000 $1,000/month for 60 months
Myanmar, China, Thailand, Cambodia, Lao PDR, Viet Nam, Malaysia and Indonesia	Monitor population status of four Southeast Asian otter species in select protected and non-protected habitats.	$ 40,000
	Support existing labs to confirm subspecies status	$ 40,000
	Organize eight workshops for enforcement agencies dealing with otter trade, conservation education and awareness in Southeast Asian countries	$ 80,000
	Organize eight capacity-development workshops for local researchers for monitoring otter population, food habit studies, and wetland conservation	$ 80,000

Asia
Small-clawed Otter
Aonyx cinereus

The smallest otter, while widespread in Southeast Asia, is now declining rapidly due their wetland habitat loss, poaching, and, more recently, the pet trade via the internet.



IUCN Red List Status
The Asian Small-clawed otter is classified as Vulnerable due to an inferred past population decline of more than 30% over the past 30 years, or three generations (Pacifici *et al*. 2013). CITES Appendix II.

Distribution
The Small-clawed otter has a broad distribution range, extending from India in South Asia eastwards through Southeast Asia, including Lao PDR, Malaysia, Myanmar, Cambodia, Bangladesh and Indonesia to Palawan, Philippines, and southern China (Mason and Macdonald 1986, Wozencraft 1993, Hussain 2000, Hussain *et al*. 2011). In India it occurs in West Bengal, Assam, Himachal Pradesh, and Arunachal Pradesh as well as in southern Indian hill ranges of Coorg (Karnataka), Ashambu, Nilgiri and Palini Hills (Tamil Nadu) and Kerala (Pocock 1941, Prater 1971, Hussain 2000, Hussain *et al*. 2011) and in Odisha in eastern India (Mohapatra *et al*. 2014). It also inhabits the lowland rivers and wetlands in the foothills of the Himalayas in Bhutan and Nepal.

Populations are inferred to be declining steeply. The species has undergone a dramatic decline in China with only three records from 2006 to the present (Li and Chan 2017). In India, its distribution range has decreased, for example, in the Sunderbans (Sanyal 1991) and in Cambodia, it is only found near Virachey National Park (Heng *et al*. 2016). Massive destruction of wetland forests in Indonesia has reduced the species' habitat (Margono *et al*. 2014), as has habitat conversion to oil palm plantations in Sabah.

Habitat and Ecology
Asian Small-clawed otters use a wide variety of natural and human-altered habitats, with a preference for slower water bodies, including meandering rivers, streams, peat swamps, mangrove forests, tidal pools, rice fields, irrigation ditches, and fish ponds. They also use shallow fast-flowing mountain creeks narrower than 5 m, particularly when the course of the streams includes natural pools, reaching up to 1,000 m elevation in parts of its range (Wright *et al*. 2015). The species is well adapted to agricultural habitats and human habitation. Small-clawed otters prefer moderate and low vegetation structure in riverine areas (Melisch *et al*. 1996).

As their name implies, the Small-clawed otter has very reduced claws, and their feet are webbed. They have a brown to light brown pelage, with a pale, sometimes almost white chest, throat, cheeks and chin.

The Small-clawed otter is adapted to an invertebrate diet with a strong preference for crabs and shellfish, supplemented by fish and other species opportunistically (Hussain *et al*. 2011). The otter forages on its prey with dextrous fingers and crushes the exoskeleton of crabs and other hard-shelled prey with strong teeth (Hussain 2013). Sometimes, otters leave shellfish in the sun so that the heat opens them, saving them the effort of crushing them (Wilson and Mittermeier 2009).

Small-clawed otters tend to be nocturnal, or crepuscular near human settlements. They are highly social, foraging and traveling in groups up to twelve or more (Lekagul and McNeely 1988). Small-clawed otters in captivity breed year-round and mating usually takes place in the water, but also on land. They appear to be monogamous (Wilson and Mittermeier 2009), but little is known of their behavior or reproduction outside of captivity. In captivity, a pair will build a nest together and raise the litter, ranging from 2 to 7 cubs (Foster-Turley 1986).

The Small-clawed otter coexists in many parts of its range with the Eurasian otter, the Smooth-coated otter, and the Hairy-nosed otter. Small-clawed diet consists of mostly crabs and other invertebrates, rather than fish that other otter species prefer. Signs of the Small-clawed otter have been found wandering further away from rivers than other otter species, between patches of reeds and river debris where crabs are more likely to be found (Kruuk *et al*. 1994). The recent discovery of small-clawed otter from Eastern Ghats of Odisha throws light on its adaptive radiation to Western Ghats.

Threats
Throughout its range, the Small-clawed otter is threatened by human development and activities. Widespread human activities -- aquaculture, swamp reclamation, siltation due to deforestation, pollution by pesticides, mining, quarrying, slash-and-burn agriculture and loss of habitat to agricultural conversions, including coffee, tea and palm oil plantations and rice fields -- all take their toll on otter habitat.

Likewise, a common threat to otters is a reduced prey base from overfishing. The species preference for crabs and other

invertebrates makes water contamination from organochlorides, heavy metals and other pollutants an important concern. The common practice of dumping garbage in wetlands is also a threat to otters, whose scat has been observed to contain plastics (Castro and Dolorosa 2006, Egana *et al*. 2016). Fishermen are known to kill otters as a competitor for fish. The main threats in Western Ghats occur from fish-kill practices -- dynamite fishing, bleach fishing and electric-rod based fishing and the use of pesticides in banana plantations and rice fields. In China, the construction of hydropower dams is causing substantial habitat loss in hill streams, a habitat of Small-clawed otters (Li Fei pers. comm.). Poaching is still a very significant threat to Small-clawed otters, and poachers rarely differentiate between otter species (Gomez *et al*. 2016). India, Cambodia, Viet Nam, Lao PDR, and Myanmar are source countries for luxurious otter pelts that then travel to markets in East Asia (Gomez *et al*. 2016, Coudrat 2016, Gomez and Bouhuys 2018). Otters are used in traditional medicines in Lao PDR, Southeast Asia and China (Li and Chan 2017, Gomez and Bouhuys 2018). International criminal networks traffic otter pelts with other valuable species such as tiger and leopard, and most range countries have weak control the clandestine trade in otters (Wright *et al*. 2015).

A growing threat to Small-clawed otters is the illegal trade in pets. Small-clawed otters are charismatic and popular attractions in zoos and increasingly in Asian pet shops, pet fairs, and even in coffee shops (Gonzalez 2010, Aadrean 2013, Gomez and Bouhuys 2018). Much of the pet trade

A population decline of more than 30% over the past 30 years.

has moved online and is difficult to control (Gomez and Bouhuys 2018.).

A less significant threat is accidental road-kill, which has been recorded in Philippines (Bernardo 2011), Indonesia, and Malaysia. Otters are also occasionally caught in traps set for other bushmeat targets and killed by feral dog packs.

Recent modelling research suggests that climate change will significantly impact Small-clawed otter habitats, forecasting up to 40% loss of suitable areas by 2070. This scenario is made worse for the Small-clawed otter by the marginality of its climatic niche (Cianfrani *et al*. 2018).

Its western range in the Himalayas is showing a decreasing trend, shrinking from west to east in Himachal Pradesh, attributed to the drying of smaller streams that they use.

Threat Mitigation Measures

The legal protection of the Small-clawed otter must be prioritized, particularly in Indonesia, Cambodia, Brunei Darussalam and Nepal, none of which have regulations that protect the species. A review of legislation in range countries is needed to assess the online trade in otters, so that law enforcement agencies can take appropriate actions. In some consumer countries, Japan for example, loopholes allow CITES Appendix II species, like the Small-clawed otter, to be traded once smuggled into the country. In Thailand and Indonesia, enforcement efforts should be enhanced to match the growing demand for pet otters and illegal captive breeding activities. The new fad for keeping pet otter is largely driven by life style and the internet. Community watch groups that advocate conservation and protection of otters in the wild can be useful in helping to curb poaching.

Conservation awareness and public education campaigns can help to reduce the impacts of human threats to the Small-clawed otter, especially in Southeast Asia and China (Li and Chan 2017). With more information, fish farmers, poachers, and pet owners have been known to change their perspective on the value and importance of the species. Educating internet citizens using social media may increase appreciation for otters and promote their protection.

Once common in the streams and wetlands of south and Southeast Asia, the species is now increasingly rare. It is crucial that of networks of protected areas, including wetlands of national and international importance under the Ramsar Convention, be conserved as habitat for this otter (Wright *et al*. 2015).

In China, systematic surveys should be conducted to clarify current distribution and status, and to safeguard remnant populations in protected areas as sources for future recolonization or expansion. Recent studies of its distribution in China, Cambodia, and India shows that the range of the Small-clawed otter is shrinking.

Governments throughout the species' range must develop policies for more environmentally friendly development and land-use, and halt or slow the conversion of wetland forests. Since Small-clawed otter can share human altered habitats if not harassed, promotion of clean drainage of agricultural water and the practice of organic agriculture can reduce pollution related threats. Corporations should be encouraged to use green technologies to reduce detrimental impacts on the environment. Across Asia, improved land use planning, maintenance of habitat mosaics, avoidance of large-scale agricultural monocultures, and promotion of environmentally friendly industries are key to otter conservation.

A regional network among researchers should be created in areas with Asian Small-clawed otter populations. Small-clawed otter research in various countries is written in different languages and characters. Local information is often unavailable among countries, because of those language barriers. An otter research network would allow the sharing of knowledge and collaboration among researchers and conservationists.

Education and community outreach programs are needed throughout range countries of the Small-clawed otter. In China, priorities include surveys to document the status and distribution of otters, enforcement of wildlife laws, and the safeguarding of remnant populations in protected areas. In Indonesia, priorities include control of wildlife trafficking, improved legal protection, and improved wetland conditions. In Malaysia, priorities include increased legal protection and more effective law enforcement. In Singapore, the priority is research in the north-eastern islands as a basis for species recovery plans. In the Philippines,

With more information, fish farmers, poachers, and pet owners have been known to change their perspective on the value and importance of the species.

priorities include the establishment of a rescue and rehabilitation facility at Palawan Wildlife Rescue and Conservation Center, designation of more protected areas, and better enforcement of environmental and wildlife laws. Better enforcement of laws and penalties for illegal trafficking of otters are also the priority in Thailand, Myanmar, Cambodia, Viet Nam and Lao PDR.

Captive populations
Small-clawed otters breed well in captivity and are a popular exhibit in over 226 zoos. No captive breeding for re-introduction purposes has been attempted. The studbook lists over 977 individuals living from 48 founders. Husbandry manuals are available in several languages from the Otter Specialist Group website.

Site-specific Conservation Locations
In the Western Ghats of India, where Eurasian, Smooth-coated, and Small-clawed otters live together sympatrically, the range of all three has shrunk, and the area offers an opportunity to protect all three species of otters and their habitat at once.

The Small-clawed otter occurs sympatrically with Smooth-coated and Eurasian otters in the Western Ghats and the Northeast of India, and the Sunderbans of both India and Bangladesh, The iconic Ramsar site of the Sundarbans in Bangladesh and India is an extensive landscape of waterways that would be a refuge for otters. These sites offer opportunities to protect all three species in south Asia, especially when a network of Protected Areas are in place.

An isolated and threatened population of Small-clawed otters that lives on Palawan Island deserves protection.

An extensive survey for the species in Cambodia suggests that the population in Virachey National Park is vulnerable (Heng *et al.* 2016), but the species is not protected in Cambodia.

Once claimed to be extinct in Pulau Ubin, Singapore, the population of Small-clawed otters now appears to be increasing. The success story of the Smooth-coated otter on the main Singapore Island could extend to a Small-clawed otter population on Pulau Ubin if it is protected.

The species still exists in mountainous areas in nature reserves in China, but their population density is very low. Kadoorie Farm and Botanic Garden, a local nonprofit, has provided training and funding for a monitoring team at Diaoluoshan National Nature Reserve on Hainan Island, which appears to be a Small-clawed otter hotspot.

A series of camera trap photos of Small-clawed otters were taken in Yingjiang Province, China by Kadoorie Farm and Botanic Garden in 2017. The local conservation authority is working with the organization to step up protection and monitoring of this otter population.

There is extensive potential habitat available for Small-clawed otters in Xishuangbanna Dai Autonomous Prefecture, Yunnan Province, China. Camera trap photos of Small-clawed otters were taken in the area bordering Lao PDR and a rare population may be protected there.

A cluster of nature reserves with a network of hill streams in southwestern Guangxi Province, China, near the border with Viet Nam, is highly suitable habitat for Small-clawed otters. The species may have been extirpated from the area but offers a key area for a reintroduction program when poaching and other threats are controlled. The presence of Small-clawed otter have been documented in the U Minh Wetlands in Viet Nam, which offers a conservation opportunity (Willcox *et al.* 2017).

There is a large Small-clawed otter population in Nakai-Nam Theun National Protected Area in Lao PDR. Ongoing management strategies, adequate funding, and the current involvement of a non-profit group makes this site a priority conservation area.

The mountainous western part of Bukit Barisan, Sumatra, in Indonesia, a landscape patchwork of wetlands and rice fields, and rich in streams, offers good habitat for the species. The several national parks of Sumatra, Java, and Kalimantan, Indonesia, contain prime otter habitat, yet Small-clawed otters are not on protected species lists.

The Lower Kinabatangan Wildlife Sanctuary, Sabah, is on the second longest river in Malaysia, and the riparian forest along its length is a key conservation area for the species. The Yayasan Sabah Conservation Area (Maliau Basin, Imbak Canyon, Danum Valley), Malaysia host significant and viable populations of both Small-clawed and Smooth-coated otters.

The Sungai Lepar watercourse in Pahang, Malaysia, although limited by palm oil plantations, used to be the only freshwater site in the Malay Peninsula with Small-clawed, Smooth-coated and Hairy-nosed otters and remains a good habitat for otters.

Small-clawed otter have been documented in the U Minh Wetlands in Viet Nam, which offers a conservation opportunity (Willcox *et al.* 2017).

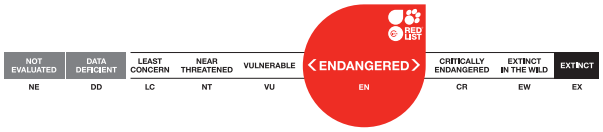
Success Stories

Social media is thriving in China, and Kadoorie Farm & Botanic Garden has been trying to raise awareness on otter conservation via this channel. The organization posted 12 Weibo (equivalent of Twitter in China) about the value of otters in aquatic ecosystems, that have been read by over half a million people throughout China. Readers show great concern and citizen scientists have been providing observation records from areas not covered by researchers or conservationists.

Small-clawed Otter *Aonyx cinereus*
Projects and Funding Opportunities

Region	Actions	Costs
All countries	National surveys to confirm the distribution range of the species every 5 years	$20,000 per country
In two or three representative locations	Study on home range and habitat use pattern, using telemetry	5 years $20,000/year per project
Indonesia, Malaysia, Singapore	Long term program to evaluate status and dynamics of Small-clawed otter in human-altered wetland habitats	5 years $20,000/year per project
All countries	Studies to confirm subspecies and inbreeding status	5 years Full-time position $ 20,000 annual salary $ 100,000 for analyses and support
All countries	Training rangers in Key Otter Conservation Areas to conduct surveys for otter presence/absence	One full-time research position to train local rangers $ 20,000/year per area
All countries	Educational programs for local communities on the illegal otter trade	$ 5,000/workshop
Indonesia, Thailand	National workshops to improve conservation status of Small-clawed otter	$ 25,000/year per educator
Pakistan, India, Nepal, Bhutan, Bangladesh	National workshops to improve conservation status of Small-clawed otter	$ 25,000/workshop
Indonesia, China	Empower internet communities to appreciate otters	5 years $ 5,000/year per country
All countries	Tracking illegal otter trafficking	One full-time research position $ 20,000/year
International/range countries	Workshop on illegal otter trafficking	$ 50,000
All countries	Books, posters, and kid's media to promote otters	$ 20,000 per language
All countries	Create an Asian Otter Network	$ 10,000
Malaysia-Singapore-Indonesia	Study of hybridization between Small-clawed and Smooth-coated otters using ecological interrelation and genetic studies	Year 1 $ 26,000 Year 2 $ 27,000 Year 3 $ 33,000 Year 4 $ 24,000 Year 5 $ 16,000

Asia
Hairy-nosed Otter
Lutra sumatrana



An otter so shy and elusive, it was declared extinct in the 1990s. It has now been 'rediscovered' in isolated areas and its presence confirmed with camera traps in southern Thailand, Malaysia, Borneo, Myanmar, Cambodia and Viet Nam. Research is needed urgently to develop conservation programs for this rarest Asian otter species. Populations of the Hairy-nosed otter are under rapid decline almost across mainland Southeast Asia, through trade-driven hunting and habitat degradation.

IUCN Red List Status
The Hairy-nosed otter is classified as Endangered, due to a decline of at least 50% or more in the past three generations or 30 years (Pacifici *et al*. 2013). CITES Appendix II.

Distribution
The Hairy-nosed otter is endemic to Southeast Asia but is so rare that recent records are basically a dispersed set of point localities. We have little idea of its current status across huge tracts of potential range. In Viet Nam, it is reported from U Minh Thuong Nature Reserve (Nguyen *et al*. 2001) and U Minh Ha Nature Reserve (Nguyen 2006, Willcox *et al*. 2017) in Mekong Delta. In Cambodia, it is reported from flooded forests and scrubs around the Tonle Sap Lake, and marshlands, coastal mangroves and Melaleuca forests (Heng *et al*. 2016). In Thailand, it is present in the Phru Toa Daeng Peat Swamp Forest (Kanchanasaka and Duplaix 2011) and Hala Bala Wildlife Sanctuary (Sasaki pers. comm.).

In Malaysia, it is present in Kelantan, Terengganu, Perak, Pahang, Selangor, and Johor (Baker 2013, Tan 2015, Sasaki pers. comm.), Kedah (Salahshour 2016), and Saba (Wilting *et al*. 2010, Ishigami *et al*. 2017). In Indonesia, it is reported in Sumatra (Lubis 2005, Latifiana and Pickles 2013), and an otter was observed in Brunei in 1997 (Sasaki *et al*. 2009). In northeast Myanmar, a Hairy-nosed otter pelt was reported at Mong La, Shan State (Shepherd and Nijman 2014). This pelt, along with a 1939 report from Myanmar indicates a population of some kind 2900 km from any other. Perhaps historically they were extant in Myanmar and Lao PDR, but never reported or collected.

Each of these locations is represented by a tiny number of observations, though a few more are reported each year now that awareness has been raised. Nowhere do they appear to be plentiful, and locations are isolated from one another by very long stretches of unsuitable habitat. Populations are therefore regarded as highly fragmented with no possibility of gene flow between them.

It appears that the animal was regarded as fairly common during the first half of the twentieth century (Wright *et al*. 2008), in Malaysia, Singapore, Borneo, Indochina, Sumatra, Java, Myanmar, and possibly Lao PDR.

Habitat and Ecology
There is very little information on habitat use by Hairy-nosed otters, but most recent observations are from low lying peat swamps, mangroves and seasonally flooded forests. They may use other kinds of habitats, such as flooded forest and marshland. Or it may be that they formerly were more flexible, but human pressure has led to reliance on habitats not much frequented by humans. Peat swamp forests are assumed to be their preferred habitats

Because of the rarity of the species, little is understood of Hairy-nosed otter ecology. It is darker in color than other sympatric otters, with a pale throat patch, hairy nose, white upper lip, and webbed feet. The species is usually observed alone and is assumed to be solitary. Reports of sociality

range from single animals to groups of 6, though group composition is unknown. The mating season of Hairy-nosed otter appears to be from November and March, with cubs appearing in April (Heng *et al*. 2016). We also know nothing about whether male and female remain together, or whether males help rear young. The species occurs in low densities and the frequency of sightings are very low.

Like all otters, Hairy-nosed otters are semi-aquatic and feed on fish, supplementing their diet with water snakes, frogs, lizards, turtles, crabs, and occasionally small mammals (Kanchanasaka and Duplaix 2011).

Hairy-nosed otters are agile swimmers, and there are reports of them herding fish into shallows to make capture easier. They have been sighted clambering around on tree limbs in flooded peat swamp forest, and even jumping short distances between adjacent trunks (Heng *et al*. 2016).

Threats

Tropical peat swamp forests are under severe threat in recent years due to the increasing frequency of fires and other anthropogenic activities such as clearing of forest for plantations of oil palm and food crops such as rice, corn and soya bean. Forest is also cleared for fish farming. In Viet Nam the entire Mekong Delta has been converted into rice fields, reducing the habitat of otters and other wildlife species into a few isolated pockets. In Sabah, Malaysia, recent fires reduced 70% of the Binsulok Forest Reserve and 10% of the Klias Forest Reserve. This has affected the surrounding environment and biodiversity. In Indonesia over the last 20 years, the ecosystem has been reduced from almost 30 million ha to only about 15 million ha, and most of what remains has already been logged selectively. Such levels of habitat modification have profound effects on native biodiversity.

The species is in rapid decline across most of its range due to trade-driven hunting (Duckworth and Hill 2008, Shepherd and Nijman 2014) and habitat replacement due to clearance for palm oil plantations – if indeed they actually are peat forest dependent. Pollution as a result of human expansion, prey depletion due to overfishing, and mining of river beds for sand and the consequent destruction of fish spawning grounds all threaten otter populations. At present, hunters are not targeting otters specifically, but they are taken as part of the decimation of ground-living species by snares set near watercourses. Otters also drown in fish traps and nets and are killed as pests by fish and prawn famers.

In its entire range the Hairy-nosed otter is under increasing pressure from intensive poaching, turning up as pelts in wildlife seizures or in markets (Shepherd and Nijman 2014). In Cambodia, around the Tonle Sap Lake, poaching of otters and other wildlife are common practice (Somanak 2007). Otters are hunted in Southeast Asia for pelts, meat, and medical use. Even if only a small proportion are *Lutra sumatrana*, such is the fragmentation of their tiny populations that this pressure is effectively far more intense than for more numerous otter species. For example, the only historical record we have of this species from Myanmar was a misidentified skin from 1939, re-identified as *L. sumatrana* by Duckworth and Hills (2008), until the pelt found in the market in Mong La in 2014 (Shepherd and Nijman 2014).

There is a growing demand in Indonesia and Japan for pet otters. Davidson observed a Hairy-nosed otter posted on the Indonesian pet otter Facebook page (November 2017 pers. comm.). So far, not many Hairy-nosed otters are known to be kept as pets, but this may change if, as a rare species, they acquire extra value in the pet trade.

Otter populations in Viet Nam are known only from two small national parks under intense pressure from the surrounding dense human population. Though there are other areas within the Mekong Delta that could contain other populations, with Mui Ca Mau the notable example, most are too small in size and suffering from similar problems.

In the large lake of Tonle Sap, in Cambodia, forests that flood during the rainy season that had been a prime habitat for Hairy-nosed otter, are now decreased by agricultural encroachment. In coastal areas of Cambodia, habitats have been destroyed by urban development, sand mining and agriculture. In Malaysia, rivers in oil palm plantations are polluted by extensively used herbicides.

Hairy-nosed otter populations are expected to decline in the future. Populations are now small and widely separated, and local extinctions are probably already occurring in areas where presence is not yet documented. Human impacts on habitat and illegal exploitation may lead to the extinction of the species unless appropriate conservation measures are taken.

Threat Mitigation Measures

It is imperative to re-examine the range of this species in light of new sighting records. To conserve the species, the illegal trade in otters must stop and remaining habitat must be preserved. There has been some local success as a result of the public awareness programs -- encouraging communities to regard otters as part of their cultural heritage. An outstanding example was the work done on Tonle Sap lake in Cambodia with local fisherfolk by Conservation International. The few Hairy-nosed otters in captivity were all animals caught in nets and surrendered to a wildlife center rather than killed and sold for many months' income, only because the people now consider them to be of cultural worth. There are now increasingly intense efforts to reduce the demand for wildlife products. There are, for example, efforts to change opinions in China, the main destination for pelts, used in coats linings, hats, and trimmings on traditional garments like the Tibetan chupa, or as trophies for display during festivals and sporting events. The sheer quantity of otter skins being traded is enormous -- over a period of two years, no fewer than 1800 otter skins were recorded openly on sale in a single market in Linxia, China (Gomez *et al*. 2017). Increasing public awareness and intensified enforcement of laws will be needed to slow and stop the illegal trade in otters.

Conservation measures for the Hairy-nosed otter are similar to that of other otters. Conservation of their natural habitat, especially peat swamp forest, together with the prevention of poaching and pollution, are the most compelling conservation measures.

Lack of knowledge is a huge impediment to determining the factors affecting this species. Sightings fell off by 1977, it was considered to be declining in number and placed on CITES Appendix II. By 1998, there had been no sightings for ten years. In 1999, however, it was rediscovered by Kanchanasaka *et al*. (2003) in the peat swamp forest in Narathiwat Province, southern Thailand. Since then, there have been more sightings, and a handful of tiny populations are now believed to exist, widely separated geographically.

The principal threat to the Hairy-nosed otter is burgeoning human populations,

Hairy-nosed otter populations are expected to decline in the future. Populations are now small and widely separated, and local extinctions are probably already occurring in areas where presence is not yet documented.

and the resulting demand on natural resources. The natural low density of the species and its dependence on aquatic ecosystems, often the first to be converted into agriculture, together with overexploitation of prey resources, makes the Hairy-nosed otter extremely vulnerable to extinction.

Captive Populations

So far there have only been a few captive specimens of Hairy-nosed otters held briefly at the Phnom Tamoa Zoo in Cambodia.

The species does not do well in captivity and is extremely difficult to keep alive for a prolonged period. Difficulty in captive care may be due to those individuals being sick or compromised before their arrival or having pre-existing issues leading to their rescue/ capture or reason for ending up in a captive environment. In addition, although Phnom Tamao kept Pursat for eight years, constraints of funding and location meant that water quality and food quality was hard to maintain, the animals were in a totally different habitat from the natural peat forests habitat, and free-roaming dogs, monkeys and birds could have transferred infections against which the otters had no resistance. The other otter species at the centre did not suffer the same mortality, despite a similar husbandry regime, suggesting that Hairy-nosed otters could be particularly delicate.

If ex situ conservation is to be considered, a detailed examination of habitat is needed – prey, water quality, surrounding environment – along with far more knowledge about behavior – are they social like Asian Small-clawed otters which do not thrive alone? Is keeping them alone contributing to stress? Wild *L. sumatrana* have never been observed sleeping – do they need dens? Do they rest in vegetation? We know very little about

There are currently no specimens in zoos or wildlife parks. Only six individuals have ever been held in captivity:

1. Taiping Zoo (IZYB 1975) although this cannot be confirmed by Taiping Zoo (Lazarus K 2018)
2. Bronx Zoo, c.1966, one female, Harris, C.J. 1968 (cause of death, distemper)
3. 2006/7, Wildlife Alliance Phnom Tamao, male, 'Dara', died 2010 (stomach ulcers, lung problems)
4. 2006/7, Wildlife Alliance, Phnom Tamao, female, (died shortly after arrival of 'stomach infection')
5. 2008, Wildlife Alliance, Phnom Tamao, Male, 'Pursat', died in 2017

the species and getting it wrong sacrifices a scarce and precious otter in poor captive conditions.

Because of the fragile nature of this animal, if ex situ conservation is to be attempted, it should be set up in range countries, and should be based on the successes such as the Owston's palm civet project at Cuc Phong, Viet Nam, ('Save Vietnam's Wildlife') where knowledge and expertise is brought in rather than transferring the animals out to other countries. This would minimise travel stress and environmental shock to the animals.

The desirability of ex situ conservation must be balanced against the fragility of the animal, but also against the danger of extinction in situ, and a decision taken as to whether the risk outweighs the benefits for the species as a whole.

There will always be individuals that are removed in some circumstance from the wild where rehabilitation may not be possible. Given the pressure the species is under, there should be a captive program set up to pursue the needs of this species, if there is no other option. They are now sometimes found in the pet trade, so procedures for seized animals is needed. At present our knowledge is woefully inadequate.

Site-specific Conservation Locations

High on the priority list of habits for the conservation of the Hairy-nosed otter are Southeast Asian peat swamp forests, especially Phru Toa Daeng in Thailand, U Minh Nature Reserve in Viet Nam, and Tonle Sap Lake in Cambodia.

In most of the range countries, law enforcement and deterrence of the wildlife trade is very poor, for many reasons including the sheer difficulty in patrolling terrain. Because wildlife crime prevention is well enforced in Malaysia, and there are relatively more sightings of the species in both Peninsular Malaysia and Sabah, this would be a good country in which to establish conservation measures. In addition, the current ruler of Brunei is environmentally aware and has set aside large areas as reserves. It would therefore be expedient to target conservation efforts for *Lutra sumatrana* in Malaysia and Brunei.

Success Stories

Most people within the range of the Hairy-nosed otter are unaware of its existence. Those who do know they exist are often only vaguely aware that there are different kinds of otters. However, the use of traps and snares are indiscriminate. Most people actively involved in hunting or trapping wildlife are very poor, and the cultural value of the animals is far less than the hard currency earned by selling them. Despite this, the experience of Conservation International in a Cambodian community showed that involvement and commitment to conservation of the species is possible. The people of the local fishing villages were aware of how much of their culture had been lost in the past and have embraced otters as part of their heritage. Conservation International also established a fat pig rearing scheme to replace the income from otter pelts. On two occasions, for example, fishermen who found Hairy-nosed otters entangled in their nets did not kill them but took them a long distance to Phnom Tamao Wildlife Center for rehabilitation, even though the pelts would have brought them a year's income.

Hairy-nosed Otter *Lutra sumatrana*
Projects and Funding Opportunities

Region	Actions	Costs
Southeast Asia	International symposium in Viet Nam,. Cambodia, Malaysia or Indonesia to develop conservation strategy	3 days $15,000 for 15 participants
Cambodia - Tonle Sap Lake	Ecological survey	4 years $ 12,000 annual salary $ 40,000 for field work Total $ 220,000
Indonesia	Ecological surveys in key habitats in Katingan, Memtaya peat swamp forest, Central Kalimantan and a location in South Sumatra or Riau Province	Initial funding secured: $ 3,000 materials $ 1,000 travel
	Public awareness campaign Citizen science monitoring of poaching	$ 1,000/year for development of apps/hosting
Malaysia	Ecological survey at Pekan Reserve peat swamp forest and rivers at Phang using fecal DNA analysis and camera traps	4 years $ 60,000
	Ecological survey at Taman Negara National Park at Pahang using fecal DNA analysis and camera traps	3 years $ 60,000
	Necropsy of Hairy-nosed otter/analysis for toxic compounds	$ 10,000
Myanmar	Preliminary survey of population status	$ 5,000
Viet Nam	Ecological surveys in U Minh Ha National Park and U Minh Thuong National Park	$ 15,000 6 months
	Ecological surveys in Mui Ca Mau and sites in Kien Giang and Ca Mau Provinces	$ 15,000
	Public awareness - integrating otter awareness into development activities, e.g. rice growing, aquaculture projects	$ 20,000
	Habitat and corridor survey for otters in Mekong Delta from Viet Nam to Cambodia	$ 20,000
Malaysia, Singapore, Indonesia	Hybridization survey of Small-clawed and Smooth-coated otters in the wild	5 years Year 1 – $26,000 Year 2 – $27,000 Year 3 – $33,000 Year 4 – $24,000 Year 5 – $16,000 Total – $126,000

Eurasia
Eurasian Otter
Lutra lutra

The most widespread otter species, the Eurasian otter inhabits a variety of habitats and ranges from Western Europe, across the Palearctic, down to India, Southeast Asia and North Africa. It is protected in many countries but remains a target of the fur trade in the eastern part of its range.

IUCN Red List Status
The Eurasian otter has been downgraded from Vulnerable to Near Threatened due to an ongoing population decline at a rate no longer exceeding 30% over the past three generations or 23 years (Pacifici *et al*. 2013). This Near Threatened assessment is a precautionary listing and indicates that while the recovery in Western Europe is genuine, conservation actions for the species need to be sustained, particularly in East Asia. CITES: Appendix I.

The Eurasian otter has one of the widest distributions of all Palearctic mammals, from Europe through North Africa and Asia (Hung and Law 2016). Over one-third of the range lies in the Russian Federation (Russia). However, many populations within the range are extinct or reduced to small, sometimes isolated enclaves.

Compared to the strong decline observed in Europe in the 1970s to the 1990s, the Eurasian otter is now recovering in many countries, although not in parts of central Europe (Roos *et al*. 2015). Recent trends indicate a strong recovery in western Europe, where it is considered near threatened. Populations are expanding in the United Kingdom, Germany, Spain, France, Austria, Denmark, Sweden, Italy, Poland, Czech Republic, Estonia, Slovakia, Slovenia and eastern Germany. Otters are still common in Portugal, Finland, Lithuania, Estonia and Ireland, and have returned to Switzerland and the Netherlands. The species is extinct in Luxembourg, Belgium, central Germany, central and northwest Italy, is endangered in Italy and Greece, and declining in Latvia and in Hungary east of the Danube (Roos *et al*. 2015). In the Netherlands, it was declared extinct in 1988 but was reintroduced in 2002. Outside the European Union, it is endangered in Bosnia and Herzegovina, vulnerable in Norway, Bulgaria, Montenegro and Albania (Balestrieri *et al*. 2016). It is still common in Serbia, and Macedonia.

In North Africa, the species is endangered in Algeria and good populations probably occur only in Tunisia. It was once common in Morocco but may be facing a dramatic decline (Delibes *et al*. 2012).

The Eurasian otter is rare or endangered across the Middle East and Turkey. It is critically endangered in Israel and Lebanon. It is rare and isolated in Syria, Jordan, and is becoming rare in Iraq (Naderi *et al*. 2017). It is endangered and declining in Turkey (Naderi *et al*. 2017), but still widely distributed in Iran (Karami *et al*. 2006).

Russia and western Central Asia have the largest part of the species range, with an estimated 75,000-80,000 otters, most abundant in the Northwestern and Far Eastern districts (Lomanova 2011). *L. lutra* is widely distributed in Ukraine and Kazakhstan, but likely declining in Belarus. After declining until 2000, it is now increasing in Russia, Ukraine (rare in the Red Data Book of Ukraine), Mongolia (very rare), and Kazakhstan (vulnerable in the Red Data Book of Kazakhstan), likely as a consequence of lower hunting pressure. It is included in the Red Data Book of Kyrgyzstan. A subspecies, *L. l. meridionalis* is rare throughout Russia and is on the regional Red Lists of endangered species of Russia, Azerbaijan and Armenia, and is vulnerable in Georgia and Turkmenistan. It is rarely found in the Altai, Trans-Urals, southern Transbaikalia, and Central Black Earth regions (Oleynikov and Saveljev 2015). The Caucasian population has fewer than 600-700 individuals (Oleynikov and Saveljev 2015). It is considered endangered or rare in Tajikistan and Uzbekistan, and vulnerable in Afghanistan.

India hosts Eurasian otters in limited numbers, with isolated populations of *L. l. monticola* in the Himalayas and *L. l. kutab* in Jammu and Kashmir, where they are rare in the rivers Indus, Suru and Dras in Ladakh (Jamwal *et al*. 2016). The subspecies *L. l. nair* is present in Tamil Nadu (Meena *et al*. 2002) and in central India (Joshi *et al*. 2016) and considered rare in Sri Lanka. *L. l. monticola* is critically endangered in Bangladesh; it is rare Pakistan, where both *L. l. kutab and L. l. monticola* occur. In Nepal, hosting *L.l. aurobrunnea* and *L. l. monticola*, the Eurasian otter is listed as near threatened, and thought to be declining. It is still common in Bhutan (*L. l. monticola*).

Chinese populations belong to the endemic subspecies *L. l. hainana*, which experienced a dramatic decline in the 20th century, especially in the North East (Zhang *et al*. 2016) and is now very rare. Viable populations occur in scattered locations, including the Pearl River Delta, Guangdong Province.

The Eurasian otter is considered endangered in Taiwan and vulnerable in South Korea. It was considered extinct in Japan, but was recently rediscovered in Tsushima Island, likely returned from Korea. Its current status and trend are unknown in North Korea.

Although Southeast Asian populations, belonging to the subspecies *L. l. barang* are not well assessed, the subspecies is considered endangered or rare in Thailand, Cambodia, Malaysia and Sumatra (Indonesia), and vulnerable or rare in Viet Nam, Myanmar, and were only historically recorded and may be extinct in Lao PDR (Coudrat, 2016).

Legal Protection
It is fully protected in China, European Union, Georgia, India, Iraq, Israel, Nepal, Thailand, Viet Nam, Myanmar, Switzerland, Turkey, and Lebanon. It is protected in Afghanistan, Albania, Algeria, Jordan, Sri Lanka, Tunisia, Bangladesh, Bosnia and Herzegovina, Mongolia, Taiwan, South Korea, Serbia, Montenegro, Morocco, and some provinces of Pakistan. In Bhutan it is likely protected although not included in schedule I (Totally Protected Wild Animals). It is protected in Norway and Belarus, but licences can be issued to kill otters at fish farms (Norway), or to trap them (Belarus). Kazakhastan, Turkmenistan, Russia, Tajikistan, and Kyrgyzstan protect the subspecies *Lutra l. seistanica.* Hunting is banned in Ukraine, Turkey, Armenia, and in protected areas of Iran and North Korea. It is not protected in Lebanon and Sumatra (although is protected in mainland Indonesia).

No information is available on legal protection in Macedonia (still common), Syria (rare), Japan (extinct), Lao PDR (extremely rare), Azerbaijan (endangered), and Cambodia (endangered).

Habitat and Ecology
Across its exceptionally wide range, the Eurasian otter lives in a wide variety of aquatic habitats, including lakes, reservoirs, rivers, marshes, swamp forests and coastal areas, and from sea level to 3,500 m in the Himalayas (Roos *et al.* 2015, Jamwal *et al.* 2016). In Southeast Asia its range overlaps with Smooth-coated otter, Asian Small-clawed otter, and Hairy-nosed otter.

The Eurasian otter is usually territorial, solitary and nocturnal, but in areas where little disturbed by human activities, it is active during the day. The otter's activities are concentrated in a narrow strip between land and water. Resting sites are provided by riparian vegetation and rock crevices along riverbanks.

Males mate with several females and territories of individual males usually overlap with family groups of mother and offspring. Sexual maturity is attained at around eighteen months in males and twenty-four months in females. From one to 5 cubs are born throughout the year in reproductive dens well hidden in riparian vegetation. Life expectancy is around seventeen years. Fish is the major prey for the Eurasian otter, but it is an opportunistic feeder, and its diet can include crustaceans, amphibians, reptiles, birds and other prey.

Threats
The magnitude of threats to the Eurasian otter varies greatly across the range. The aquatic habitats of otters are extremely vulnerable to modification by humans. Canalization of rivers, removal of bankside vegetation, dam construction, oil spills, draining of wetlands, and aquaculture are unfavorable to otters (Reuther and Hilton-Taylor 2004). Declines in fish biomass result from acidification of rivers and lakes and organic pollution from nitrate fertilizers, untreated sewage, and farm slurry.

Pollution is a major threat to otters in western and central Europe. The main pollutants posing a danger are the organochlorines dieldrin and DDT/DDE, polychlorinated biphenyls (PCB), and the heavy metal mercury. PCB and DDT were banned in most European countries in the 1970s. Fifteen years after the bans, otter populations recovered to some degree in Sweden and other areas (Roos *et al.* 2012). New pollution threats include Endocrine Disruptive Compounds and other pharmaceuticals. Recently, high and increasing concentrations of per and polyfluorinated chemicals have been seen in otters in Sweden (Roos *et al.* 2013).

A significant illegal trade in otter pelts is largely fueled by demand in East Asia, particularly in China, and are sourced in South and Southeast Asia. Legal trade supports an unknown level of export of otter pelts from Russia to East Asia.

Organized criminal networks move otter pelts with other valuable wildlife parts, and enforcement of laws prohibiting the trade is weak (Gomez *et al*. 2016).

Where otter populations are increasing, major causes of mortality are traffic accidents and drownings in fishing gear, including fyke nets set for eels or fish and as creels set for marine crustaceans. A further threat is strangulation by transparent, monofilament drift nets. Traps set for other species, such as muskrats and beavers, are a threat to otters. In some European countries, political pressure, especially by fishermen, has resulted in granting licenses to kill otters, but the impact on populations is not clear. Conflict with anglers varies. A vocal minority suggests that otter impact on fisheries is everywhere, but most fisheries are little affected. Roadkill may have slowed, but not prevented natural recolonization.

In Russia and Central Asia, exploitation for the pelt market in the 20th century was the main cause of otter decline, especially in accessible areas in Far East and Siberia, and the harvest rate was as high at 5,000 individuals per year (Oleynikov and Saveljev 2015). Illegal hunting is still a problem in this part of the otter's range.

Highly endangered otter populations in the Middle East are affected by illegal killing, dam construction, water shortages and pollution, marshland drainage, and lack of legal protection or law enforcement. Conflict with aquaculture activities is documented in Iran (Naderi *et al*. 2017).

Isolation of fragmented populations of subspecies (*L. l. monticola*, *L. l. kutab*, and *L. l. nair*), (Hung and Law 2016) might represent a main threat in India. Illegal hunting by fishermen occurs in Bangladesh, where otters are also captured for use in traditional fishing methods. Habitat destruction and pollution threaten South Indian populations. Otters in Sri Lanka suffer from habitat destruction, dam construction, and water pesticide pollution. In China and Taiwan, Eurasian otter populations have declined steeply due to habitat loss, illegal hunting for pelts and medicinal use (Conroy *et al*. 1998, Zhang *et al*. 2016, Li and Chan 2017), water pollution, reduction of prey biomass, and conflicts with aquaculture. In Taiwan, otters are threatened by increased tourism activity. Pollution by pesticides, fertilizers, heavy metals, and sewage are major threats to waterways (Li *et al*. 2017).

Illegal hunting for the pelt, pet, and traditional medicine markets, together with habitat loss, are the main causes of decline of the Eurasian otter in Southeast Asian countries (Hon *et al*. 2010, Gomez and Bouhuys 2018), followed by habitat loss and water pollution, illegal killing by fishermen, and a decrease in prey species. The traditional medicine market for otters is especially popular in Lao PDR, Myanmar, Cambodia and Indonesia. In Viet Nam and Lao PDR, habitat destruction due to the Viet Nam War is still evident.

Threat Mitigation Measures
As threats and conflicts vary greatly across the range, especially in Europe, North Africa and Asia, so do threat mitigation measures. Legal protection and banning of water pollutants in the 1990s in Western Europe likely allowed otter recovery in many countries. A similar effort in Asia would greatly enhance the situation for Asian populations. Legal protection and the restoration of water quality and forests, for example, have been the key for recovery of otters in South Korea.

Although their role is debated, successful reintroduction programs have been implemented in Sweden, Spain, the UK, Netherlands, and Czech Republic. They likely contributed to reinforce the natural recovery of otter populations.

Recovery centers for orphans and wounded otters have been established in Italy, Germany, Scotland, and the UK. Together with otter havens established in the UK, these initiatives likely contributed to raise public awareness and, to a lesser extent, helped otter recovery.

Other mitigation measures include the following:

- Riparian vegetation belts should be protected and restored in otter habitats, especially in areas with intensive agricultural activity.

- Remnant populations safeguarded in protected areas can serve as sources of otters for future recolonization programs and natural expansion, as witnessed in Southern Italy, where two National Parks (Pollino and Cilento, Vallo di Diano e Alburni) contributed to safeguard and recovering of the small remnant Italian population.

- In Asia, particularly in India and China, the creation of more and connected protected areas in good Eurasian otter habitat would greatly enhance the conservation of the species.
- Laws protecting otters, effective enforcement, and penalties for conviction would improve the situation for otters in Russia and Asia, as well as in small countries like Lebanon.

- Reducing the conflict between otters and fish farmers and anglers in Europe and Middle Eastern countries through education and use of measures to prevent otter damage to fishing gear is important for protecting newly recovered populations. Likewise, an analysis of the impact of road kill is needed, and implementation of mitigation measures such as road signs in areas of otter density.

- An evaluation of the cumulative impact of mini-hydroelectric power stations is a first step in putting mitigation measures in place, especially at watershed scale.

- An evaluation of the impact of new water pollutants is a first step to implement current regulations.

- The first step in protecting the Eurasian otters in countries where the status of it is poorly known is systematic surveys in China, Russia, central India, Nepal, Algeria, Tunisia, Lebanon, North Korea, and some non-EU European countries (Serbia, Montenegro, Macedonia), using new cost-effective detection techniques like e-DNA. Halting the illegal killing of otters for pelts and capture of juveniles for the pet trade is a high priority in South and Southeast Asia, but also in Afghanistan. Some countries, such as Nepal and India, have made concerted efforts to arrest and prosecute international traffickers, but the trade remains a significant threat to otter populations in the region (Gomez *et al*.2016). More actions are needed to reduce the demand in East Asia, and to shift the cultural norms that encourage exploitation of otters.

- Where isolated small populations occur, especially those belonging to subspecies with limited ranges, like *L. l. kutab*, *L. l. monticola*, and *L.l. nair*, analyses of ecological requirements, habitat fragmentation and population viability are needed to prioritize conservation plans and areas of intervention.

- A deeper evaluation of climate change impacts on otters is required, especially in Mediterranean countries, the Middle East and South Asia, where more extreme and frequent drought events are expected (Cianfrani *et al*. 2011).

Captive populations
The Eurasian otter, often exhibited in European zoos, did not start breeding in captivity until the 1970s, when husbandry techniques improved. The Eurasian otter studbook lists 226 individuals currently living in 82 zoos from 95 founders. There have been hybrids between *Lutra lutra lutra* and *Lutra lutra barang* reared in captivity and some of these were reintroduced into the wild in the UK and the Netherlands.
In Italy, captive breeding programs have been established in Penne (WWF Nature Reserve, Abruzzo), Caramanico Terme (Majella National Park), Regional Park Ticino Lombardia, Regional Park Ticino Piemonte. All captive breeding programs were hosting line B otter individuals, not suitable for reintroduction, and have been converted either to education programs (Penne, Ticino) or to recovery centers for orphaned and wounded otters.

Success Stories
A project in Kyrgyzstan has been promoting environmental education of children and youth through "citizen science" programs. The program, called the Ecosystem-based Adaptation to climate change in the high mountain regions of Central Asia, was enabled by new wildlife management and conservation policies, and a 2014 law on "Hunting and Hunting Entities." This new legal framework enables local communities to take control of and manage wildlife resources in "their" territory. The program promotes the improvement of scientific knowledge and monitoring, the basis for the sustainable management.

The recovery of the Eurasian otter in Europe, although slow and not occurring in all parts of the region, is a great success story. Legal protection and banning of water pollutants in the 1990s allowed recovering in many countries. Specifically, full protection is guaranteed by the Bern convention (included in Appendix I) and the Habitat Directive 92/43/EEC (otter included in Annex II for which its presence imposes the designation of Special Areas of Conservation, and Annex IV- the species is given rigorous protection). The Directive established 4,189 Special Areas of Conservation and Special Protection Areas hosting otters in the Natura 2000 Network (http://ec.europa.eu/environment/nature/natura2000/index_en.htm).

Obligations by the European Habitat Directive include periodic (every six years) reporting by Member States on otter

distribution, population trend, threats and mitigation measures. Most important conservation measures reported by State Members in the last reporting cycle (2007-2012) include legal protection, restoring and improving water quality and hydrological regime, establish protected areas, managing water abstraction, regulation/management of hunting and fishery in lakes, and management of traffic and energy transport systems. (European Environment Agency, 2013). Otter habitat quality in the European Union is also expected to improve following adoption and implementation of the Water Framework Directive 2000/60/CE, imposing Member States to attain a good chemical and ecological status of all EU water bodies.

LIFE Projects funded by EU allowed habitat restoration, stakeholders involvement and education in many European countries. Successful reintroductions have enhanced otter recovery in UK, Sweden, Spain, and the Netherlands. Reintroduction in France in Alsace has been less successful.

Otter action plans have been implemented in Italy, France, many UK regions, in the Czech Republic, Denmark, and in the Hima Anjar-Kfar Zabad in the Beqaa Valley of Lebanon.

China offers a special opportunity for the Eurasian otter. Unusually rapid declines in otter populations have occurred in China, but a changing social climate and social media offer new possibilities for recovering otters. For example, a non-profit organization like Kadoorie Farm and Botanic Garden, has provided training and funding to establish an otter research team at Diaoluoshan National Nature Reserve on Hainan Island. KFBG will establish a similar otter team at Tangjiahe National Nature Reserve, Sichuan Province in the future.

Tangjiahe is keen to use the otter as one of their flagship species. KFBG is also working with relevant local government agencies to protect the population around the Pearl River Delta, which has a small but stable population. An otter sanctuary should be established at this site, and the aquatic ecosystems of the site protected and sustainably managed (Li *et al*. 2017).

Other research teams, from Sun Yat-sen University, The University of Hong Kong, and Beijing Forestry University, are starting to study otters throughout China, using e-DNA, camera-trapping, literature reviews and interviews. The taxonomic status of the Eurasian otter needs to be clarified throughout this vast country, to identify and conserve key populations.

Eurasian Otter *Lutra lutra*
Projects and Funding Opportunities

Region	Actions	Costs
Europe	Support existing labs to analyze effects of new water pollutants through analyses of road kill carcasses	$ 30,000
Europe	Analyze cumulative impact of mini-hydroelectric power stations at a river basin scale	5 years $20,000/year per project
Europe	Promote online road kill archives in each country by developing a common free sharing platform	One professional-level position $ 24,000
Europe	Support existing labs to evaluate road kills impact on otter populations and produce inferential models/maps of collision risk	Three year PhD position $ 36,000
Albania, Croatia, Bosnia Hercegovina, Bulgaria, Serbia, Switzerland	Country representative to monitor populations and raise awareness	Travel to international meetings $ 10,000
Croatia, Bosnia Hercegovina, Serbia, Macedonia, Montenegro,	Support existing labs for e-DNA monitoring to assess otter occurrence at river basin scale	Three year PhD position $ 36,000
Austria, France	Organize one conservation education and awareness workshop in each province where otters have recently returned, near fish farms, and present measures to prevent otter damage	$ 80,000 for eight workshops
Austria, Italy, France, Slovenia, Switzerland	Organize two meetings to reach a transboundary agreement among governmental and regional agencies, local administrations, and NGOs, to support the establishment of a viable otter population in the Alpine region	$ 20,000 per meeting
Morocco, Algeria, Tunisia	Country representatives to monitor populations and threats	Travel for country representatives to international meetings $ 3,000
Mediterranean Region - Morocco, Algeria, Tunisia, France, Spain, Italy, Greece, Albania, Croatia, Bosnia Herzegovina, Turkey, Jordan, Syria, Israel, Lebanon	Collect data on impact of extreme climate change events (droughts, floods) Survey sample areas before and after extreme events	Skilled surveyor $ 5,000/area for 17 countries Total: $ 85,000
North African Region - Morocco, Algeria, Tunisia	Support existing labs for e-DNA monitoring to assess subspecies occurrence at river basin scale	Three year PhD position $ 36,000 Field sampling, lab supplies $ 20,000
Lebanon	Steps toward Legal protection: organize meetings involving Ministry of Environment, Environmental Agencies, NGOs, IUCN, stakeholders; implement a National Action Plan	Meetings: $ 10.000 Action Plan: One full-time professional-level position for one year $ 30,000

Eurasian Otter *Lutra lutra*
Projects and Funding Opportunities

Region	Actions	Costs
Europe	Support existing labs to analyze effects of new water pollutants through analyses of road kill carcasses	$ 30,000
Europe	Analyze cumulative impact of mini-hydroelectric power stations at a river basin scale	5 years $20,000/year per project
Europe	Promote online road kill archives in each country by developing a common free sharing platform	One professional-level position $ 24,000
Europe	Support existing labs to evaluate road kills impact on otter populations and produce inferential models/maps of collision risk	Three year PhD position $ 36,000
Albania, Croatia, Bosnia Hercegovina, Bulgaria, Serbia, Switzerland	Country representative to monitor populations and raise awareness	Travel to international meetings $ 10,000
Croatia, Bosnia Hercegovina, Serbia, Macedonia, Montenegro	Support existing labs for e-DNA monitoring to assess otter occurrence at river basin scale	Three year PhD position $ 36,000
Austria, France	Organize one conservation education and awareness workshop in each province where otters have recently returned, near fish farms, and present measures to prevent otter damage	$ 80,000 for eight workshops
Austria, Italy, France, Slovenia, Switzerland	Organize two meetings to reach a transboundary agreement among governmental and regional agencies, local administrations, and NGOs, to support the establishment of a viable otter population in the Alpine region	$ 20,000 per meeting
Morocco, Algeria, Tunisia	Country representatives to monitor populations and threats	Travel for country representatives to international meetings $ 3,000
Mediterranean Region - Morocco, Algeria, Tunisia, France, Spain, Italy, Greece, Albania, Croatia, Bosnia Herzegovina, Turkey, Jordan, Syria, Israel, Lebanon	Collect data on impact of extreme climate change events (droughts, floods) Survey sample areas before and after extreme events	Skilled surveyor $ 5,000/area for 17 countries Total: $ 85,000
North African Region - Morocco, Algeria, Tunisia	Support existing labs for e-DNA monitoring to assess subspecies occurrence at river basin scale	Three year PhD position $ 36,000 Field sampling, lab supplies $ 20,000
Lebanon	Steps toward Legal protection: organize meetings involving Ministry of Environment, Environmental Agencies, NGOs, IUCN, stakeholders; implement a National Action Plan	Meetings: $ 10.000 Action Plan: One full-time professional-level position for one year $ 30,000

Eurasian Otter *Lutra lutra*
Projects and Funding Opportunities

Region	Actions	Costs
Lebanon, Jordan, Syria, Turkey, Israel, Iran	Support existing labs to confirm subspecies status	One-year post-doc fellowship $ 24,000/year Travel and lab supplies $ 10,000
Lebanon, Jordan, Syria, Turkey, Israel	Organize one conservation education and awareness workshop with stakeholders (anglers, restaurants, farmers) in each country, in areas of remnant populations close to fish farms	$ 20,000 per meeting
Lebanon, Jordan, Syria, Turkey	Country representative to monitor populations and raise awareness	Travel for country representatives to international meetings $ 5,000
Central Asian Region - Armenia, Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Ukraine, Belarus, Uzbekistan	Country representatives to monitor populations and threats	Travel for country representatives to international meetings $ 10,000
Russia	Support existing labs for Population Viability Analysis to assess impact of pelt hunting on viability of populations, and set sustainable harvest rates	Skilled surveyor $ 5,000/area for 2 areas Total: $ 10,000
Ukraine	Collect data on impact of extreme climate change events (droughts, floods); survey sample areas before and after extreme events	Travel to international meetings $ 10,000
India	Refine e-DNA techniques to detect subspecies occurrence and species co-occurrence at river basin scale	Three year PhD position $ 36,000
India	Non-invasive genetic sampling to detect otter density and population structure of each subspecies in Himalayas, Tamil Nadu, and Central India	Three year PhD/post doc position $ 36,000/45,000 Field sampling, lab supplies $ 15,000
India	Population surveys for each subspecies in Himalayas, Kashmir, Nadu, Central India	$ 50,000 for 5 surveys
Bhutan. Bangladesh, Nepal,	Planning protected areas in regions likely to be impacted by climate change.	One professional-level position $ 90,000/year per person Travel $ 15,000/year per person
Bangladesh	Population survey of the critically endangered *L. l. monticola,* through either standard survey or e-DNA	One year post doc position $ 24,000 Field sampling, travel, lab supplies $ 5,000
Pakistan	Refine e-DNA techniques to detect occurrence of *L. l. kutab* and *L. l. monticola*	One year post doc position $ 24,000 Field sampling, travel, lab supplies $ 5,000
Nepal	Refine e-DNA techniques to detect occurrence of *L.l. aurobrunnea* and *L. l. monticola*	One year post doc position $ 24,000 Field sampling, travel, lab supplies $ 5,000

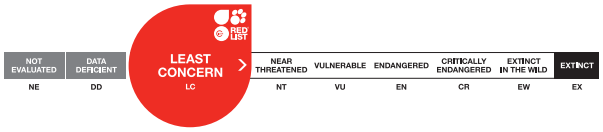
Eurasian Otter *Lutra lutra*
Projects and Funding Opportunities

Region	Actions	Costs
China	Monitor populations in otter hotspots in Delta of Guangdong Province and Qinghai–Tibetan Plateau through GPS tracking and non-invasive genetic sampling	Two three year PhD positions $ 36,000/each Total: $ 72,000 Field sampling, lab supplies $ 30,000
China	Establish an otter sanctuary in the Pearl River Delta	Planning project $ 10,000 Meetings with stakeholders $ 10,000
China	Modelling distribution and connectivity among remnant populations	Part-time expert research scientist $2,000/month for 12 months $ 24,000
China	Organize eight workshops for enforcement agencies dealing with otter trade, conservation education and awareness in strategic regions for pelt and traditional medicine market	$ 80,000
China	Refine e-DNA techniques to detect occurrence of subspecies *L. l. chinensis* across central south China	Two-year post doc position $ 24,000/year
China, Viet Nam, Myanmar	Collect data on impact of extreme climate change events (droughts, floods); survey sample areas before and after extreme events	Skilled surveyor $ 5,000/area for 3 countries
Southeast Asia: Myanmar, Cambodia, Indonesia, Lao PDR, Malaysia, Thailand, Viet Nam, Borneo	Support existing labs for e-DNA surveys of *L. l. barang* and detect species co-occurrence at river basin scale	Three year PhD position $ 36,000 Field sampling, lab supplies $ 20,000
Thailand, Bhutan, Myanmar, North Korea, Cambodia, Viet Name	Country representative to monitor populations and raise awareness	Travel for country representatives to international meetings $20,000
Southeast Asia: Myanmar, Cambodia, Indonesia, Lao PDR, Malaysia, Thailand, Viet Nam	Organize eight workshops for enforcement agencies dealing with otter trade, conservation education and awareness	$ 80,000
Sumatra	Steps toward legal protection: Organize meetings involving Ministry of Environment, Environmental Agencies, NGOs, IUCN, stakeholders Implement an Action Plan	Meetings: $ 10.000 Action Plan: One full-time professional-level position for one year $ 30,000
Lao PDR	Survey to assess occurrence of *L. l. barang*	$ 10,000

Eurasian Otter *Lutra lutra*
Projects and Funding Opportunities

Region	Actions	Costs
Japan	Surveys to monitor newly established population in Tsushima Island	$ 50,000 every two years
Italy, India, Morocco, Algeria, China	Population Viability Analysis for small and isolated populations/subspecies to identify critical factors for their long-term survival	Three year PhD position $ 36,000
All	Establish a Climate Change working group/ task force within IUCN-OSG members	Travel for one meeting/year S10,000/year
All	Explore genetic and morphometric variation across the range to detect Evolutionary Significant Units and priority Management Units for Conservation, in the light of subspecies extensive range	Three year PhD position $ 36,000 Travel to museums, lab supplies $ 30,000
All	Explore the degree of niche overlap among sympatric otter species and potential competitive interactions that could affect species survival in areas of range overlap now under climate change shifts	One-year post doc position $ 24,000
All	Experimental design and tests of devices to avoid otters drowning in nets and devices	Three year PhD position $ 36,000 Travel, lab supplies $ 30,000

North America
North American River Otter
Lontra canadensis



Excessive trapping and pollution took a heavy toll on river otters in North America until the 1970s.

In 2015, thanks to the Clean Water Act, new environmental regulations, and successful reintroduction programs in 22 states returned the river otter to its former range in the lower 48 states.

IUCN Red List Status
The North American river otter is classified as Least Concern by the IUCN Red List, since it is not currently declining at a rate sufficient for a threat category. CITES: Appendix II.

Distribution
The historic range of the North American river otter included much of the North American continent, from arctic Alaska and northern Canada to the USA (Hall 1981, Melquist *et al*. 2003). However, overharvest and perturbations to aquatic environments contributed to the decline and, in some cases, the extirpation of river otter populations through substantial portions of the species' former range (Bricker *et al*. in press). The river otter has recovered in many areas and now occupies at least portions of its historic range in each USA state (except Hawaii, where the species never occurred), Canadian province or territory, (except Canada's Prince Edward Island), with populations currently reported as stable, expanding, or a combination of both.

Habitat and Ecology
The North American river otter is an aquatic-habitat generalist, capable of exploiting virtually all freshwater systems, estuaries, and some coastal marine areas depending on the availability of adequate prey and riparian cover (Melquist *et al*. 2003). The diet of the river otter is comprised mostly of fish, but amphibians (mostly frogs) and crustaceans (mainly crayfish), and birds may also be eaten depending on region and season (Sheldon and Toll 1964, Knudsen and Hale 1968, Stenson *et al*. 1984, Serfass *et al*. 1990, Reid *et al*. 1994, Stearns *et al*. 2011). Typically, the slowest moving and most abundant fish (e.g., members of the sucker and minnow families) species are preyed upon most (Serfass *et al*. 1990, Stearns *et al*. 2011). Depending on availability, crayfish in some areas exceed the importance of fish in the river otter diet (Serfass *et al*. 1990). River otters prefer undisturbed riparian with adequate cover to serve as denning and resting sites (Swimley *et al*. 1998, Stevens *et al*. 2011). Both diet and riparian habitat use vary based on regional differences in aquatic systems and associated conditions.

Adult North American river otters weigh from about 5 to 15 kg. Size varies among geographic areas, with males are typically larger than females. River otters display delayed implantation, resulting in a period of almost one year from time of breeding until giving birth. Young are typically born in February and March, and breeding occurs shortly thereafter, well before the young are independent (Liers 1951, Hamilton and Eadie 1964). Males and females are sexually mature at two years of age, but variation in the reproductive age has been reported (Hamilton and Eadie 1964, Docktor *et al*. 1987). Litter sizes typically are comprised of one to three young (Hamilton and Eadie 1964, Tabor and Wight 1977, Docktor *et al*. 1987). Maximum life expectancy is typically about 10 years of age in the wild and up to 20 years of age in captivity (Stephenson 1977, Melquist *et al*. 2003).

Ultimately, river otter populations are limited by the distribution of suitable aquatic and riparian habitats. Consequently, any factors that reduce the quantity or degrade the quality of aquatic environments will adversely affect populations. River otters travel, forage, scent mark, and are otherwise most active during nocturnal and crepuscular periods (Melquist and Hornocker 1983, Stevens and Serfass 2008) The extent of travel is influence by gender, region, season, and habitat conditions (Spinola *et al*. 2008). Males occupy larger home ranges than females (Melquist and Hornocker 1983, Reid *et al*. 1994, Melquist *et al*. 2003, Spinola *et al*. 2008). Home ranges for river otters occupying riverine habitats in Idaho ranged from 8 to 78 km² (Melquist and Hornocker 1983).

River otters generally maintain low population densities (e.g., about 1 otter per 3.58 km of riparian habitat in Idaho; Melquist and Hornocker 1983), apparently without the need for overt (aggressive) displays of territoriality. Although considered to be territorial, home ranges of adjacent individuals may overlap to varying degrees based on gender and season (Melquist and Hornocker 1983, Spinola *et al*. 2008). River otters likely avoid aggressive interactions by practicing mutual avoidance through olfactory communication facilitated by scent marking at latrines.

Threats
Fur trapping
The river otter has transitioned from a species of conservation concern in many areas of NA to one that is now widely trapped for fur, including states where the species was reintroduced. Trapping of river otters has been demonstrated to be sustainable in many states. However, increases in river otter harvest have furthered the need for implementing

reliable approaches for monitoring the long-term status of populations, which is currently lacking throughout most of NA where river otters are trapped for fur. Bricker *et al*. (In press) showed that relatively few USA states or Canadian provinces and territories that harvest river otters have formal monitoring protocols for assessing either the density or the distribution of populations, except for recording annual harvest levels.

River otter–human conflicts
The reintroduction of river otters in many states has in some cases been negatively depicted in the media because of the species' predatory (i.e., fish eating) habits. The successful reintroduction of river otters in the states of Missouri, Ohio, Kentucky, and Illinois was followed by strikingly similar patterns of negative media messages suggesting that river otter predation was having widespread negative impacts on commercially-reared fish and game fish important to anglers (Serfass *et al*. 2014). Management actions, including opening trapping seasons, subsequently were implemented in these states partly to alleviate the public concern and animosity portrayed in the media about river otters.

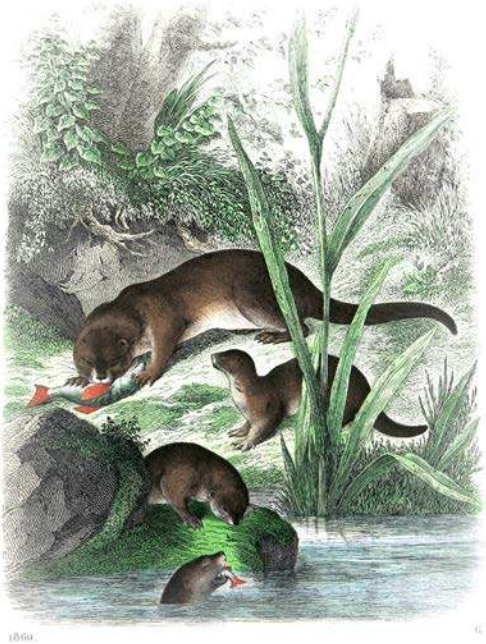
Wildlife agencies responsible for managing trapping of river otters in some cases have been complicit in fostering negative portrayals about river otter predation to gain public support for trapping seasons. Such negative portrayals have potential to contribute long-term deleterious consequences regarding public attitudes towards river otters.

River otter genetics
River otters from Louisiana have most commonly been used as a source for reintroduction projects in the US –about 64% of river otters reintroduced in the US were obtained from this state. Serfass *et al*. (1998) and Brandt *et al*. (2014) discussed genetic implications for river otter reintroductions in NA. Ultimately, how reintroduced populations and their expansion will influence the genetic structure and subspecies delineations of river otter populations in NA is unknown and should be the focus of future investigations.

Limited research on native populations
The majority of research on river otters has been conducted on reintroduced populations. Information about native populations has been derived largely from examination of carcasses obtained in areas where river otters are trapped. Basic natural history information is particularly lacking for river otters inhabiting coastal environments.

Sub-optimal habitat use
Expansion of reintroduced and, in some cases, native river otter populations has resulted in the species now sometimes inhabiting areas formerly considered sub-optional habitats. Consequently, there is the potential for the paradigm to develop that river otters are tolerant of perturbations to aquatic environments, in lieu of long-term supporting evidence. Current optimism about river otters being able to tolerate a wider range of aquatic habitat disturbances may be misleading and unfounded in that such disturbed areas could represent sink habitats, where populations are sustained by dispersing individuals and not through adequate levels of reproduction and survival by individuals occupying the area.

Threat Mitigation Measures
Fur trapping
Monitoring annual harvest records for river otters in NA should be an ongoing role of the North American Coordinator of the Otter Specialist Group. Bricker *et al*. (In press) demonstrate an excellent



approach for such large-scale monitoring and should be used as a foundation for future monitoring. In addition, the CITES process being followed for river otters in NA should be evaluated to determine the adequacy of reporting by public conservation agencies in NA. Formal protocols for field surveys should be developed for monitoring river otter populations. Latrine and other activity-sign surveys generally are considered reliable for detecting the presence of river otters (Swimley *et al.*, 1998, Melquist *et al.*, 2003, Stevens and Serfass 2008), and can form an important basis for monitoring river otter populations. Such monitoring should especially be encouraged in states where reintroduced river otter populations are harvested.

River otter–human conflicts

Portrayals of complaints about river otter predation have seldom been corroborated with formal evaluations and appear to have been exaggerated in some cases (Serfass *et al.* 2014, Bricker *et al.*, In press). Assessments of attitudes towards river otters should be conducted through sociological surveys conducted by objective social scientists trained to assess human-wildlife conflicts. Factual information about the role river otters play as predators in aquatic ecosystems must be communicated to the public, and methods for disseminating such information must be defined.

Likewise, in cases where river otters are creating depredation problems (e.g., at fish rearing facilities), appropriate remedies for resolving the problem must be determined and refined, along with approaches for implementing such remedies.

Methods for evaluating the extent of such problems likewise must also be developed and implemented. Such evaluations are critical in forming a basis for developing remedial approaches from problems caused by river otters. Pearce *et al.* (2017) conducted research at fish-rearing facilities in Pennsylvania, demonstrating that the extent of river otter depredations was often exaggerated and of limited consequence to most operators of fish-rearing facilities. The approaches followed by Pearce *et al.* (2017) should be applied elsewhere to assess the actual extent of depredations contributed by river otters at fish rearing facilities.

River otter genetics

A through, large-scale, genetic assessment should be initiated to determine the

genetic composition of remnant and reintroduced river otter populations. Particularly important will be the development of a genetic profile of native populations as basis for future long-term comparisons to assess the level of genetic introgression that occurs as reintroduced populations expand and interact with remnant/native populations.

Limited research on native otter population investigations should be undertaken to better understand populations dynamics of remnant (not reintroduced) populations of river otters. Of particular values would be assessments to better elucidate reasons that native river otter populations expanded slowly in comparison to rapid expansion of reintroduced populations. Inherent to such an assessment would be determining if legal harvest was the primary factor inhibiting more rapid expansion of native river otter populations and if reintroduction projects would have been necessary if factors limiting expansion of native populations were removed. Comparison of population dynamics between populations trapped for fur to those in areas where fur-trapping is prohibited (e.g., National Parks) would be of particular interest and value. Studies on most aspects of river otters inhabiting coastal areas are lacking and need to be undertaken. Radio-telemetry studies should be considered as a basis for studies designed to gain insight on movement patterns of river otters. However, non-invasive studies including sign surveys, remote-camera surveys at latrines, and genetic studies based on extraction of DNA from scats can provide enormous insight on various aspects of river otter ecology and should be encouraged. Research on river otters is particularly limited in many areas of the river otters' historic range in Canada.

Sub-optimal habitat use

The implementation of long-term systematic monitoring in areas now occupied by river otters that previously would have been considered suboptimal habitat should be implemented throughout the range of the river otter where aquatic and riparian habitats are degraded. These investigations should be designed to assess population characteristics related to source-sink dynamics to determine if river otter populations in presumed lower quality habitats would be self-sustaining if

Factual information about the role river otters play as predators in aquatic ecosystems must be communicated to the public, and methods for disseminating such information must be defined.

not reinforced by immigrants from higher quality habitats. Such studies should include assessment of the bioaccumulation of toxic substances in river otter tissue in relation to impacts on reproduction.

Captive Populations

North American river otters breed well in captivity and are a popular exhibit in zoos in North America and Europe; the studbook lists 332 individuals currently living in 130 zoos from 160 founders. Husbandry manuals are available in several languages from the Otter Specialist Group website.

Site-specific Conservation Locations

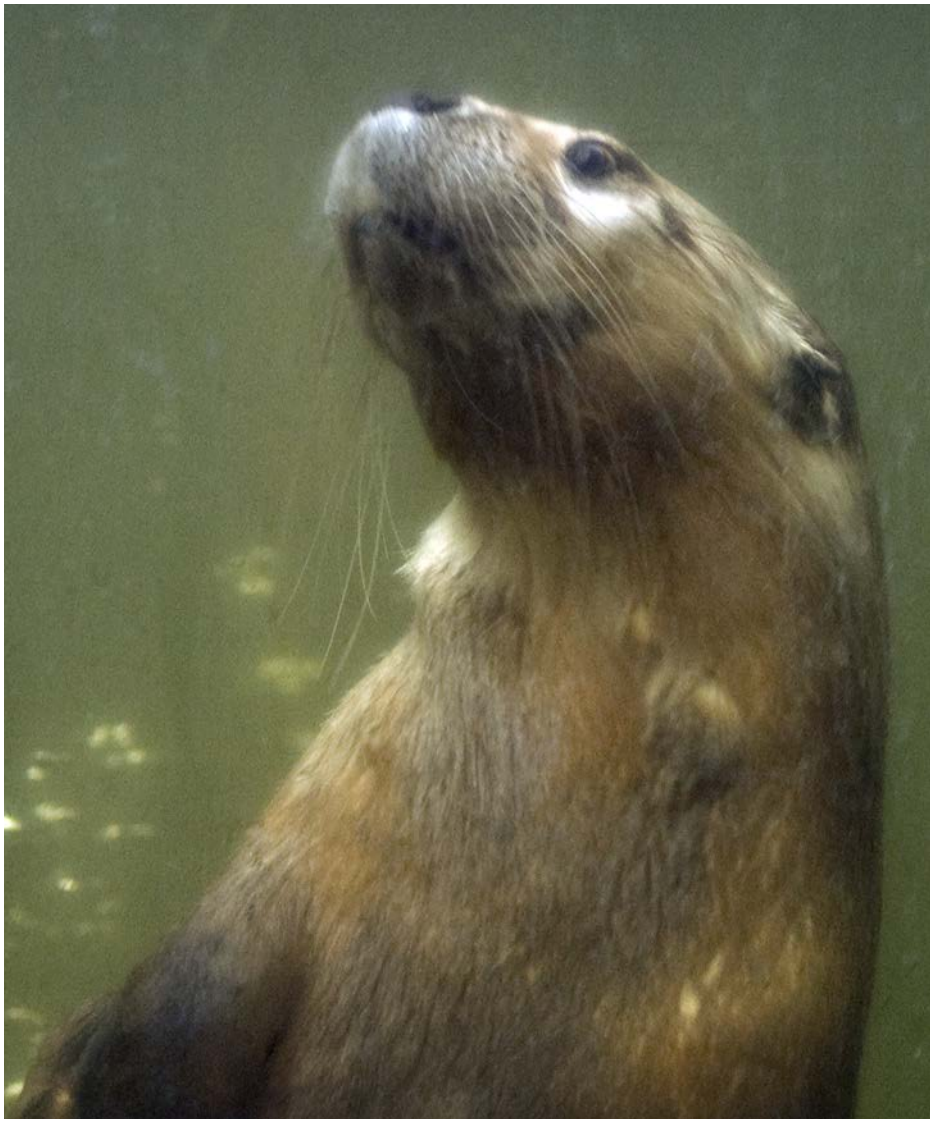
The river otter is widely distributed among a variety of aquatic habitats in NA. Hence, there generally are no specific areas in need of conservation attention based on the imperilment of the species. However, there are issues for which specific locations could be identified for particular conservation actions, including: 1) areas where river otters remain extirpated and could potentially recover; 2) areas where river otter populations are recovering but should be monitored to assess the long-term impacts of persistent environmental threats (e.g., areas where water pollutants could inhibit long-term recovery of expanding populations); 3) areas that could serve as ideal locations for educational and citizen-science programs based on river otter ecology and conservation; 4) identification of locations where river otters can easily be viewed and appreciated by the public, especially in protected areas such as national parks; and 5) identification of zoos and aquaria that house river otter populations of particular value for educating the public (i.e., those that have well developed educational programs, excellent displays for viewing and photographing river otters).

A large portion of research associated with river otters has been conducted as part of reintroduction projects. In contrast, remnant populations have received little research attention, especially in coastal areas and throughout Canada. Research projects in these regions should be encouraged and supported. Site-specific conservation locations should represent a variety of aquatic landscapes. Both Canada and the United States have an extensive system of protected areas, including National Parks, which could be a focal point of some site-specific

conservation locations. Areas that could serve as prototypes for developing a network of site-specific conservation areas for river otters should include: 1) coastal areas of northern California where river otters are recovering and being studied through The River Otter Ecology Project (http://www.riverotterecology.org/); 2) The Greater Yellowstone Ecosystem; 3) Isle Royal National Park; 4) Acadia National Park; 5) the Chesapeake Bay; 6) Everglades National Park; and 7) Newfoundland and Canadian Maritime Provinces. These recommended areas represent a variety of aquatic conditions inhabited by river otters, are well known and receive considerable public attention, and have established infrastructure for developing and sustaining long-term conservation initiates.

Success Stories

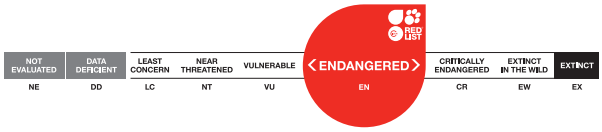
River otters experienced substantial declines caused by unregulated fur harvest in the 1800s and degradation of aquatic habitats through the mid-1900s. River otter declines were particularly severe in the USA, where, by 1980, populations were considered completely extirpated from 11 states and endangered in 9 others (Bricker *et al.*, In press). However, populations have since expanded to occupy at least portions of the river otter's historic range in all USA states and Canadian Provinces, except Prince Edwards Island. This increase in river otter distribution and abundance was facilitated by a combination of reintroduction projects implemented in 22 states, improvements in aquatic habitat quality, and the natural expansion of native populations range (Bricker *et al.*, In press). The conservation status of river otter populations in NA has improved considerably, constituting a substantial conservation success story.



North American River Otter *Lontra canadensis*
Projects and Funding Opportunities

Region	Actions	Costs
All states, provinces, and territories where river otters are harvested	Encourage wildlife agencies to develop and implement ongoing, formal, field-based monitoring of populations	Communication of message $10,000 over 2 years
Canada	Otter Conference, emphasis on promoting research in Canada and site-specific conservation areas and highlight threat mitigation measures	$ 50,000
Coastal northern California	Citizen science-based conservation initiative to monitor recovering river otter population	$10,000/year for 5 years $ 50,000
Greater Yellowstone Ecosystem	Pilot project to promote river otters as a focus for environmental education and citizen science-based monitoring of aquatic habitat conditions	$ 50,000/year for 2 years $100,000
All states, provinces, and territories with remnant (not reintroduced) river otter populations	Establish a genetic profile of extant river otter population throughout NA as a basis for assessing long-term consequences of genetic introgression contributed by reintroduction projects	$ 50,000/year for 5 years $ 250,000
Continent-wide	Develop a web page to portray up-to-date management status of river otters in all geopolitical conservation jurisdictions and provide reliable information that portrays the value of river otters in aquatic ecosystems.	$ 5,000
Isle Royale National Park, New Brunswick, and Nova Scotia	Pilot projects to develop of long-term monitoring protocols, including use of genetic techniques to develop population estimates using scats, including assessments of potential model bias associated with seasonal variation in river otter marking and group dynamics	$ 80,000/year for 2 years for 2 projects $ 320,000
Chesapeake Bay, Everglades National Park, Columbia River drainage	Pilot projects to evaluate the presence and bioaccumulation of toxic substances in river otters	$ 60,000/year for 2 years for 3 projects $ 360,000

North America
Sea Otter
Enhydra lutris



The Sea otter, with the thickest fur of all mammals, was prized by fur traders worldwide and came close to extinction in the mid-19th century. Active management and translocation programs in the Pacific Northwest and California, and strict protection measures, have allowed Sea otters to return to their former habitats.

IUCN Red List Status
The Sea otter is classified as Endangered based on a past large-scale population decline exceeding 50% over the past 45 years, or three generations (Pacifici *et al*. 2013). CITES: *Enhydra lutris nereis* - Appendix I; all other subpopulations are on Appendix II.

Distribution
Sea otters are distributed in a wide arc from northern Hokkaido, Japan, northward up the western Pacific coast and southward down the eastern Pacific coast as far as Baja, Mexico. Seventy three percent of the world population of Sea otters live in the US state of Alaska, followed by Russia, with 20%. The world population estimate for the Sea otter is approximately 136,000. Approximate regional population numbers: Russia (*E. l. lutris*): Populations have not been systematically surveyed for this population. Kuril Islands was inhabited by 19,000 otters in 2004 but reports from biologists indicate a 40 to 50% decline in populations in portions of the islands.

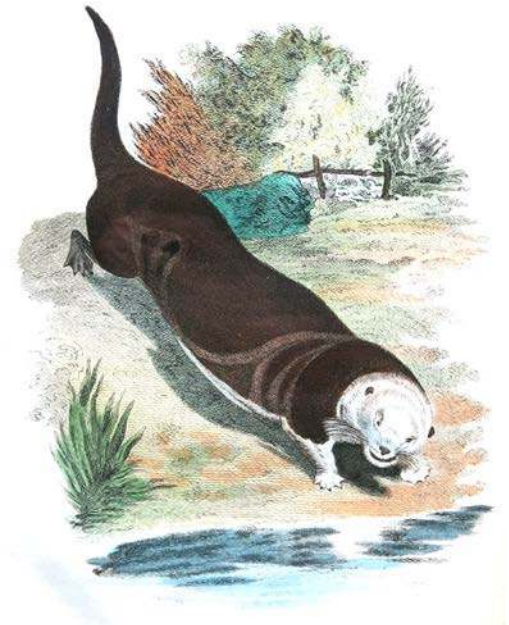
Kamchatka Peninsula was inhabited by 3,000 otters in 2004, but with a population decline in the Cape Lapotka area (S. Kornev 2004 pers. comm.). There were 5,500 otters reported in the Commander Islands in 2004, a population considered at equilibrium density or possibly increasing.

United States (US) (*E. l. kenyoni* and *E. l. nereis*): In Southwest Alaska (*E. l. kenyoni*) 54,771 otters were reported in 2000-2008. There are low densities of Sea otters from Castle Cape (south Alaska Peninsula) to Attu Island (Aleutian Island chain) and the population no longer functions as a keystone species in the habitat. Moderate densities are found from Castle Cape to Kamishak Bay (including the Kodiak Archipelago) and numbers are stable or slightly increasing. There is no evidence of further population decline or recovery in the central Aleutian Islands. In Southeast Alaska 25,712 otters (*E. l. kenyoni*) were reported in 2000-2012, and population range expansion is expected to continue in this region, but more slowly than originally predicted. A report for Southcentral Alaska included 18,297 otters in 2000-2010 and this population is also expected to continue an increasing abundance trend.

In the US state of Washington 1,806 otters (*E. l. kenyoni*) were reported in 2016. Population growth is expected to continue in this region. In the US State of California, 3,272 otters (*E. l. nereis*) were reported in 2016. The population has been numerically stable for the past 5-6 years with a low annual growth rate of less than 1% per year. In Canada, 6,754 otters (*E. l. kenyoni*) were reported in 2013. Population range expansion is expected to continue in this region.

Single animals have been sighted in several places: in Hokkaido, Japan (*Enhydra l. lutris*) in 2005, in Mexico (*E. l. nereis*) in 2014. In the outer coast of the US state of Oregon (probably *E. l. kenyoni*) there have been 28 single Sea otters sighted.

Habitat and Ecology
The Sea otter forages, sleeps and give birth in the sea, and is the largest and heaviest of the otter species. Kelp beds are an important habitat component for the Sea otter, used for both foraging and resting



(Riedman and Estes 1990). Throughout their range, Sea otters use a variety of nearshore marine environments and most Sea otters forage in water less than 30 m in depth (Bodkin *et al.* 2004). In much of their range, foraging occurs within a km of the shore. They forage in rocky substrates that support kelp beds, but also frequent soft-sediment areas where kelp is absent (Riedman and Estes 1990, Burn and Doroff 2005). They are often found in areas with protection from the most severe ocean winds, such as rocky coastlines, thick kelp forests, and barrier reefs.

The species has unusually dense and waterproof underfur, which protects it from the cold marine environment. It is known for its use of tools, such as rocks, to dislodge and open shells of hard-shelled prey species.

Sea otters apparently are polygynous, although the nature of the mating system may vary. Male Sea otters reach sexual maturity around age 5 or 6, but probably do not become territorial or reproductively successful for two or three more years (Riedman and Estes 1990). Females normally give birth at the age of 5 or 6 to a single pup at a time (Riedman and Estes 1990), and pups are dependent on their mothers for about six months (Jameson and Johnson 1993). Longevity in Sea otters is estimated to be fifteen to twenty years for females and ten to fifteen years for males (Riedman and Estes 1990).

Sea otters generally occupy a home range of a few kilometres and remain there year-round. Male Sea otters are weakly territorial (Kenyon 1969), patrol territorial boundaries and attempt to keep other adult males from the area. Females move freely among male territories. Sea otter annual home ranges can be up to 0.8 km² and extend along sixteen km of coastline (Kenyon 1969, Loughlin 1977). Typically, female Sea otter home ranges are about twice as large as adult males during the breeding season but have smaller annual or lifetime home ranges than males (Riedman and Estes 1990).

Sea urchins, abalones and rock crabs are the main prey of Sea otters in the newly re-occupied habitats of central California (Vandevere 1969). Clams and crab make up the diet in soft-sediment habitats (Kvitek *et al.* 1992, Doroff and DeGange 1994). In the Aleutian archipelago, fish may comprise up to half of their diet. They regularly eat bottom-dwelling fish, but also crab, clam, mussels, turban snails, sea cucumbers, squid, octopus, chitons, tubeworms, large barnacles, scallops, and sea stars (Wild and Ames 1974, Riedman and Estes 1990).

Threats

The historical maritime fur trade resulted in the worldwide reduction of Sea otter populations to fewer than 2,000 animals in widely dispersed remnant populations (Kenyon 1969). Sea otters were reduced to just 1-2% of their original number scattered throughout their range, resulting in a halving of their original genetic diversity (Kenyon 1969, Ralls *et al.* 1983, Larson *et al.* 2002a). This low genetic diversity reduces the Sea otter's ability to successfully respond to climate change factors, such as ocean acidification, biotoxin events, and the frequency and intensity of storm events, as well as new pathogens and shifts in prey availability.

Oil spills from the marine shipping of petroleum products are the greatest anthropogenic threat to Sea otters (Geraci and St. Aubin 1999). Sea otters become hypothermic when oiled because their fur loses its insulative property. They also ingest oil while grooming, leading to gastrointestinal disorders. Volatile components of oil are caustic and can cause eye and lung damage and eventual death (Garrott *et al.* 1993, DeGange *et al.* 1994). Toxins linger in the water column and bioaccumulate in prey, and otters are exposed to negative impacts for years.

Population declines in California's Sea otters may be related to summer commercial fisheries. Significant numbers of Sea otters drowned in gill and trammel nets in California and Alaska from the mid-1970s to the early 1980s (Estes 1990). Higher levels of mortality in the summer months is correlated with commercial fin fish landings in the coastal live trap fishery (Estes *et al.* 2005). There are heightened conflicts in this region with commercial dive fisheries, cited as a factor in limiting range expansion. Otters are also affected by the depletion of commercially harvested prey species, sea cucumber, crab, and urchin in southeast Alaska. In Alaska, there is a push to remove Sea otters from the protection of the Marine Mammal Protection Act and to transfer management from the Federal to State authority, potentially weakening protection. Interactions with commercial shell fisheries have been an issue in northern Hokkaido.

Recent studies have found infectious disease to be an important mortality

factor in California Sea otter populations. Around 280 Sea otters found dead have been linked to a pair of protozoan parasites, *Toxoplasma gondii* and *Sacrocystis neurona*, which are spread to the nearshore marine environment by land hosts such as cats and opossums (Conrad *et al*. 2005, Johnson *et al*. 2009). In Alaska, *Streptococcal endocarditis*, encephalitis and septicemia has been identified in necropsies of northern Sea otters (Unusual Mortality Event Working Group 2006). Northern Sea otters from the Alaska Peninsula, Kodiak and Kachemak Bay area are infected with phocine distemper (Goldstein *et al*. 2009).

Marine biotoxins, such as domotic acid, saxitoxin, and microcystin, are changing with warming ocean temperatures, nutrient loads, and longer and more frequent algal blooms. Pathways will vary by biotoxin, but bivalves that accumulate toxins in their tissues will affect Sea otters. Domoic acid is a neurotoxin that causes seizures and is linked to heart conditions (Kreuder 2005) and saxitoxin causes respiratory arrest. In California, microcystin has been implicated in 40 Sea otter deaths from 1999-2007.

Killer whales, great white sharks, bald eagles, coyotes, and brown bears prey on Sea otters (Riedman and Estes 1990). Predation by killer whales is one factor thought to have caused Sea otter population declines across the Western Gulf of Alaska and Aleutian Islands (Doroff *et al*. 2003, Estes *et al*. 1998, Hatfield *et al*. 1998). Significant declines in preferred killer whale prey, e.g. northern fur seals harbour seals, and Steller sea lions are believed to have caused killer whales to switch to consuming Sea otters (Estes *et al*. 1998). In California, shark related mortalities in the southern part of the range is currently the primary known cause of mortality.
A global market still exists for Sea otter, and management must take care to prevent an illegal trade in pelts. In Russia, poaching and the illegal trade are still a conservation concern for Sea otters, and in southeast Alaska, legal harvest by Native Americans and poaching may also be contributing factors to the slow growth of the population. In southeast Alaska, there are strong industry pressures to increase levels of legal Sea otter hunting and marketing of pelts in order to decrease the otter population. Any such actions should be considered very carefully in light of climate change stressors, fishing conflicts, oil spills, and historic population patterns. It was the commercial value of Sea otter pelts that led to a near extinction of the species. Past history dramatically illustrates the vulnerability of Sea otters to exploitation.

Severe weather and periodic climatic events such as El Nino can disrupt foraging behaviour and food availability, harm kelp canopy, and increase pup loss through separation from the mother.

Ocean acidification, a component of global climate change, disrupts marine food webs to an unknown degree. Many of Sea otter prey items form shells, a process that is disrupted by acidification, potentially affect prey availability. In Washington State, acidification events have already affected oyster farms and have changed farming practices.

Threat Mitigation Measures
Oil spills can be mitigated by measures put in place to cope with these events, including prevention drills and response-ready equipment for containment of spills. Plans should also be put in place for rescue and rehabilitation of otters exposed to oil and include training for the care and handling of oiled otters.

Otter mortality from gill and trammel net and pot commercial fisheries can be mitigated by fisheries observers. Such programs can document encounters and implement mitigation strategies. In the US, there must be regular reporting in the Species Stock Assessment Reports of the National Oceanic and Atmospheric Agency and the Marine Mammal Commission. From 2010 to the present, Sea otter foraging ecology studies continue to examine the impacts on Sea otters of commercial harvests of sea cucumber and urchin. For the transport of new or emerging land-sourced pathogens, long-term monitoring through forensic-level necropsy programs can address sources of pathogens and their impacts on Sea otters.

A global market still exists for Sea otter, and management must take care to prevent an illegal trade in pelts.

To address the very low genetic diversity of the species, all source populations should be protected. Natural range expansion should be allowed, and restrictions that keep the subspecies distinct should be lightened.

Protecting and preserving refuge habitats, such as lagoons and dense kelp forests, can

ALEUTIAN SEA OTTER CANOE, OR BAIDARKA, AND HUNTERS

From Charles Melville Scammon, *The Marine Mammalia of the Northwestern Coast of North America*, New York, 1874

help to mitigate the threat of predators, in particular great white sharks in California and killer whales in Alaska. Canopy-forming kelp beds within the Sea otter range should be identified and mapped, and connected with marine sanctuaries and protected areas that may have ongoing monitoring programs for canopy-forming kelp.

Strict legal protections in the US have allowed successful resurgence of some otter populations. All US Sea otter populations are protected under the Marine Mammal Protection Act of 1972, which has a cultural exemption allowing for the harvest of Sea otters by coastal Alaska Native people. For all populations in Alaska, the reported take is below the Potential Biological Removal level, but establishing a harvest limit would ensure that the take stays below that level in the future.

The subspecies *E. l. kenyoni* in southwest Alaska, and the subspecies *E. l. nereis* in California, are listed as Threatened under the Federal Endangered Species Act. In the States of Washington and California, Sea otters are afforded additional levels of protection by State laws. In Canada, the subspecies *E. l. kenyoni* is listed as a Special Concern species under Canada's Species-at-Risk Act. Such protections should be adopted in the Asian range of the Sea otter.

In places where climate-forced changes in food availability, mapping areas that are resource limited and those where the population can expand may help. Population trends of Sea otters and key prey should be monitored and resource-rich areas should be mapped to enable otter expansion.

Human conflict with Sea otters includes illegal and legal take (only in Alaska in the US). In the US, enforcement of the Marine Mammal Protection Act should help mitigate mortality from illegal take. The US Marine Mammal Stranding Program documents and mitigates other forms of conflict mortality. In Russia, better monitoring and documentation of poaching will help to protect the species.

The potential threat of ocean acidification is difficult to mitigate. Monitoring acidification levels in the nearshore habitat where Sea otters forage would add to the limited baseline data on trends and variability in acidification.

Captive Populations

The first Sea otters to be exhibited were from the Alaskan populations. The first attempt occurred in February 1954 when several were transported from Alaska to the Woodland Park Zoo in Seattle. They were then transferred to Washington, DC but died soon afterward. The following year came the first success in a public facility, when one was housed for six years at the Woodland Park Zoo beginning in 1955. California Sea otters were first exhibited in captivity in 1969. Sea otters do well in captivity in that they exhibit all their life history traits and live typically longer than their wild counterparts. Since 1979 there have been several successful otters born in captivity.

As of 2017, there were 14 facilities in North America displaying 53 Sea otters (Casson 2016). The North American aquariums are as follows: Seattle Aquarium, Point Defiance Zoo and Aquarium, Oregon Coast Aquarium, Oregon Zoo, Monterey Bay Aquarium, Sea World of California, Aquarium of the Pacific in Long Beach, Minnesota Zoo, John G. Shedd Aquarium, Pittsburgh Zoo and PPG Aquarium, New York Aquarium, Aquarium of the Americas, Georgia Aquarium, and The Vancouver Marine Science Center. There were 2 facilities in North America that house Sea otters for research purposes only; University of California, Santa Cruz and Marine Wildlife and Veterinary Care and Research Center.

Success Stories

Decades of collaborative effort have reestablished Sea otter populations in regions of the US where they were extirpated by past trapping. Sea otters were restored to their former habitat in Canada and the US states of Alaska, Washington and Oregon from remnant population centers in the Aleutian Islands and Prince William Sound, Alaska by the Alaska Department of Fish and Game and the California Department of Fish and Game. Enlarging the range of the species has also meant reducing the risk of events that can limit the population, such as oil spills, disease events and predation. Monterey Bay Aquarium in central California has played an important role in the recovery of the Sea otter. Their Sea Otter Research and Conservation program has been working to understand and

reduce the impacts on wild populations since 1984. The Aquarium research and husbandry teams, in collaboration with the California Department of Fish and WIldlife, the University of California Santa Cruz, Elkhorn Slough National Estuarine Research Reserve, and other partners have been caring for injured otters, raising and releasing orphaned pups, and training students with research projects on topic such as Sea otters' survival and movements, aquatic eutrophication, and marine invasive trends. The Aquarium programs are publicized to the general public through educational activities and a popular television program.

Under the Marine Mammal Protection Act (MMPA) the non-wasteful harvest of Sea otters by Alaska Natives is allowed for subsistence and handicraft purposes. The harvest is monitored by the US Fish and Wildlife Service through a Marking, Tagging, and Reporting regulation that requires hunters to report their harvest and have the hides and skulls tagged within 30 days of the harvest. If a stock is considered depleted under the MMPA, or listed under the Endangered Species Act, subsistence harvested is still allowed. However, for depleted or ESA listed stocks, both laws provide the Fish and Wildlife Service the ability to regulate the harvest, if it is determined that it is necessary for the conservation or recovery of the stock.

The impact of disease-causing pathogens carried to southern Sea otter habitat has been of great concern in California. As human population densities increase in coastal areas, pathogens enter the marine environment. Humans, pets, and other animals can shed pathogens that flow to the sea through runoff and stormwater. Since the threat was identified, there have been decades of collaborative research by California Department of Fish and Wildlife, US Geological Survey, Monterey Bay Aquarium, the Marine Mammal Center, University of California at Santa Cruz and Davis, to develop the tools and knowledge needed to mitigate this threat.

Site-specific Conservation Locations
The present-day Sea otter founding populations should be protected and monitored in order to preserve maximum genetic diversity. These founding populations reside in 11 remnant population centers in the Central Kuril Islands, Kamchatka Peninsula, Bering Island, Aleutian Islands, Alaska Peninsula, Kodiak Archipelago, Prince William Sound, and California. Increased frequency of population surveys to detect trends in abundance is needed for these sites.

Lagoons that are protected from storm events and non-human predation, and therefore safe habitats for rearing pups, should receive special attention. Clam Lagoon in Alaska and Elkhorn Slough and Drakes Estero in California are examples.

Sites that have long time series of data about Sea otter food supplies, oceanic indices, primary and secondary production, and Sea otter mortality, can help us understand the Sea otters' relationship to their ecosystem. Other important relationships needing study include estuary functional processes such as land to sea transport of pathogens, eelgrass habitat; nearshore marine ecology; marine invasive species, and harmful algal blooms. Monterey Bay, Moss Landing, and Elkhorn Slough in California and Kachemak Bay, Glacier Bay and potentially South Slough in Alaska are good examples of such data-rich sites.

Canopy-forming kelp beds within the Sea otter population range are important conservation locations and should be identified and mapped. Kelp beds provide protection and shelter during storm events, cover from predators such as sharks and killer whales, protective habitats for pup rearing, and diverse prey.

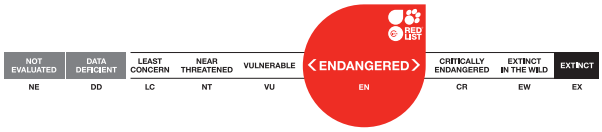
Sea Otter *Enhydra lutris*
Projects and Funding Opportunities

Region	Actions	Costs
United States	Species Coordinator position for each of the two subspecies (*Enhydra l. kenyoni* and *E. l. nereis*); responsible for collaboration, communication, education and outreach, reporting on current and emerging issues (e.g. climate issues) with management agencies such as US Fish and Wildlife Service, the Marine Mammal Commission, Native Tribes	One professional-level position each in Alaska and California $ 90,000/person/year. Travel $ 15,000/person/year
United States	Population surveys for each subspecies	California $ 50,000 Alaska $ 50,000
United States	Development of new technologies to track and monitor Sea otters, investigate emerging issues, and further investigate ecosystem functions of Sea otters	Alaska, Washington, Oregon, California $100,000/year
Russia	Species Coordinator position for the subspecies *Enhydra l. lutris*; responsible for collaboration, communication, education and outreach, reporting on current and emerging issues to management agencies, population surveys	One professional-level position in either the Commander Islands or the Kamchatka Peninsula $ 90,000/person/year
Russia	Population surveys for each subspecies in all remnant population areas, Commander Islands, Kamchatka Peninsula, Kuril Islands	$ 50,000
Russia	Development of new technologies to track and monitor Sea otters, investigate emerging issues and ecosystem functions of Sea otters in all remnant population areas	$ 100,000/year
Canada	Population surveys for each subspecies	$ 50,000/year
Canada	Development of new technologies to track and monitor Sea otters, investigate emerging issues, and further develop ecosystem functions of Sea otters, in their range in British Columbia	$ 50,000/year
Japan	Species coordinator responsible for communications in regions where Sea otter populations are expanding	One half-time professional-level position $ 45,000/year
Japan	Coastal surveys to document population range expansion every three – five years along Hokkaido and southern Kuril Islands	$ 50,000 every 3-5 years

Sea Otter *Enhydra lutris*
Projects and Funding Opportunities

Region	Actions	Costs
Mexico	Local liaison to work with the species coordinators and responsible for communications in regions where Sea otter populations are expanding	One half-time professional-level position $ 45,000/year
Mexico	Coastal surveys along Baja, California, to document population range expansion every three to five years	$ 50,000 every 3-5 years
All	Competitive graduate research fellowships and undergraduate internships - all population segments	$ 100,000/year
All	Population surveys for each subspecies	California $ 50,000 Alaska $ 50,000
All	Travel for OSG leadership and species coordinators to International Meetings, for species coordinators within their regions, and to support students and research collaborations	$ 100,000/year
All	Competitive husbandry and captive research program support.	$ 100,000/year

South America
Giant Otter
Pteronura brasiliensis



The largest otter was once the most endangered in the mid-1970s when the fur trade decimated its numbers over most of its South American range. The implementation of CITES, strong national protection legislation, and ongoing conservation programs in the range countries allowed the Giant otter to make a comeback.

IUCN Red List Status
The Giant otter is classified as Endangered. A future reduction in population size of 50% or more is projected over the next 25 years, or three generation lengths (Pacifici *et al.* 2013). CITES: Appendix I.

Distribution
The Giant otter is endemic to South America and its historical broad distribution ranged from east of the Andes in the Orinoco and Amazon Basins to northern Venezuela and the river networks of the Guianas and to its southern limit in Argentina, occurring in lowland environments no more than 600 m elevation. But local extinctions caused fragmentation of the Giant otter's range, due to commercial hunting for most of the 20th century and to habitat destruction. The populations from the Paraná Basin in southern Brazil and from Argentina and Uruguay are considered extinct or nearly so. In the Brazilian Cerrado a population persists in the face of intense habitat modification. Important populations are still found in parts of the Amazon, in the Pantanal region and possibly in the Guianas.

Hunting for the pelt trade was the greatest threat to the Giant otter in the past and the species came close to extinction in the early 1970s in Ecuador, Colombia, Venezuela, Bolivia, and Brazilian Pantanal (Duplaix 1980). From 1960 to 1969, records indicated a regional harvest of 12,390 giant otter skins. In 1973, Giant otters were placed on CITES Appendix I, and the enforcement of international trade restrictions on Giant otter skins in 1975 finally ended Giant otter hunting (Recharte and Bodmer 2010). Stable populations are now known in some parts of the Pantanal (Leuchtenberger and Mourão 2008, Ribas *et al.* 2012, Tomás *et al.* 2015) and the Amazon (Rosas *et al.* 2007, Groenendijk *et al.* 2015). Recently some populations have been recovering and or returning to their original range, for example, the Yavarí-Mirín River in Peru (Recharte and Bodmer 2010), the Madidi and Itenéz and Guaporé Rivers in Bolivia (Ayala *et al.* 2015, Zambrana Rojas *et al.* 2012), the Lagarto-Cocha and Cuyabeno Rivers in Ecuador (V. Utreras pers. comm. 2018), and the Amanã Reserve in Brazil (Marmontel *et al.* 2015) and in the middle Içana River, Northwest Amazonia in Brazil (Pimenta *et al.* 2018).

Habitat and Ecology
The Giant otter inhabits large rivers, streams, lakes and swamps (Duplaix 1980, Carter and Rosas 1997). In Suriname, the species seems to prefer black water creeks and rivers with sandy or rocky bottoms (Duplaix 1980). In Peru, large lowland rivers with gentle flow and oxbow lakes with high fish densities are preferred (Schenck 1999). In Bolivia, both clear and whitewater floodplains are used (Zambrana Rojas *et al.* 2012). Since Giant otters build dens and use campsites along the banks of water bodies, some habitat traits are important determinants of presence, such as gentle slopes, vegetation cover and proximity to the water's edge (Lima *et al.* 2012). In seasonally flooded habitats, the availability of banks and other habitat features may change and induce changes in habitat selection by the otter (Leuchtenberger *et al.* 2013).

During the peak inundation in the southern Pantanal, when the banks are flooded,

Giant otter groups use emerged shrubs as refuges and latrines (Leuchtenberger *et al*. 2015). At such times, when prey is more dispersed, Giant otters were observed in flooded forest, swamps and grasslands adjacent to the river (Leuchtenberger *et al*. 2013). Territoriality and population density may lead some groups to use unusual sites, such as artificial lakes along roads in the southern Pantanal (Leuchtenberg *et al*. 2013). Giant otters also use agricultural channels (Laidler 1984) and the reservoirs of dams (Palmeirim *et al*. 2014). The preferred habitat for Giant otters seem to be undisturbed water bodies, with high quality vegetation cover and abundant prey density.

Giant otters are one of the most social members of the otter family. A Giant otter group consists of a dominant breeding pair, non-breeding subadults and offspring. Group size can range from two to sixteen individuals that may or may not be related (Ribas *et al*. 2016). Reproduction is related to the capacity of the group to defend high quality territories, usually a function of group size (Groenendijk *et al*. 2014, Leuchtenberger *et al*. 2015), possibly explaining the advantage of having non-related individuals in the group (Leuchtenberger and Mourão 2008, Ribas *et al*. 2016). Giant otters attain sexual maturity at around 2 1/2 years old (Oliveira *et al*. 2011), and the earliest breeding may occur at age 3 (Groenendijk *et al*. 2014). A group usually produces one litter a year, ranging from one to six young but averaging two (Duplaix 1980, Staib 2005, Groenendijk and Hajek 2006, Leuchtenberger and Mourão 2008).

Groups live in well-established territories that are constantly defended by scent-markings at latrines, campsites and dens along the banks of lakes and rivers (Leuchtenberger and Mourão 2009), and warning vocalizations (Leuchtenberger *et al*. 2014, Mumm and Knörnschild 2017). Conflict encounters are common when an intruder is detected and may lead to serious injuries or even death (Schweizer 1992, Rosas and Mattos 2003, Ribas and Mourão 2004). Territories vary in size from 0.5 km to 18 km of riverbank in the dry season, and 8 to 24 km in the wet season (Utreras *et al*. 2005, Leuchtenberger *et al*. 2015) and appears to be related to group size (Groenendijk *et al*. 2014, Leuchtenberger *et al*. 2015). The size of neighboring groups may limit the expansion of territory (Leuchtenberger *et al*. 2015).

The diet of Giant otters consists almost exclusively of fish but may also include caiman and other vertebrates (Ribas *et al*. 2012, Rosas-Ribeiro *et al*. 2012). The species is opportunistic in its diet and adapts its diet according to prey availability.

Threats

The species is threatened by multiple human activities throughout the species range, destruction of riparian habitat, overfishing, contamination of water bodies -- especially by gold mining, fossil fuel exploration, and the use of pesticides and fertilizers, domestic animal diseases, and mismanaged tourism (Duplaix 1980, Schenck 1999, Utreras and Tirira 2001). Human populations are increasing and expanding in the region. In the last census, the Amazon region registered the highest population growth in Brazil. Illegal settlements, road opening and deforestation threaten pristine habitats. Colonization of new areas are expected, followed by intensive exploitation of natural resources. Furthermore, proposed mega-projects in the 2007 Brazilian Growth Acceleration Plan represent a significant threat to Brazilian Amazonian and Pantanal habitat.

The Giant otter remains endangered because of the low recuperation rate of relict populations now also under pressure from human activities (Groenendijk *et al*. 2014). Direct conflict between humans and otters is an increasing problem. Otters may be killed for fun or out of fear, or, more often,

Even a decade after gold mining stopped, areas affected still had depleted fish populations and had not been recolonized by otters.

because they are seen as competitors for fish by loggers, miners, and fishermen, who often blame them for depleting fish resources used for local consumption and in commercial trading in markets (Gómez and Jorgensen 1999, Recharte *et al*. 2008, Rosas-Ribeiro *et al*. 2012, Utreras and Tirira 2001). Giant otters can drown, get stuck in fishing nets and traps, and are then blamed for damaging them (Rosas-Ribeiro *et al*. 2012, Utreras *et al*. 2013). Fish farming is rapidly increasing in the species' range, for example in parts of the Ecuadorian Amazon, and expose otters to retaliation killing (V. Utreras pers. obs.). Cubs are sometimes captured illegally to be kept as pets (M. Marmontel pers. obs).

Giant otters are highly susceptible to persecution: they are large, conspicuous, social, and very vocal. They are active in daytime and occupy open habitats and stable territories. Their signs – latrines and dens – are easily recognizable, making it possible to identify areas of recent activity by a group (Groenendijk *et al*. 2005). Individuals and groups often react to people by approaching to investigate. Moreover, only the dominant pair produces young, and usually only once a year. During the years of the pelt trade, these life history attributes of the species combined to make it an easy target for fishermen. In 2017 a Giant otter group was killed by fishermen in the Pantanal and according to locals, kills occur frequently during the fishing season (C. Leuchtenberger, pers. comm.). In 2011-2012, the Kanamari indigenous people promoted a massive Giant otter killing in their territory (Território Indígena Kanamari), based on their perception that the species was overfishing the river turtle population. The community leader bought 300 cartridges for the hunters, who shot 64 giant otters (Endo pers. comm. 2012). Such incidents of targeted killing can lead to extinction of small populations in a watershed.

Gold mining, both artisanal and industrial, is a significant threat to the species, particularly in the Guiana Shield region, in southeastern Peru, and the western region of the Ecuadorian Amazon. The main impacts are habitat destruction, sedimentation of rivers, and pollution (Kimbrough 2014). Gold miners cut swathes into the floodplain forest and blast river banks with pressure hoses, using mercury to amalgamate gold particles. Gold prices are at a record high, whereas mercury is inexpensive. Forest conversion to mining increased six-fold from the periods 2003-2006 to 2006-2009 (Swenson *et al*. 2011).

Even a decade after mining stopped, areas affected still had depleted fish populations and had not been recolonized by otters. In areas of gold mining, fish are contaminated with mercury. Gutleb *et al*. (1997) found that mercury concentrations in most fish near Manu National Park were higher than considered tolerable for the Eurasian otter. Migration of contaminated fish and long-range atmospheric transport of mercury probably increase the area of influence of such contaminants. Contamination of otters by other heavy metals through pesticides and other agrochemicals is still poorly understood. Over the last two decades, the Guianas and Peru regions are facing significant expansions in areas subject to gold mining, and consequently in French Guiana populations are still considered as decreasing, due to habitat threats (Allard *et al*. 2017).

The many planned hydroelectric dams in the species' range are a major threat to giant otters. These will alter hydrological regimes of rivers and affect fish populations and habitat (Latrubesse *et al*. 2017). Dams disrupt the annual cycles of inundations, vital for the maintenance of populations of flood dependent species such as the giant otter (Mourão *et al*. 2010, Alho and Sabino 2011). One hundred and eighty-four new dams are planned or under construction, greater than two MW capacity over the next 20 years in the Amazon. These dams would include five of the six major Andean tributaries of the Amazon. Sixty per cent of the dams would cause the first major break in connectivity between protected Andean headwaters and the lowland Amazon.

Giant otters can live in some artificial lakes, such as the shallow Balbina Reservoir in Brazil (Rosas *et al*. 2007). In other areas, hydroelectric dams have depleted Giant otter populations, as did the Curuá-Una Hydroelectric in the Brazilian Amazonia (Rosas *et al*. 2007). Around the Pantanal, there are over 115 projects of small hydroelectric plants. Other major infrastructure projects include the Inter-oceanic highway in southeastern Peru, and the Initiative for the Integration of the Regional Infrastructure of South America (V. Utreras pers. comm.).

Giant otters are vulnerable to disturbance

One hundred and eighty-four new dams greater than two MW capacity are planned or under construction over the next 20 years in the Amazon.

from poorly managed tourism, including sport fishing. It is important to control increasing levels of tourism on lakes and rivers both in and outside protected areas (Groenendijk and Hajek 2006). Research has shown that Giant otter reproductive success and sighting success by tourists is considerably lower on unmanaged lakes than on managed lakes (Groenendijk and Hajek 2006).

Giant otter cubs held in captivity have died of canine parvovirus, so domestic animal diseases may pose a serious threat to wild giant otter populations. Infection can also occur in remote areas, since transient otters and people hunting with dogs travel large distances with potential for contact and infection of vulnerable otter populations (Schenck 1999).

Climatic changes are predicted to increase suitable areas for Giant otters (Cianfrani *et al.* 2018). However, long-term habitat and climatic modifications may increase the exposure of some core otter areas to the negative effects of the surrounding unsuitable areas (Cianfrani *et al.* 2018). The species also has a high specialized niche, making it more vulnerable to climate change.

Captive Populations
There are currently 116 Giant otters in captivity in 27 zoos, and more than half of these individuals are in European zoos. The comparison of the gene diversity index among captive subpopulation is the result of different strategies in Europe and the US. In Europe breeding has been kept low, which results in a lower inbreeding factor and a higher gene diversity, although the number of animals is decreasing. In US breeding the program is strong which results in high inbreeding, low gene diversity and stable demographics. Currently, Giant otters are not breeding in the Latin American captive population. Their collective genetic profile is the best (wild born, confiscated animals or first or second-generation captive born) but the total number of individuals is very low. For a globally sustainable captive population, exchange programs between zoos in Latin America are needed and collaborative breeding programs must be launched.

Site-specific Conservation Locations
The population of Giant otters living in the Cerrado biome in Brazil has a high conservation value. Recent surveys conducted from the Araguaia basin to the eastern limit of the species' distribution estimate a population size of over 200

Threat Mitigation Measures
Some priority actions include:

1. Establish protected areas in all range countries, including fish corridors, to connect fragmented populations and protect stable populations
2. Strengthen national, departmental and municipal protected area administrations, as well as other key actors, especially with indigenous grassroots organizations
3. Implement reintroduction programs to recover historical populations in Argentina (Corrientes) and Brazil (Paraná Basin)
4. Establish national conservation plans throughout the species range
5. Foster multinational cooperation (ie, Amapá-Brazil and French Guiana, Suriname and Guyana, Southern Amazon and the Pantanal) to coordinate management of transboundary or connected protected areas, control of illegal mining and the integrity of continuous otter habitat
6. Create protocols in all range countries to regulate mitigation and compensation for projects like hydroelectric dams, gold mining, agriculture, deforestation and overfishing within the species range
7. Implement resilience and recovery projects in areas of human activities to help the return of giant otters after threat mitigation
8. Create global guidelines for giant otter watching by ecotourists including mandatory responsible behavior
9. Promote the value of giant otters through environmental education programs in communities that coexist with otters
10. Develop management plans to regulate overfishing to reduce conflicts and protect the prey base
11. Implement sustainable economic alternatives for communities that coexist with giant otters by training locals to guide otter watchers and strengthen local networks to participate in the regional decision-making processes
12. Create a map of risk and decision scenarios for stakeholders, incorporating otter presence and the current and future threats
13. Establish long-term giant otter conservation programs for key populations in Brazil (Pantanal, Amazonia, Cerrado), Bolivia (Amazonia), Peru (Amazonia), and Colombia (Orinoco)
14. Conduct population surveys in areas with poor or no knowledge about giant otter occurrence in the last decade, especially in Uruguay, Argentina, Brazil (Paraná Basin)
15. Document the illegal trade in Guyana where otters are removed from the wild, either to trade or breed for pets

individuals (G. Georgiadis, pers. obs.). A long-term monitoring program of the Cantão Park in Tocantins State provided the first information about Giant otter ecology and behavior in this region (Georgiadis *et al*. 2015) but information about this population's genetic structure is still lacking.

The Paraná Basin, where the otter has not been sighted in a decade (Rocha-Mendes *et al*. 2005, Silvestre 2015) and is considered extinct or nearly extinct, is a potential site for a reintroduction program. In Corrientes, Argentina, a rewilding program plans to reintroduce Giant otters to the Iberá Wetlands, where the species was eliminated by hunting in the 1980s. The tradeoffs between natural recovery and reintroductions needs evaluation.

The Pantanal otter population should receive special attention because of its low genetic diversity (Pickles *et al*. 2011), southern distributional limit, and human disturbance (Harris *et al*. 2005, Alho and Sabino 2011).

Fisheries at the Amapá National Forest (Michalski *et al*. 2012), the Amanã Sustainable Development Reserve (Lima *et al*. 2014), the Orinoco region in Colombia (Trujillo *et al*. 2015) and on the Cuiabá River in the north Pantanal (C. Leuchtenberger pers. obs.) deserve attention. The development of otter-based ecotourism may provide benefits in these areas that help mitigate losses to fisheries in these areas.

Success Stories

Indigenous stories describe a harmonious relationship between Giant otters and humans. In Colombia, some indigenous groups believe that Giant otters guarantee the health of the river, culling contaminated fish, while others tell a story that Giant otters became people and fished like humans (Colombia 2016). While colonization and modernization of indigenous peoples have changed these views, there are still examples of indigenous people taking steps to protect the species within their territories.

In Bolivia, for example, the Tacana people list the Giant otter as one of the species which should not be hunted within the framework of traditional subsistence hunting (CIPTA 2008). Indigenous territories make up almost 30% of the Amazon basin, and many of these indigenous territories are large enough to ensure that subsistence hunting is essentially sustainable, and are often adjacent to, or overlap, national, state and municipal protected areas which make up another 20% of the Amazon basin. Working with local people in and around the protected areas and indigenous territories of the Amazon represents the greatest opportunity for the conservation of Giant otter population strongholds.

Long-term population monitoring programs have documented Giant otter recovery since early 2000 in: Manu National Park, Peru, on the Vermelho-Miranda Rivers, Brazilian Pantanal, in Balbina Lake and Amanã Sustainable Development Reserve in Amazonia, Brazil, in Cantão State Park in the Cerrado of Brazil, on the Upper Rupununi River of Guyana – showing growing numbers and expanding occupancy area (Georgiadis *et al*. 2015, Groenendijk *et al*. 2014, Leuchtenberger *et al*. 2015, Lima *et al*. 2014, Marmontel *et al*. 2015).

In Brazil and Peru, the Giant otter is seen as a charismatic species for ecotourism, attracting tourists interested in wildlife watching. At the Barranco Alto Lodge in the Southern Pantanal, Giant otter watching is conducted in a nonintrusive and careful manner. Ecotourism represents an important tool to improve human attitudes towards the species, creating economic alternatives for local people and reinforcing the conservation of Giant otters.

A non-profit organization has been working at the Jauaperi River, a tributary of the Negro River in the Brazilian Amazon, to raise international funds to address the threats of habitat degradation, while offering sustainable economic alternatives to the local community (Evangelista and Tosi 2015). This organization has reduced the migration from rural sites to the cities and improved the quality of the community. Local residents that were former Giant otter hunters are today esteemed guides for tourists and researchers (Duplaix *et al*. 2015, Evangelista and Tosi 2015).

A program was launched in Peru at 2017 aimed at investigating the effect of mining and other human activities on Giant otter populations. The program monitors Giant otter territories in the protected Manu National Park and compares them with the adjacent mined areas of the lower Madre de Dios River. The program focuses on demography and behavior of Giant otters and samples the local fish communities to understand their abundance and the mercury exposure risk for local Giant otters.

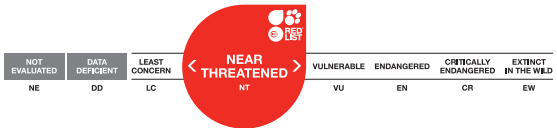
In Guyana, where conservation planning is underway, the Giant otter is recognized as an important umbrella species and there is interest among conservation organizations working in the region in protecting this species – along with many other rare "giants" such as the jaguar, giant anteater, and river turtle.

Giant otter populations of the Pantanal appear to be recovering, with signs of reaching carrying capacity in some areas (Tomás *et al*. 2015). Specific conservation action plans have been developed in Brazil (ICMBio 2016), Colombia (Colombia 2016), Ecuador (Utreras *et al*. 2013) and Venezuela (Ferrer *et al*. 2017) to recover and maintain remaining populations. Continuing and effective conservation strategies are needed in these locations.

Giant Otter *Pteronura brasiliensis*
Projects and Funding Opportunities

Region	Actions	Costs
States/provinces/territories where giant otters coexist with traditional communities	Support to national, departmental and municipal protected area administrations, and other key actors, especially indigenous grassroots organizations	Not estimated
States/provinces/territories where there are relict populations of giant otters	Protected area creation in all range countries, including fish corridors, to connect fragmented populations and protect stable population	Not estimated
Argentina **Iberá Reserve** **Corrientes** **Brazil (Paraná Basin)**	Reintroduction programs to recover historical populations in Argentina (Corrientes) and Brazil (Paraná Basin)	$ 100,000/year for 5 years, two projects
All countries lacking a conservation plan for giant otters	Establishment of national conservation plans throughout the species range	Publication of conservation plans $ 20,000
Continent-wide	**Workshop to:** **1)** foster multinational cooperation to coordinate management of transboundary or connected protected areas, control of illegal mining and integrity of continuous otter habitat **2)** create protocols to regulate mitigation and compensation for projects like hydroelectric dams, gold mining, agriculture, deforestation and overfishing **3)** create a map of risk and decision scenarios for stakeholders, incorporate otter presence and current and future threats	Meeting for 50 participants $ 35,000 for 5 days
Guiana Shield	Resilience and recovery projects in areas of human activities to support giant otter return after threat mitigation	$ 60,000/year for 10 years in 3 countries
Brazil (Pantanal, Amazonia, Cerrado) **Bolivia (Amazonia)** **Peru (Amazonia)** **Colombia (Orinoco)**	Environmental education programs in communities that coexist with otters to promote the value of giant otters and to implement sustainable economic alternatives by training locals to guide otter watchers and to strengthen local networks to participate in regional decision making	$ 40,000/year for 2 years Four projects in 4 countries
Uruguay (Merin Lagoon Basin) **Brazil and Argentina (Paraná-Paraguay Basin)**	Population surveys in areas with poor or no knowledge about giant otter occurrence in the last ten years	$ 50,000 each for two projects
Brazil (Pantanal, Amazonia, Cerrado), **Bolivia (Amazonia), Peru (Amazonia),** **Colombia (Orinoco)**	Long-term population monitoring programs to evaluate population dynamics, behavior, health, genetics and ecological constraints in pristine habitats as control cases in assessing impacts on giant otter populations under high human impacts	$ 60,000/year for 5 years, 4 projects
Brazil (Tapajós River system)	"Before-After With Control" monitoring programs of giant otters in areas of hydroelectric power plant projects to evaluate impact on the species and to develop protocols for mitigation/compensation actions	$ 200,000 $ 20,000/year for 10 years
Brazil (Pantanal) **Peru (Manu National Park)**	Creation of global guidelines for giant otter watching by ecotourists including mandatory responsible behavior; conduct training workshops with locals to implement guidelines in areas with high ecotourism potential	$ 60,000 for 2 years Two projects

South America
Neotropical Otter
Lontra longicaudis



A species closely related to the North American river otter, the Neotropical otter is widely distributed across Latin America. Often found in areas inhabited by the Giant otter, the two species appear to coexist.

Red List Status
The Neotropical otter is classified as Near Threatened in the IUCN Red List. It is projected to undergo a decline of 25% in the next 27 years, or three generations (Pacifici *et al*. 2013). CITES: Appendix I.

Distribution
The Neotropical otter is widely distributed throughout north, south and central South America and Mexico (Sánchez and Gallo-Reynoso 2007, Rheingantz and Trinca 2015). The species is present in almost the entire South American continent except for Chile. Across the known distribution, the Neotropical otter has high genetic diversity based on geographic factors (Trinca *et al*. 2012, Hernandez-Romero *et al*. 2018). Three subspecies are proposed by their present disjunct distribution: *L. longicaudis annectens*, restricted to Central America and northwestern South America; *L. l. enudris*, distributed across the Amazonian region, from eastern Venezuela, Colombia, Guianas, Suriname, Ecuador and Peru to northwestern Bolivia and northern Brazil; and *L. l. longicaudis*, present in the rest of the range in South America (Larivière 1999, Trinca *et al*. 2012, Hernandez-Romero *et al*. 2018).

Habitat and Ecology
The Neotropical otter is found in aquatic environments such as rivers, streams, lakes, lagoons, estuaries, mangroves, marshes and coastal shorelines (Rheingantz and Trinca 2015, Rheingantz *et al*. 2017a). This otter occurs in a wide variety of habitats from rocky shorelines to deciduous and evergreen forests, warm and cold climate rainforests, and coastal savanna swamps, from sea level up to 4000 m (Larivière 1999, Rheingantz *et al*. 2014). It has been reported using coastal habitats and islands in Brazil (Carvalho-Júnior *et al*. 2006), as well as intermittent rivers in seasonally dry tropical forests of the Brazilian Northeast region (Rosas-Ribeiro *et al*. 2017).

The otter has a long, dark brown, heavily built body with fully webbed feet. The species is flexible in its activity behavior, being more diurnal in the Pantanal and more nocturnal in the Atlantic Forest, perhaps due to human activities (Rheingantz *et al*. 2016).

The Neotropical otter is considered a solitary species, although pairs are observed during reproductive periods, and small groups of females and their cubs also occur (Rodrigues *et al*. 2013). In spite of its high dependence on water, the species spends a considerable amount of time on land, especially in activities such as scent marking, reproduction and parental care (Rodrigues *et al*. 2013). Breeding occurs mostly during the dry or low water season but may occur throughout the year in some places (Parera 1996). Litter size varies from one to five cubs (Larivière 1999), with two or three on average (Parera 1996).

Otters are opportunistic predators that mainly prey on fish and crustaceans (Gallo-Reynoso 1997, Pardini 1998, Utreras *et al*. 2002, González *et al*. 2004, Rheingantz *et al*. 2017a) but also consume amphibians, mammals, birds, and other prey (Rheingantz *et al*. 2017b). As an otter with a wide distribution range, *L. longicaudis* has a varied diet (Rheingantz *et al*. 2017b). Detailed data on population size and

The Neotropical otter

The Neotropical otter has been a well-known species since pre-Hispanic times. Indigenous histories report a harmonious relationship between these otters and humans.

The VIII Aztec emperor 'Ahuitzotl' was named after the Neotropical otter in Nahua language.

Later on, otters were described to missionaries as a well-known species and the subject of several legends.

Nowadays there are many place names referring to otters in Spanish -- nutria, perro de água, lobo de rio, lobito de rio, in Portuguese -- lontra, lontrinha, cachorro de água -- in French -- loutre à longue queue, loutre d'Amérique du Sud -- and in indigenous languages (Gallo-Reynoso 2013).

Otters were kept as pets by indigenous people throughout their distribution range, and even today otters are sometimes kept as pets by fishermen and indigenous people.

Public awareness of the ecological role of otters in aquatic systems and the impact of otters on fisheries need attention, particularly in areas of conflict.

densities for the species are scarce and limited to small areas but suggest that Neotropical otter populations are decreasing (Trujillo and Arcila 2006, Rheingantz and Trinca 2015). Recently, efforts by researchers have generated a more complete database on the species status at the continental level that changed the IUCN Red List status from Data Deficient to Near Threatened (Rheingantz and Trinca 2015).

Threats

The modification and fragmentation of natural habitats by human activities represents the main threat to the species by creating isolated populations of otters. The species may occur in areas with some human activities and habitat degradation, but human density is negatively correlated to otter presence (Rheingantz *et al*. 2014, Rheingantz and Trinca 2015). There are stable populations in more pristine areas throughout the species' range, but populations are decreasing in more heavily human-modified areas (Rheingantz and Trinca 2015).

The species was severely hunted until the 1970s for the international fur market, with hundreds of thousands of pelts exported from South American ports between 1945 and 1975 (Brack Egg 1978, Donadio 1978, Larivière 1999, Antunes *et al*. 2016). Even this estimate is probably low, since official export numbers may be less than 50% of the actual trade (Donadio 1978). Despite this heavy demand for fur, biological and ecological characteristics make Neotropical otters more resilient to exploitation than giant otters. Oral history and data from historical documents indicate that Neotropical otter populations have persisted at low densities in local and regional scales (Pimenta *et al*. 2018).

Neotropical otters are still illegally hunted and killed in conflicts with fishermen and fish hatcheries due to perceived fish depredation (Chehébar 1990, Barbieri *et al*. 2012). Although fishermen often have a negative perception of the otter, many of them report that actual damage from the Neotropical otter is small (Barbieri *et al*. 2012, Castro *et al*. 2014, Fonseca and Marmontel 2011). Indeed, fishermen from northeastern Mexico showed a positive attitude toward conservation actions for the otter (Mayagoitia-González *et al*. 2013). Otters also become entangled in fishing nets, as reported in southern Brazil (Quintela *et al*. 2011).

Exposure to and bioaccumulation of toxins is known to harm the species (Josef *et al*. 2008, Ramos-Rosas *et al*. 2013). Mercury has been observed in fur and tissues samples of the species from the Pantanal (Fonseca *et al*. 2004), and in otter scat in southeastern Brazil (Josef *et al*. 2008). Studies show that the Neotropical otter may be exposed to high levels of other heavy metals such as lead and cadmium even in protected areas of Mexico (Ramos-Rosas *et al*. 2013), and other Persistent Organic Pollutants (Latorre-Cárdenas 2013). Industrial waste spills increase heavy metal levels in watercourses and have been associated with otter mortality in Mexico (Gallo-Reynoso 1997).

Roadkills of Neotropical otters have also been documented in the Guianas (Duplaix 2004), in southern and southeastern Brazil (Quintela *et al*. 2011), and in Costa Rica and Mexico (Santiago-Plata pers. comm.). Episodes of intense rainfall are becoming more frequent and when combined with deforestation along riverbanks can cause landslides and flooding. According to Navarro and Quadros (2017) this can force otters to abandon an area, to which they return only slowly.

The effect of cattle ranching in the riparian habitat of some rivers in Mexico has devastated the biodiversity of some rivers, causing significant river bank erosion and turning the river ecosystem into an oxygen poor environment, thus reduced fish abundance. There is also a concern that zoonotic diseases may be transmitted by cattle to wildlife (J.P. Gallo-Reynoso pers. comm.).

The long-term impacts of dam construction on the species are poorly understood. Dams have the potential to degrade the environment by changing flowing to standing water and by decreasing functional connectivity for both individuals and populations. Dams also change the local prey community, affecting otter diet in unknown ways (Quadros 2012). Despite this, the species has been recorded in hydroelectric reservoirs years after damming (Cabral *et al*.2008, Róseo 2010).

Neotropical otters are held in a number of zoos in Latin America but are currently absent from zoos in the Northern Hemisphere.

The protozoans *Giardia spp*. and *Cryptosporidium spp*. were recently first reported for *L. longicaudis* from northern and northeastern Brazil. Although clinical significance of these results is still unclear, they raise concerns about transmission to other aquatic mammals and even humans, since oocysts and cysts may remain infectious for long periods (LeChevallier *et al*. 1991). Mortality of otters due to diseases such as canine distemper (Hernández-Romero pers. obs.) is also a threat. The intensity and effect of the impact of diseases on local otter populations need to be further investigated.

Keeping Neotropical otter cubs as pets has been reported in México (Gallo-Reynoso 1989), in the Brazilian Amazon (Marmontel *et al*. 2011, Silva pers. comm.) in Venezuela (Gonzalez and Utrera 2004), and in north of Costa Rica (Santiago-Plata pers. comm.). In some locations, medicinal use of otters has been documented. In the Brazilian Amazon for example, an infusion of Neotropical otter skins has been said to cure shortness of breath and asthma (Fonseca and Marmontel 2011). In Costa Rica, among indigenous Bribri in the Talamanca Mountains range, when a family wants one of their children in the future to be a good fisherman, they bring an Awá (Shaman) to pass a piece of otter skin over the back of the pregnant mother (Borge and Castillo 1997).

The intensity and effect of these threats on otters is poorly understood, but there is a perception that populations are declining across the species' range (Rheingantz and Trinca 2015). With expanding human activities in Latin America, Neotropical otter populations may further decline in the future. The threat is more acute in some regions, such as in Northeastern Brazil, where the otter populations are concentrated in lowland rivers which are prime locations for agriculture, ranching and other human activities (Rosas-Ribeiro 2017).

Threat Mitigation Measures

Policies need to be adopted to mitigate the impact of human modification and fragmentation of riverine and coastal habitats such as dams, gold mining, agriculture, deforestation and overfishing, as well as regulate the release of domestic and toxic waste in riverine systems near critical populations of otters.

Throughout their range, Neotropical otters are present in many protected areas, the centerpiece for the conservation of the species. Standardized monitoring programs should be implemented in protected areas and data collected from all range countries should be combined to compare regional status.

National otter conservation plans should be developed for range countries that do not yet have them and implemented in countries that do have them. National conservation plans can identify regional threats and design specific conservation actions at a country and regional level.

The enforcement of laws protecting otters is usually weak, even though the species is listed on Appendix I of CITES and declared illegal to kill in several countries. National legal protections must be more strongly enforced.

Surveys should be conducted in areas with little information in Suriname, Guyana, Paraguay and most countries of Central America. We recommend long-term research on human impacts on otters both inside and outside protected areas throughout the species range. The geographic distribution of the species needs to be better understood, especially in border areas of its distribution, such as Mexico, Argentina, and northeastern Brazil. This will advance an understanding of which climatic and ecological factors influence limitations on the species range as well as the role of corridors and geographical barriers.

Public awareness of the ecological role of otters in aquatic systems and the impact of otters on fisheries need attention, particularly in areas of conflict. Effective education programs help change the negative perception of fishermen of otters in coastal and riverine habitats. Such programs already exist in Mexico, Colombia, French Guiana and Brazil, and need to be expanded elsewhere in the species range. Training local people to work in the field and community involvement generates empathy for the animal.

Strategies should be developed to prevent otter predation on fish farms and damage to fishnets. We recommend the adoption of electric fences in fish farms as used in Europe for Eurasian otters. A baseline evaluation of the economic impact of otters in fisheries and fish farms is needed. At indigenous and community levels, community agreements for responsible fishing need to be designed and implemented.

We recommend that environmental impact studies be required for all dam projects and legal instruments developed that ensure compensatory measures for negative impacts on otters. Monitoring the impact of dams on Neotropical otters before and after dam construction is needed to assess changes in population dynamics and genetic structure. We recommend the establishment of long-term Neotropical otter conservation programs in coastal areas of the Atlantic forest, Mexico, the Cerrado, Central America, Argentina, and the Amazon Basin.

Captive Populations
Neotropical otters are held in a number of zoos in Latin America but are currently absent from zoos elsewhere.
In Mexico: Zoológico de Guadalajara, Acuario de Veracruz, Zoológico de la Ciudad de México, Zoológico de la Ciudad de México, Acuario Michin-Jalisco, ZOOMAT-Chiapas, Zoológico de San Juan de Aragón. In Colombia: Parco Zoológico de Cali. In Brazil: Aquário de São Paulo, Fundação RioZoo – Zoológico do Rio de Janeiro, Museu Emilio Goeldi. In Ecuador: Zoológico Parque Histórico, Zoológico Yanacocha.

Site-specific Conservation Locations
The vast Amazon Basin represents the best opportunity for the conservation of the Neotropical otter. The dozen or so conservation mosaics made up of neighboring national, state and municipal protected areas, together with overlapping indigenous territories, are crucial as strongholds for the conservation of Amazonian wildlife, including the Neotropical otter.

Other priority areas for Neotropical otter protection are the headwaters of major rivers across its wide distribution range. Neotropical otter habitat is important in the headwater rivers of the highlands of Brazil, Mexico and Andes, where studies of fish farms can enable an assessment of otter interaction with these facilities. We recommend the protection of perennial tributaries of the Paraná and Amazon Rivers.

Protected Areas with suitable habitat, both those with and without otter populations, should be managed for otter, particularly in Northeastern Brazil, the Cerrado, Brazilian Amazon, Central America, and Mexico. The Gulf of México Basin includes many large rivers used for navigation and oil-related industries and heavily used for fishing. In the Pacific Basin, including the Gulf of California Basin, two or three rivers are used for port activities and transport of mineral, agricultural and industrial goods. These lower basins can dry out seasonally, trapping water in the upper basin tributaries, which then provide crucial habitat for otters.

In Mexico, the upper parts of the basins of the two oceanic slopes are areas with high anthropogenic pressure and high degree of disturbance and are important areas to otter conservation. There are several dams and lagoons in the interior of the country, where there is still adequate habitat for otters and are important to be conserved. There are few rivers on the Yucatán Peninsula, but marshes, wells and lagoons provide good otter habitat and deserve protection (Ortega-Padilla *et al*. In press).

Estuarine and coastal habitats and islands of southern, southeastern and northeastern Brazil and in Central America and Mexico are key marine habitats for Neotropical otters, both inside and outside

protected areas.

In northeastern Brazil, otter populations are concentrated in coastal river basins partially or completely covered by Atlantic Forest. The northeastern Atlantic Forest is the least conserved portion of this biome, with high human populations, putting otters at risk. Here, the São Francisco River is the largest perennial river crossing the Caatinga biome and has been suggested as an important potential dispersal route connecting coastal river basins with those located north of the Caatinga (Rosas-Ribeiro, 2017).

In coastal areas and islands of the south, southeast and northeast of Brazil, Central America and Mexico, otters need conservation attention.

The Choco region, on western slopes of Colombia, Venezuela and Ecuador, presents an important opportunity to develop regional conservation actions in an ecosystem that is highly altered by human activities.

In Peru, Manu National Park is a case of special concern. Otter presence has been confirmed there in two southern Peruvian rivers, but lack clear species identification. If the species is the Neotropical otter, it would be an expansion of known distribution range of the species to the west and would deserve attention. Surveys to confirm distribution range are needed in Mexico, Northeastern Brazil, Paraguay and Argentina, and in the highlands of Brazil, Mexico, central region of Venezuela and the Andes of Peru and Ecuador.

Success Stories

The large conservation landscapes of the Amazon Basin provide hope for the conservation of the immense biodiversity of the region. The Basin, with its many large and small rivers, represents a collective opportunity for national, state and municipal protected areas, together with large indigenous territories, to protect the Neotropical otter. Almost 50% of the Amazon Basin is already designated either as protected area or indigenous territory. These conservation mosaics are especially important for wide-ranging and naturally scarce species such as the Neotropical otter. Conservation efforts should continue to concentrate on securing and supporting these conservation strongholds.

In Southern Brazil, two long-term projects have focused not only in otter research, but also in riverine and coastal community involvement: Projeto *Lontra* and Instituto de Pesquisas Cananéia. These two programs have identified human-otter conflicts, otter bycatch, and use of otters as pets in their region. Through educational programs in elementary and high schools, the programs teach students about the entire ecosystem, wildlife, environmental impacts, and ways to mitigate those impacts. They work together with wildlife managers, local leaders and public authorities to sensitize the riverine and coastal communities in environmental conservation.

Effective education programs help change the negative perception of otters by fishermen in coastal and riverine habitats. Such programs already exist in Mexico, Colombia, French Guiana and Brazil, and need to be expanded elsewhere in the species range.

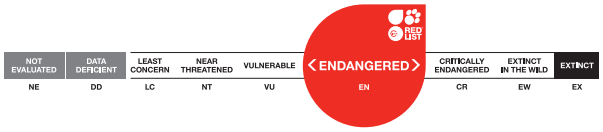
Neotropical Otter *Lontra longicaudis*
Projects and Funding Opportunities

Region	Actions	Costs
All countries	Conduct national surveys to confirm the distribution range of the species every 5 years to evaluate possible range contraction or expansions	$ 60,000/year per survey
All countries	Create a long-term program to evaluate the impacts of otters in fish farms and fisheries; stable isotopes and feeding ecology research to evaluate actual otter-human conflict	10 years Field trips and analyses $10,000/year per area
All countries	Clarify phylogeography – gather 20 samples of each genetic group to confirm subspecies status	$5 years Full-time position $ 20,000/year salary Analyses and support $ 100,000
All countries	Train Protected Areas rangers to conduct surveys for otter presence/absence	10 years One full-time position of a teacher/researcher to train rangers $ 20,000/year per area
Central America	Create full-time researcher position to gather information and conduct surveys in areas lacking information	5 years $ 12,000 annual salary Field work/year; $ 20,000
Brazil, Colombia, Argentina and Mexico	Develop long-term population ecology research (genetics, radiotelemetry) at least in one area of each proposed subspecies	10 years $ 50,000/year per area
Brazil, Colombia, Mexico	Create educational programs with riverine communities that coexist with otters, to portray the otter as wetland ambassador	$ 30,000/year for 3 years Four projects in 4 countries
Highlands of Peruvian Andes and Mexico)	Conduct surveys to document presence of Neotropical otters in mountainous areas	$ 500,000 $ 50,000/year for 10 years

Neotropical Otter *Lontra longicaudis*
Projects and Funding Opportunities

Region	Actions	Costs
Brazil	Implement before and after monitoring of otter population in areas of dam projects	$ 30,000/year per study area
Brazilian Amazon	Investigate human-otter conflicts; feeding ecology and prey community	3 years At least 6 areas $ 5,000 /year per area $15,000 total per area
NE Brazil	Conduct surveys to document presence and absence of otters south of São Francisco River; population genetics surveys throughout Northeastern region and along São Francisco River Basin to investigate the limits of the subspecies *L. l enudris* and *L. l. longicaudis;* human-otter conflict research	One full time research position, two assistants, ten campaigns $30,000/year for 5 years $ 30,000 for genetic analyses
Otters in coastal areas and islands of Brazil	Conduct population monitoring; environmental education; studies on feeding ecology and habitat use	Six areas – 5 years $ 10,000/year per area $50,000 per area
Urban environments – Rio de Janeiro, Panambi and Florianópolis, Brazil	Conduct population monitoring	4 years $ 20,000/year per area
Southern Brazil	Conduct population genetics survey and human-otter conflicts research	4 years $ 20,000/year per area
Paraguay	Create full-time research position to study ecology of *Lontra longicaudis* and *Pteronura brasiliensis*; surveys in areas with no information	4 years $ 20,000 per area per year
Argentina	Create baseline for long-term monitoring program by rangers in Protected Parks	5 years One full time and two PhD positions One survey in each Protected Area/year $ 40,000/year

South America
Marine otter
Lontra felina



One of the smallest otter species, the Marine otter is found along the coastlines of Peru and Chile in a long and discontinuous distribution. Hunting in tide pools and in the surf, it comes ashore to eat and rest in rocky crevices.

IUCN Red List Status
The Marine otter is classified as Endangered, based on a projected population reduction of at least 30% over the next three generations, or 30 years (Pacifici *et al*. 2013). CITES: Appendix I.

Distribution
The Marine otter is found along the southern Pacific coast of South America from Chimbote (9°S) in northern Peru (Valqui 2012), to Isla Grevy (56°S) at the southern tip of Chile (Sielfeld 1997) and eastwards to the Isla de los Estados (54°S) in Argentina (Parera 1996). The species' distribution in Argentina is unclear (Cassini 2008). Its habitat is a patchwork of disconnected suitable habitats, such as rocky shore patches with caves or sometimes docks, shipwrecks or abandoned fishing boats, and unsuitable habitats such as sandy beaches or rocky shoreline without caves. Marine otters may be absent for several hundreds of kilometres of coastline throughout the species´ long distribution range, resulting in highly fragmented populations (Redford and Eisenberg 1992, Sielfeld 1997, Vianna *et al*. 2010, Valqui 2012).

Habitat and Ecology
The habitat of the Marine otter is the Pacific coast of South America. It prefers rocky shores with caves that are above the high tide mark. The species primarily uses coastlines from about 30 m inland to 100 to 150 m offshore (Castilla and Bahamondes 1979), although several populations have been observed in freshwater habitats farther inland in Peru. In southern Peru and in Chile, it is present near large algae communities, which offer a high abundance and diversity of prey (Castilla and Bahamondes 1979). Sandy beaches offer marginal habitat (Sielfeld 1989) and typically are used only for resting during long-range traveling, for traveling between dens, and to access dens some distance from the water's edge (Ebensperger and Castilla 1992). Marine otters are, for the most part, restricted to salt water, but may occasionally travel up freshwater rivers in search of prey (Brownell 1978, Cabello 1978, Redford and Eisenberg 1992). Marine otters only use rocky shores if dens are present, suggesting high ecological requirements for breeding space.

The Marine otter is one of the smallest otters and the smallest marine mammal. It has coarse dark brown fur, with a dense insulating underfur, and webbed paws with strong claws. They are typically solitary, with a group size of seldom more than two to three individuals. It is generally active during the day, with peaks of activity in early morning, mid-afternoon, and evenings (Medina *et al*. 2006). Reproductive behavior is observed all year long with litter sizes from two to four cubs (Valqui 2012). Young otters remain with their parents for about ten months.

The Marine otter diet is very variable, regionally and seasonally, and the species shows an opportunistic feeding behavior (Medina-Vogel *et al*. 2004). The diet is composed mostly of invertebrates, including shrimp and crabs, molluscs, as well as fish, occasional birds, small mammals, and fruit (Cabello 1978, Brownell 1978, Castilla and Bahamondes 1979, Ostfeld *et*


yaqu pacha

A strategy to protect otter habitats along the entire coast, coupled with initiatives to create specific regional conservation areas, is a challenging but ideal goal for Marine otter protection.

al. 1989, Sielfeld 1990, Medina 1995).

Threats

Historical reports on Marine otters suggest that the species was abundant until the 19th century (Tschudi 1844, Darwin 1859) when populations declined steeply due to hunting for the pelt trade. Thousands of otter pelts were exported from Chile in the first half of the 20th century (Iriarte and Jaksic 1986). While hunting was the major threat to the species until the 1980s, it has diminished considerably, with only occasional poaching documented today. In southern Chile, direct hunting was reported in 2004 at Caleta El Manzano de Pucatrihue to 'control' the population (Cordova and Rau 2016).

Today, the ever-increasing pressure of human populations on coastal habitats represents the major threat to the Marine otter. The species' preference for coastal waters that offer an abundance and diversity of prey conflicts with growing small-scale fisheries. Small-scale fishermen increased 34% from 1995 to 2005, and fishing boats 54% within the same decade (Alfaro-Shigueto *et al*. 2010). Although there is no qualitative documentation of bycatch, there are an increasing number of reports of otters entangled and drowned in fishing nets (Mangel *et al*. 2011, Pizarro 2008). Dynamite fishing, although illegal, is still used for fishing along the Peruvian coast.

Urban development conflicts with the Marine otter's use of the coastline. Chile is one of the top ten countries in aquaculture production, and the deep and long-term impacts of the industry on rivers and marine ecosystem, will expose the species to bacteria, viruses and antibiotics. Releases from mining tailings and sewage into the ocean expose Marine otters to heavy metals, pesticides and other toxic elements.

Urban development within the region results in an increase in domestic and feral dogs, cats, and rats, which can displace otters from their habitat, attack them directly (Mangel *et al*. 2011, Medina-Vogel *et al*. 2008, 2007, 2006) and introduce infectious diseases (Mangel *et al*. 2011).

Laws protect this endangered species in Peru and Chile, but enforcement is very weak. If an otter is killed or poached, the perpetrators may be identified, photographed or filmed, and still no legal action is taken. Rules in natural protected areas such as no hunting, fishing, poaching, or trespassing are not always respected.

Global natural factors like the El Niño Southern Oscillation (ENSO) also may considerably affect the Marine Otter population (Vianna *et al*. 2010), due to the more or less drastic climatic and oceanographic changes that cause the mortality of several marine communities from fish to mammals (Apaza and Figari 1999, Wang and Fiedler 2006).

Threat Mitigation Measures

An initiative to establish a regional conservation area in southern Peru -- Area de Conservación Regional Marino Costero Morro Sama, Tacna -- was started around 2003, but effective implementation stopped in 2006 because of a change in government, and the situation has not progressed since then. The area is the only otter hotspot on the Peruvian coast (with about 88 individuals in 55 km of coast) (Alfaro and Mangel 2008). Thus the initiative of establishing a protected area containing an otter hot spot should be supported and completed.

A strategy to protect otter habitats along the entire coast, coupled with initiatives to create specific regional conservation areas, is a challenging, but ideal goal for Marine otter protection. Thirty-four existing natural protected areas in Peru and another ten in Chile could host artificial habitats, such as wave breakers, and specially designed artificial otter habitats. These should be visibly advertised to raise awareness of the otter's presence to local communities.

A reassessment is needed concerning the construction of two hydroelectric power stations, on the Colca-Majes River and the Cotahuasi-Ocoña River, both in Peru, where Marine otters are reported in freshwater since 2012. Specific mitigation measures for impacts on wildlife should be considered. Dam construction should be approved only if careful and explicit mitigation measures are put in place.

An effective program to control invasive feral dogs, cats, and rats should be developed, and should be paired with studies on prevalence of transmittable diseases, especially in populations near human settlements. In Chile, studies on disease transmission to otters are already being conducted.

Environmental education programs should be carried out, such as the one by the NGO Pro Delphinus, aimed at the general public and the young people who are the stakeholders of the future and will help to develop sustainable activities in their region.

In order to stem further declines, studies should be undertaken to explain why the distribution of the Marine otter is discontinuous along its coastal range. Moreover, both the northern limit and southern limits of its distribution need to be clarified through surveys (Alfaro *et al*. 2011).

Although not all fishermen consider otters to be pests, some do, and may kill them "just in case." Fishermen can be informed through awareness programs that the amount of damage otters do has a minor economic impact.

Reintroduction programs are not recommended until more is known about the reasons for the decline of Marine otter populations. High logistic and economic efforts are needed for such programs, and efforts should concentrate on habitat protection and research for the time being.

Success Stories

Research and environmental education programs show that the Marine otter has a high recognition factor and a great potential as a flagship species. The non-profit organization Chinchimen in Chile uses the species as its logo and reports a high recognition and value to its visitors. Fishermen often express sympathy towards the species despite conflict. In Peru, this is never the case for South American sea lions, another species with fishermen conflicts. According to Cordova and Rau (2016) about 67% of artisanal fishermen from a harbor in southern Chile report that otters do not affect their fishing, while 30% said that they do. In another nearby harbor, all fishermen had a positive attitude towards the species, some stating that the species has potential as a tourist attraction and might benefit them indirectly (Cursach *et al*. 2012).

Schoolchildren are often fond of otters and easily identify the species. In educational workshops children prefer to play with otter figures and make drawings of this charismatic animal. Regional governments in Tacna, Peru are including Marine otters in their environmental policies. The Natural Protected Areas and Natural Resources Agency uses the Marine otter as an ambassador for communicating conservation messages to the visitors, for example, in Paracas National Reserve or the Reserva Nacional Sistema de Islas and Islotes y Puntas Guaneras. Reserve managers in protected areas along the

Chilean coast also use the Marine otter as an ambassador for ecosystem protection.

Captive Populations
Currently there are two specimens in the Parque Zoologico, Huachipa, Peru and one in the OBC Chinchimen, Rescue Center in Chile. There are no Marine otters in captivity in the Northern Hemisphere.

Site-specific Conservation Locations
The characteristics of the Marine otter's habitat makes it hard to design a site-specific conservation strategy. Otters are distributed in fragmented populations along the coast of Peru and Chile, over 6,000 km long.

Recent discovery of otters in the Colca-Majes-Camana and the Cotahuasi-Ocoña Rivers in South Peru, far from the coast, suggests that these populations may be highly vulnerable. Otters may need protection from conflicts with fishermen, pollution from illegal mining, and unsustainable tourism development.

Otter populations in Cotahuasi-Ocoña, in the buffer zone of the Cotahuasi Reserve, are at risk from poaching by local shrimp fishermen and the construction of a hydroelectric dam and need special attention.

The Reserva Nacional Sistema de Islas, Islotes y Puntas Guaneras, in Peru's protected areas system, was established in 2010. Studies on otters in the reserve are crucial to understand existing population needs there, as are efforts in law enforcement and otter protection, as well as in the already established Paracas National Reserve and San Fernando National Reserve.

In two fishing ports in South Peru, Morro Sama and Vila Vila, otters have been observed in groups of up to 10, but these two areas are not included in the new system of Peruvian protected areas. A regional protected area was proposed in 2010 but was left aside due to changes in the political landscape. Including this area would be a logical completion of the protection area system and conserve the only otter hotspot along the Peruvian coast.

Considering the characteristics of the Marine otter distribution and the fact that threats will most likely increase in the near and middle future, a stepping-stone model of conservation areas along the distribution area should be implemented. The model should include not only natural protected areas but also artificial habitat features used by otters (wave breakers, otter-boats, etc.).

Local and regional action plans should be developed. Local groups (general public, politicians, fishermen) should be included in the concrete efforts for otter conservation. The sum of local action plans should be documented in a national and/or international action plan.

Local governments should be empowered to take legal action on poaching and other law infringements affecting otters, such as dynamite fishing. Keeping otters as pets should be illegal. Environmental education is needed throughout the Marine otter range.

A program to control and prevent invasive feral animals, such as dogs, cats, and rats, should be implemented. This should be paired with studies on the prevalence of transmittable diseases in these animals, especially in populations located close to human settlements.

Constant long-term monitoring should be done to understand the development of population trends and assess threats.

Studies on Marine otters that live in rivers have recently been initiated and should be expanded to provide a better knowledge on population numbers, ecology and threats.

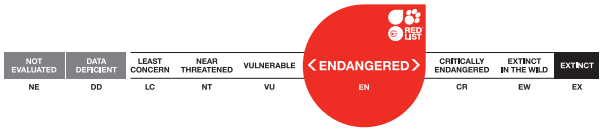
A National Action Plan for Peru for otters in marine and "river/Andean" habitats, is currently being developed.

Marine otter *Lontra felina*
Projects and Funding Opportunities

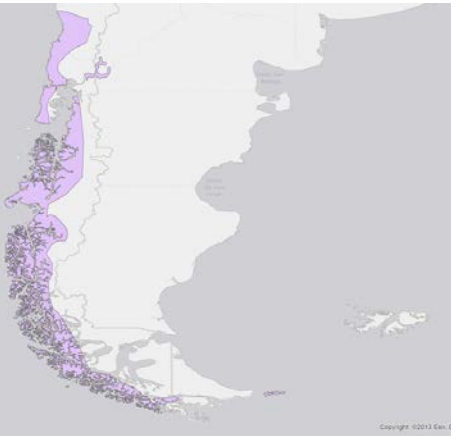
Region	Actions	Costs
National Reserves: **RN Paracas** **(Ica, Central Peru),** **RN San Fernando** **(Ica, Central Peru)** **RNSIIPG*** **(Peruvian Coast)**	Population monitoring Environmental education Feral animal management	One guard per site $ 5,000/year/site $ 62,000/year
Morro Sama **(Tacna, South Peru)**	Create a regional protected area	4 years $ 124,000
All countries	Clarify phylogeography: gather 20 samples of each genetic group to confirm subspecies status	$5 years Full-time position $ 20,000/year salary Analyses and support $ 100,000 Total $ 200,000
Rivers: **Colca-Majes Camanà** **(Arequipa, Peru),** **Cotahuasi-Ocoña** **(Arequipa, Peru)**	Comprehensive study (ecology, genetics, anthropogenic threats) of otters in two Andean rivers	One full time position, two assistants, 6 field campaigns, laboratory costs 4 years $ 335,000
Maitencillo village **(Valparaiso, Chile)**	Improve facilities of the "Chungungo" Aquarium, an environmental education project with 15,000 visitors per summer.	Equipment and infrastructure $ 52,000
Boyecura-Chungungo **(Central Chilean coast)**	Population monitoring Environmental education	Workshops, Citizen science network $ 224,000

* Reserva Nacional Sistema de Islas, Islotes y Puntas Guaneras, a natural reserve system with 10 land points and 24 islands along the Peruvian coast.

South America
Southern River Otter
Lontra provocax



The endangered Southern river otter from the very tip of the Southern Hemisphere has a small distribution in both coastal and freshwater areas of southern Chile and Argentina. Its small population size make strict conservation measures a priority.



IUCN Red List Status
The southern river otter (*Lontra provocax*) is classified as Endangered and populations that use freshwater rivers and lakes are projected to decline by 50% in population size over the next 30 years, or three generations. For populations that use the marine habitats of fjords and islands of Chile, a decline by 50% over the next 30 years is expected.

Distribution
The southern river otter, or huillín as it is locally named, is distributed in southern Patagonia, South America, including parts of the Valdivian temperate forests, the Patagonia steppe, and the Magellanic subpolar forests. This species inhabits freshwater bodies in the northern parts of its range and marine coasts in the southern part of its range in both Chile and Argentina. It probably occupies one of the smallest geographical areas of all otter species (Chehébar 1986).

The species freshwater range was historically wider in both countries (Figure 1). In Chile, the otter inhabited rivers and lakes from Cachapoal River (34°S) (Gay 1847, Reed 1877) north to the Peninsula de Taitao (46°S) (Medina 1996). The current freshwater distribution in Chile has been strongly reduced from north to south due to land use change and human colonization (Medina 1996), and otters are now only found to the Imperial River (38°S) (Rodríguez-Jorquera and Sepúlveda 2011). In Argentina, freshwater populations historically ranged from the Neuquén Province (36°S) to Lake Buenos Aires (46°S) and were mostly associated with water courses in the Andean Range and the steppe (Valenzuela *et al*. 2012). At present, the freshwater distribution in Argentina is mostly restricted to the Limay River watershed, mainly within Nahuel Huapi National Park (Chehébar 1985, Cassini *et al*. 2010, Valenzuela *et al*. 2012).

Southern river otters in marine environments are distributed along the Pacific coast of Chile from 46°S to Tierra del Fuego in Chile (Cabrera 1958, Redford and Eisenberg 1992, Sielfeld 1992, Malmierca *et al*. 2006). In Argentina, marine otters are present only in the Fuegian Archipelago in Los Estados Island and the Beagle Channel, mostly restricted to Tierra del Fuego National Park (Malmierca *et al*. 2006, Valenzuela *et al*. 2012, Valenzuela *et al*. 2013).

Otters in the marine environment in Argentina are probably continuous with those along the Chilean coast (Sielfeld 1992). In the marine environment in Argentina, there are probably two separate populations, one in Isla de Los Estados, National and Provincial Reserve, and the other in Bahia Lapataia, Tierra del Fuego National Park in the Beagle Channel (Centrón *et al*. 2008, Valenzuela *et al*. 2012). Recently the species has been observed in Aguirre Bay of the Mitre Peninsula (Valenzuela *et al*. 2013). Both freshwater and marine populations in Argentina are mostly inside national protected areas.

Habitat and Ecology
In freshwater habitats, the species prefers rivers with abundant vegetation and inhabits diverse types of wetlands including Andean lakes, rivers of different sizes, ponds and estuaries (Chehébar *et al*.1986,

Medina-Vogel *et al*. 2003). In the marine range the species uses rocky coastlines with abundant vegetation cover and low exposure to wind and waves (Sielfeld 1992, Sielfeld and Castilla 1999). In this environment the southern river otter is sympatric with the marine otter (*L. felina*), which is segregated by its preference for more wave-exposed coasts (Sielfeld 1992, Ebensperger and Botto-Mahan 1997).

Southern river otters tend to be solitary and nocturnal. Females with young and breeding pairs are usually the only social groups (Sepúlveda *et al*. 2007). A low overlap of home range between individuals of same sex suggests intrasexual territoriality (Sepúlveda *et al*. 2007).

The otter dens in rock cavities, hollow trees or logs, tree roots (Chehébar and Benoit 1988) or excavates its own den in banks (Chehébar 1982). Cubs are born in September or October in Central Chile, but young can be observed all year round in the southern range (Lariviere 1999). One or two cubs are commonly born, but litter size may reach up to four (Lariviere 1999).
In freshwater habitats otters feed primarily on crustaceans, and to a lesser extent on fish and amphibians (Aued *et al*. 2003, Cassini *et al*. 2009, Sepúlveda *et al*. 2009, Medina 1997, Medina-Vogel and Gonzalez-Lagos 2008, Fasola *et al*. 2009, Rodríguez-Jorquera and Sepúlveda 2011, Franco *et al*. 2013). The diet in the marine coastal environments is composed of coastal fish (Sielfeld and Castilla 1999, Valenzuela *et al*. 2013). In both marine and freshwater environments the species seems to be a specialized aquatic bottom forager, preying on slow benthic fish and crustaceans.

Threats
The distribution of the southern river otter in Chile has declined drastically due to combined pressures from the destruction of habitat, removal of vegetation, river and stream canalization, and extensive dredging (Medina 1996, Medina-Vogel *et al*. 2003). In freshwater environments of otters, the high demand for water for agriculture and other human uses is altering watercourses through these factors, particularly for otter populations in lowlands, such as the Central Valley and the Coastal Range of Chile (Medina-Vogel *et al*. 2003, Sepúlveda *et al*. 2009).

In the case of Andean lakes, where the species occurred historically, high levels of urbanization and tourism is thought to be responsible for its local extinction (Medina 1996).

Habitat alteration by agro-industry plantations of exotic pine and eucalyptus species have a detrimental impact on freshwater otter habitats in Chile, particularly in the coastal range. Likewise, agro-industry ranching and farming activities lead to alteration of habitat by draining watercourses and removing riparian vegetation in freshwater habitats in Chile, particularly in the coastal range and central valley (Sepúlveda *et al*. 2009).

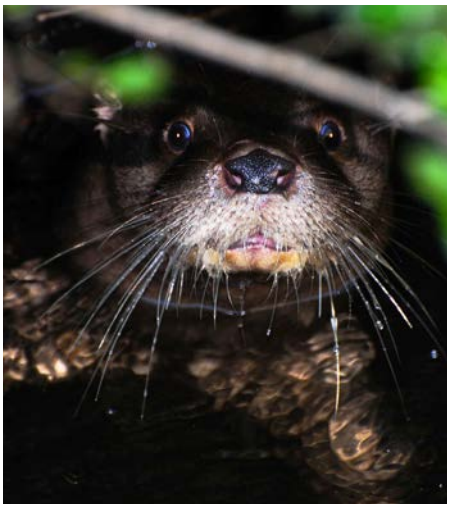
Free-ranging dogs are an important threat to carnivores because of predation and the transmission of diseases such as canine distemper virus, especially in rural and protected areas (Vanak and Gompper 2009, Espinosa 2012, Sepúlveda *et al*. 2014a). Implementing population dog control measures and dog vaccination programs are important measures to mitigate this threat (Sepúlveda *et al*. 2014b).

In several parts of the range, hydroelectric dams are completed or planned for the near future, but thus far no research has been conducted on their potential impact on otters. Wild exotic salmon and the salmon farming industry may reduce otter prey, leading to competition between otters and salmon (Medina 1996, Aued *et al*. 2003, Cassini *et al*. 2009) but no studies have confirmed this. There appears to be no competition between the invasive American Mink (*Neovison vison*) and river otters (Medina 1997, Aued *et al*. 2003, Fasola *et al*. 2009, Valenzuela *et al*. 2013,

The distribution of the southern river otter in Chile has declined drastically due to combined pressures from the destruction of habitat, removal of vegetation, river and stream canalization, and extensive dredging.

Medina-Vogel *et al*. 2013), but the mink is a potential vector of the canine distemper virus given their behavioral similarities (Sepúlveda *et al*. 2014b).

Poaching is a minor problem at present but still occurs, particularly south of 43°S latitude where control of hunting is difficult to implement. From 1910-1954 a total of 38,263 otter pelts (*Lontra felina* and *L. provocax*) were exported from Chile but pelt export stopped after 1954 due to the implementation of country laws and international agreements (Iriarte and Jaksic 1986).



Threat Mitigation Measures

Because of the several agencies involved in the management of the southern river otter, a strong coordination with clear responsibilities and a work agenda is of major urgency in the short term. Actions recommended for both Chile and Argentina are to:

- Develop a Conservation Bi-National Plan for the species
- Develop specific National Conservation Plans
- Develop validated Monitoring Programs in protected and unprotected lands, particularly in Chile where there is no such activity in any population, and
- Reinforce the importance of environmental impact assessment projects in relation to otters in order to a) adequately determine presence of otter population in project areas, and b) appropriately require projects to incorporate measures of monitoring, mitigation and compensation activities.

There have not been any reintroduction attempts, which could be an appropriate conservation action considering the success of such plans with North American and European otter species.

In the freshwater otter habitats of the coastal range and central valley in Chile, the Southern river otter needs protection from intensive human activities through the creation of protected areas of adequate size and suitability. Otter corridors need to be established by river restoration projects to improve habitat connectivity. Free-ranging dogs in this region should be controlled through sterilization and educational campaigns and vaccinated against canine distemper virus.

Infrastructure projects, and particularly dam projects, should consider the Southern river otter in the environmental impact assessment process and mitigate damaging impacts on the species. The protection of otter habitat, both riparian and coastal lake vegetation, should be integrated into zoning processes of urban and tourist areas. Studies should be conducted in the marine coastal range to determine impact of intensive salmon industry on otter populations.

National Action plans are developed by the Ministerio del Medio Ambiente, but no Action Plan exists for this species at present, which is the most urgent conservation action priority. In Chile, the species is classified as Endangered by the Reglamento de Clasificación de Especies (Chile 2011). The Subsecretaria de Pesca

is the governmental agency responsible of the conservation and management of the species, and the Corporacion Nacional Forestal is responsible for the conservation of populations inside protected areas. Hunting has been prohibited since 1929 (Iriarte and Jaksic 1986).

In Argentina, the Southern river otter needs continued high priority protection. The species is classified as Endangered, and the governmental agency responsible for its conservation and management is the Ministerio de Ambiente y Desarrollo Sustentable de la Nación through the Dirección de Fauna Silvestre y Conservación de la Biodiversidad. The Administración de Parques Nacionales (National Parks Administration) is responsible for conservation of populations inside the national protected areas, where the species is classified as Special Value Species.

Success Stories
The administration of the Nahuel Huapi National Park in Argentina has been implementing systematic monitoring of otter distribution since 1986. During this time, the populations have shown a stable status and even expanded their distribution outside the park in the Limay River (Fasola 2009). Furthermore, in 2002 in another segment of the Limay River, another population was discovered (Carmanchahi *et al*. 2006). Since 2008, and every year until now, "The Week of the Huillín" is celebrated in Vicente Perez Rosales National Park. During the second week of October for five days, activities related to environmental education, and in particular the Southern river otter, are carried out by local communities, the municipality and the Park administration, CONAF.

Captive Populations
To our knowledge there are no ex situ captive individuals of this species, and no historical records exist at zoos or other captivity centers.

Site-specific Conservation Locations
In Chile and Argentina there are Southern river otter populations within several official protected areas. Outside protected areas there are two kinds of sites with adequate otter habitat: 1) areas with healthy otter populations, and 2) areas where otters were present in the past but no longer are. For areas with good habitat and otter presence, we recommend official protection. For areas with good habitat and no otters, we recommend studying the potential for otter reintroduction programs.
In the freshwater habitat of Chile, the following protected areas inhabited by otters merit special attention: 1) the Natural Sanctuary Carlos Anwandter and the Ramsar site Los Rios District, 2) Alerce Costero National Park, 3) Vicente Pérez Rosales National Park, Los Lagos District, and 4) Chiloé National Park, Los Lagos District. In the Chilean freshwater distribution there are areas with adequate otter habitat but no otter presence in the Villarrica Lake, Llanquihue Lake, Rupanco Lake and Pirihueico Lake.

These areas should be assessed for potential otter reintroduction projects. Furthermore, there are some areas where otters are present in freshwater environments but have no official land protection, such as the Mahuidanche and Queule Rivers, swamp-forests in La Araucania Region, Maullín River in Los Lagos Region, and the private park Tantauco on Los Lagos Region that could have official protection. In the case of the Carlos Anwandter Natural Sanctuary in Los Rios Region an increase the category of protection and expanded territory of protection are needed for the upper part of the watershed.

In the freshwater habitat of Argentina, the following protected areas inhabited by otters merit special attention: 1) Nahuel Huapi National Park, 2) Protected Landscape of Limay River, 3) Muncipal Park Llao Llao and 4) Morenito-Ezquerra Urban Reserve. Some areas where otter habitat is in good condition but otters are not present are: the North section of Limay River Basin and Hua Hum River Basin (both within Lanín National Park), Futaleufú River Basin (Los Alerces National Park), Chubut River Basin, and Buenos Aires Lake Basin (close to Patagonia National Park). These areas should be assessed for potential otter reintroduction projects. There is otter presence in areas without official protection in the Limay River and associated reservoirs: from Nahuel Huapi Lake to Neuquen City (Río Negro and Nequén Provinces), and La Plata and Fontana Lakes in Senguer River Basin (Chubut Province). Official protected areas should be created in these areas.

In the marine coastal environment of Chile, the following protected areas inhabited by otters merit special attention: 1) Corcovado National Park, 2) Isla Magdalena National Park, 2) Las Guaitecas National Reserve, 3) Katalalixar National Reserve, 4) Laguna San Rafael National Park, 5) Bernardo O'Higgins National Park, 6) Alacalufes Forest Reserve, 7) Alberto D'Agostini National Park, and 8) Yendegaia National Park.

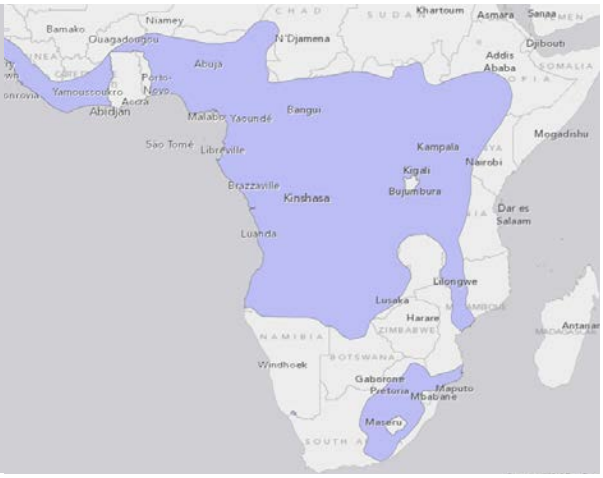
In the marine coastal environment of Argentina, Isla de los Estados has otter populations in most of the fiords and bays of the island (Valenzuela pers. comm.). While this island is a National and Provincial Protected Area, it still lacks a Management Plan, and there is no control or monitoring of tourist or naval activities. Goats, red deer, and rats are on the island, invasive species that could harm the otter population. This Protected Area should be better managed for otters and an exotic species eradication campaign begun. Otters have also been sighted at Mitre Peninsula at the tip of Tierra del Fuego Island, and the area should be studied for the possibility of establishing an official Protected Area.

Southern River Otter *Lontra provocax*
Projects and Funding Opportunities

Region	Actions	Costs
Chile: freshwater distribution	Studies on land ownership, legal issues, biodiversity conditions and threats to investigate purchase of otter habitat	One professional (part-time) to coordinate studies for 5 years $ 50,000/year
Chile: freshwater distribution	Study to determine technical feasibility and costs of a reintroduction project in specific sites	Two professional positions $ 30,000/year per person every 3-4 years
Chile: freshwater distribution	Develop and implement strategic communication campaign	Journalist (part time) $ 15,000/year
Chile: freshwater distribution	Comprehensive study (ecology, genetics, anthropogenic threats) of otters in two Andean rivers	One full time position, two assistants, 6 field campaigns, laboratory costs 4 years. $ 335,000
Argentina: marine and freshwater distribution	Develop and implement strategic communication campaign	Journalist (part-time) $ 12,000/year
Chile and Argentina	Install monitoring capacities in protected areas: 1) Workshop defining standard methodology 2) Develop capacity in institutional teams	Workshop Expert facilitator $ 8,000 Monitoring specialist $ 8,000 Workshop attendees travel/housing $ 25,000
Chile: marine distribution	Monitoring survey for all marine distribution	2 professional positions $ 25,000/year per person for 2 people, every 3-4 years Logistics $ 50,000 every 3-4 years
Argentina: freshwater distribution	Surveys, field and social, throughout past distribution of the species especially in Northern Neuquén, East Neuquén and central west Chubut Province to detect isolated populations	2 professional positions $ 25,000/year for 2 people
Argentina: marine distribution	Expedition to Península Mitre (eastern part of Tierra del Fuego) to determine otter status	2 professional positions, 30 day expedition, $ 4,500 each Field support $ 10,000
Chile and Argentina	Travel and meetings for the OSG leadership and species specialists for meetings within the region or international travel	$ 40,000/year
Chile and Argentina: marine and freshwater distribution	Annual competitive research grants for graduate and undergraduate students	$ 100,000/year for five grants
Chile and Argentina: marine and freshwater distribution	Comprehensive genetic study based on samples collected during expeditions, surveys and monitoring	$ 50,000

Africa
Spotted-necked Otter
Hydrictis maculicollis

The Spotted-necked otter is similar in appearance to the Eurasian otter but is phylogenetically quite distinct and not closely related to other otter species. Widely distributed, it remains poorly known in many countries.



IUCN Red List Status
The Spotted-necked otter is listed as Near Threatened and almost qualifies as Threatened. This is a precautionary listing given the continued decline in the overall Spotted-necked otter population and a projected decline of at least 20% over the next three generations (Pacifici *et al.* 2013). CITES: Appendix II.

Distribution
Spotted-necked otters have a large distribution in Africa but are restricted to areas of permanent freshwater, good bankside cover and an abundant prey base. Thus, while the distribution range is large, the spatial size of their occupied habitats is much smaller and generally unknown. The species is found in sub-Saharan Africa from Guinea-Bissau in the west, to southwest Ethiopia, east to Kenya and Tanzania and south to northern Namibia, Botswana and Northwest Zimbabwe, also in Malawi, Mozambique and eastern South Africa. It is not found in marine or estuarine waters.

Recent studies in West and East Africa (Djagoun *et al.* 2011, Reed-Smith *et al.* 2010, Reed-Smith pers. comm.) indicate population declines due to many threats. Unfortunately, beyond these studies there are very little data available on presence or status of this species throughout most of its historic range for the last fifteen years, and only marginally more for the last 30 years. The Spotted-necked otter is decreasing throughout its range, mainly as a result of degradation of its habitat (Rowe-Rowe 1995) and unsustainable fishing practices (LVFO 2008).

Habitat and Ecology
The Spotted-necked otter inhabits freshwater systems where water is clear, unpolluted and rich in fish. Prime Spotted-necked otter habitat in Africa includes the large lakes of central and East Africa as well as the open waters of areas like the Okavango Delta (Rowe-Rowe and Somers 1998, d'Inzillo Carranza and Rowe-Rowe 2013). Other important areas are year-around river systems with dense shoreline vegetation or rocky outcroppings that provide good cover for resting and denning. The species appears to prefer shallow to deep waters (d'Inzillo Carranza and Rowe-Rowe 2013) but has been observed foraging in water greater than 40 m deep off Rubondo Island National Park in Lake Victoria (Reed-Smith 2010).

The fur of the Spotted-necked otter is reddish to chocolate brown with creamy or whitish patches on the throat and chest. The head is broad with a short muzzle, small rounded ears, and a hairless nose pad.

Adequate riparian vegetation in the form of long grass, reeds, bushes, and tree root systems or rock piles are essential to provide cover during periods of inactivity (Reed-Smith 2010, d'Inzillo Carranza and Rowe-Rowe 2013). Resting places and dens are generally on stream or river banks, islands where there are ledges in banks, rock islands, or boulder shorelines with dense vegetation cover (Reed-Smith 2010, d'Inzillo Carranza and Rowe-Rowe 2013).

Spotted-necked otters are primarily solitary but may also be found in small family groups, and occasionally larger groups up to 20 individuals (Rowe-Rowe and Somers 1998). The home range of males is larger than that of females but Spotted-necked otters generally appear to be non-territorial with high variability and large overlap in home ranges. Litter size is usually one to three cubs, who remain with the mother for up to a year. The species is generally diurnal, and most active in early morning and late afternoon.

Spotted-necked otters feed on fish, crabs and frogs, and occasionally other food items such as amphibians and birds. The species generally hunts alone, but sometimes cooperation among individuals helps facilitate prey capture.

Threats
Poverty and human activities continues to be a serious pressure in the Spotted-necked otter range. An increased dependence by people on fish as a source of protein has led to overfishing in many freshwater ecosystems. In Benin, for example, wetland areas have attracted many important economic activities that generate significant income and employment, such as salt production, agriculture, and fishing (Akpona *et al.* 2015). These same wetlands also provide prime habitat for the otter. Habitat loss from the removal of bankside vegetation (Kubheka *et al.* 2013), draining of wetlands, erosion due to agriculture, and water pollution from inputs from agriculture, mining, oil drilling and human generated refuse, all put pressure on otter populations.

Aquaculture activities are in conflict with otters, including overfishing, drainage of water systems or ponds to increase catch, use of poisons or dynamite to increase

Protection outside of parks is lacking in most countries and licensing requirements are poorly enforced across the continent. Killing of otters typically goes unnoticed and is rarely prosecuted.

catch, and creation of fish farms that attract otters (Akpona *et al*. 2015). Otters are also killed in fishnets. Although the extent to which this occurs is unknown, it is thought to be increasing due to a growing degree of illegal fish net usage and the length of time nets are left unattended. Reduction of prey biomass for otters could become an issue in Africa's great lakes due to the need for fish protein to feed growing human populations. In addition, the introduction of Nile perch into Lake Victoria is forcing a dietary shift for otters (Kruuk and Goudswaard 1990), with unknown consequences.

In parts of Africa, conflict with both fish farm owners and recreational anglers remains a serious threat. Retaliatory killing of otters takes place based on the assumption that they are decimating fish populations although there is no evidence to support this (R. Jordaan pers. comm.). Studies in Benin have proven that otters take fish from and damage fishing equipment. It may not be the case that otters are responsible for the damage, since other predatory species using the same habitat, crocodiles and Nile monitor lizards for example (Akpona *et al*. 2015).

The traditional uses of otters varies from country to country. In Tanzania there is increasing evidence that killing otters for traditional medicine is increasing. In Benin otters are associated with some cultural practices including traditional medicine and mythic uses in the Hlan River complex – Oueme Valley and Sô Valley in Southern Benin (Akpona 2004, Adande 2017). Otters are apparently not utilized in South Africa (Ngwenya 2001). The once sustainable use of otters for traditional purposes in ceremonies, medicine, and the treatment of sexual impotence is now thought to be unsustainable.

Legal and possibly illegal hunting for the pelt and bushmeat markets has been documented, but the extent to which this occurs is unknown. There have been reports of tribes in southern Tanzania that target the otter as food. An ongoing study in the area documents that 19% of respondents report eating otter and 37% report traditional uses (Reed-Smith pers. comm.). A recent study conducted by Adande in 2017 in Benin also revealed the use of the Spotted-necked otter as a traditional asset for human nutrition (35%) followed by the magico-mystical (33%) use and medicinal (32%) in Sô Valley in southern Benin. Otters may be hunted opportunistically in many other countries where they are eaten by hunters and their families, and do not end up in markets. Increasingly old taboos against eating otter held by some tribes are breaking down and they are now viewed as an acceptable source of protein.

The bioaccumulation of organochlorines (Mason and Rowe-Rowe 1992) and acid-rain pollution from coal mining (Stuart 1985, Mason and Rowe-Rowe 1992, Rowe-Rowe 1995) is increasingly having an impact on otter habitat (Angelici *et al*. 2005, Veron *et al*. 2008) and potentially on long-term survivability of otter populations. The impact of global climate change is difficult to assess but models predict that Africa's otters are at great risk throughout much of their range (Dixon *et al*. 2003, Cianfrani *et al*. 2018).

Internal political conflicts and terrorism continue to be issues in many African nations, putting pressure on all wildlife as sources of protein. It also makes field work difficult for researchers, such that there is little or no new information on Spotted-necked otters for since 1990. The lack of infrastructure and adequate enforcement means that protection in national parks or reserves is limited. Protection outside of parks is lacking in most countries and licensing requirements are poorly enforced across the continent. Killing of otters typically goes unnoticed and is rarely prosecuted.

Threat Mitigation Measures

In the context of an increasing local human population density, safeguarding and managing otter populations will depend on the ability to find solutions that reconcile both nature conservation and sustainable economic development (Akpona *et al*. 2015).

A lack of knowledge about all African otters has impeded the effort to prescribe conservation action since 1990. While some progress has been made, particularly in South Africa, conservation is hampered by a lack of knowledge about the status and biology of the species. Priorities include establishing current population status in areas of known historic range using rapid survey techniques, networking of otter researchers and conservationists,identification of key conservation areas such Central and East African lakes with strong otter populations and suitable habitat where the potential for creating successful refuges exists, and training range-country partners to conduct community-based outreach programs. Regional workshops, in both French and English, can train wildlife students, college and university staff, park staff, and wetland biologists from range countries, A regional meeting can enable local biologists and conservation activists

working in freshwater ecosystems to share information, identify community problems and design collaborative efforts and local, innovative solutions.

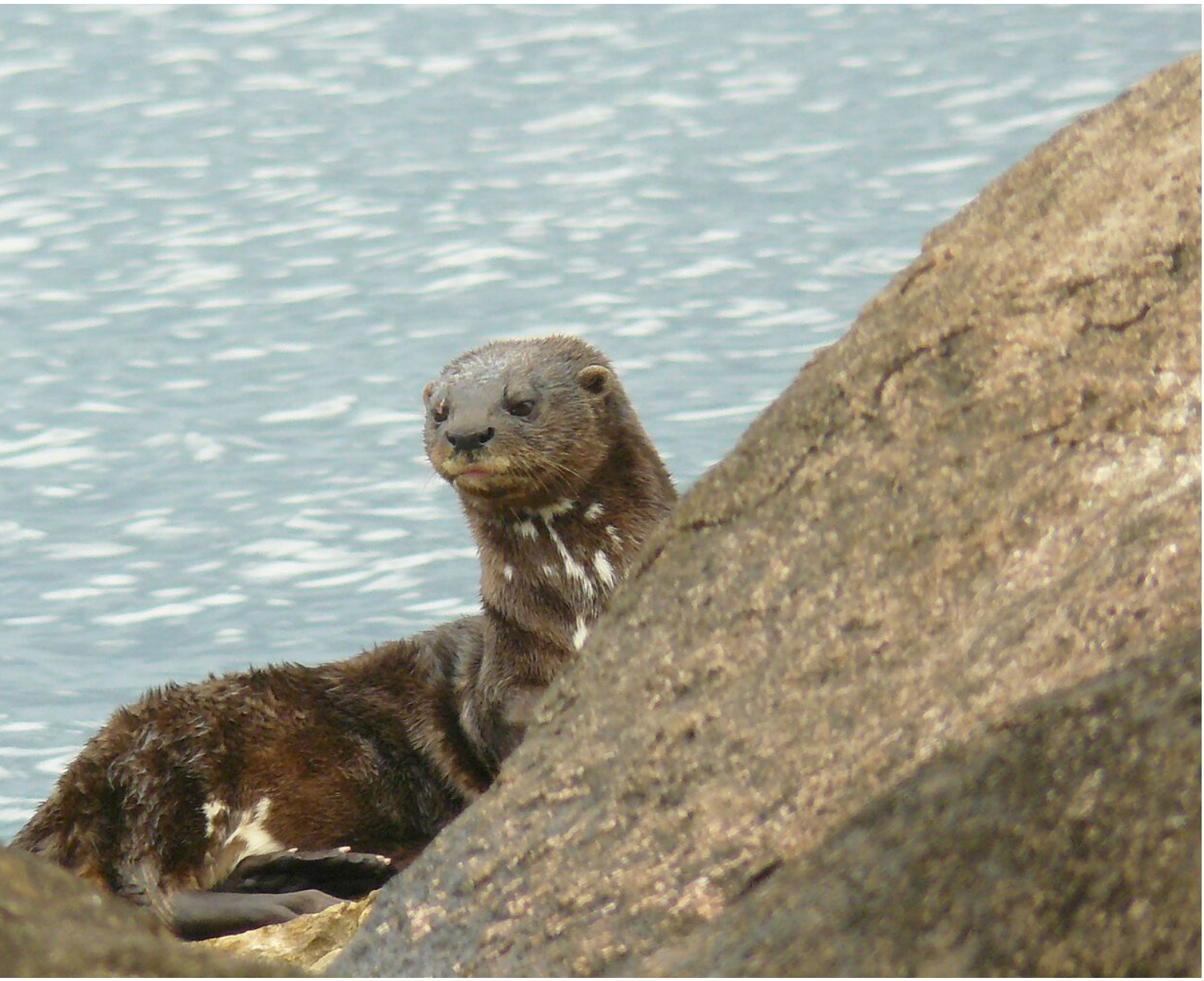
Basic surveys to establish presence, status and distribution are needed in virtually all the range countries of the Spotted-necked otter. In addition, in Benin and Democratic Republic of Congo, conflict mitigation is needed along with community conservation education programs. In Kenya, key conservation areas should be identified and conflict issues with fishermen should be addressed. In South Africa, there should be increased efforts to educate rural people in soil and water conservation, grassland management, and sound agricultural practices. Existing legislation relating to industrial and mining pollution should be strictly enforced and active policing efforts increased.

Captive Populations
In the United States and Canada, 25 individuals are held in 18 zoos and are currently listed as a Red Species Survival Programme by the Association of Zoos and Aquariums (AZA). This program is at risk of being dropped due to low numbers of zoos participating and an inadequate captive gene pool to maintain genetic diversity.

In South Africa the situation is unclear; there are rehabilitation centers and resources to advise on this species and some zoos and aquariums may hold a few individuals.

Site-specific Conservation Locations
Tanzania: Rubondo Island National Park. This park has the only actively protected and patrolled waters in Lake Victoria. The otter population on the island appears to be stable, habitat is suitable and the prey base is satisfactory. The Tanzanian National Park Authority staff is actively engaged in conservation outreach with the local communities.

East African great lakes: Lake Victoria, Lake Tanganyika, Lake Nyasa (a.k.a Lake Malawi). Otter populations are present on all three lakes but the status of these populations needs further study to identify stable pockets of habitat with quality vegetation and viable prey base for the otters.
South Africa: Drakensberg Park, KwaZulu-Natal. A large protected area, which



includes the catchments of a number of major rivers, can ensure the protection and future existence of Spotted-necked otter in eastern South Africa (Rowe-Rowe *et al*. 1995). Continued protection of this area is a priority. Outreach education programs focusing on the importance of the park should be supported and continued research on the resident otters.

Uganda: Kibale National Park and Nile River area. All three African species of otter are known to occur in Kibale NP. Otter populations should be assessed, monitored, and protected. There are local reports of Spotted-necked otter presence in the Nile area which should be assessed, monitored and protected.

Democratic Republic of Congo: Akpona (pers. obs.) reported seeing Spotted-necked otters on Maringa River and spoke to seventeen fishermen who confirmed existence of conflicts with fishermen. No conflict with fishermen has been documented in the Maringa Lopori Wamba landscape, despite frequent killings of the species every year.

Benin: Hlan river, Oueme Valley and Sô Valley. Spotted-necked otter populations have been confirmed, and continued awareness and protection are needed to ensure sustainability of otter populations (Akpona *et al*. 2015).

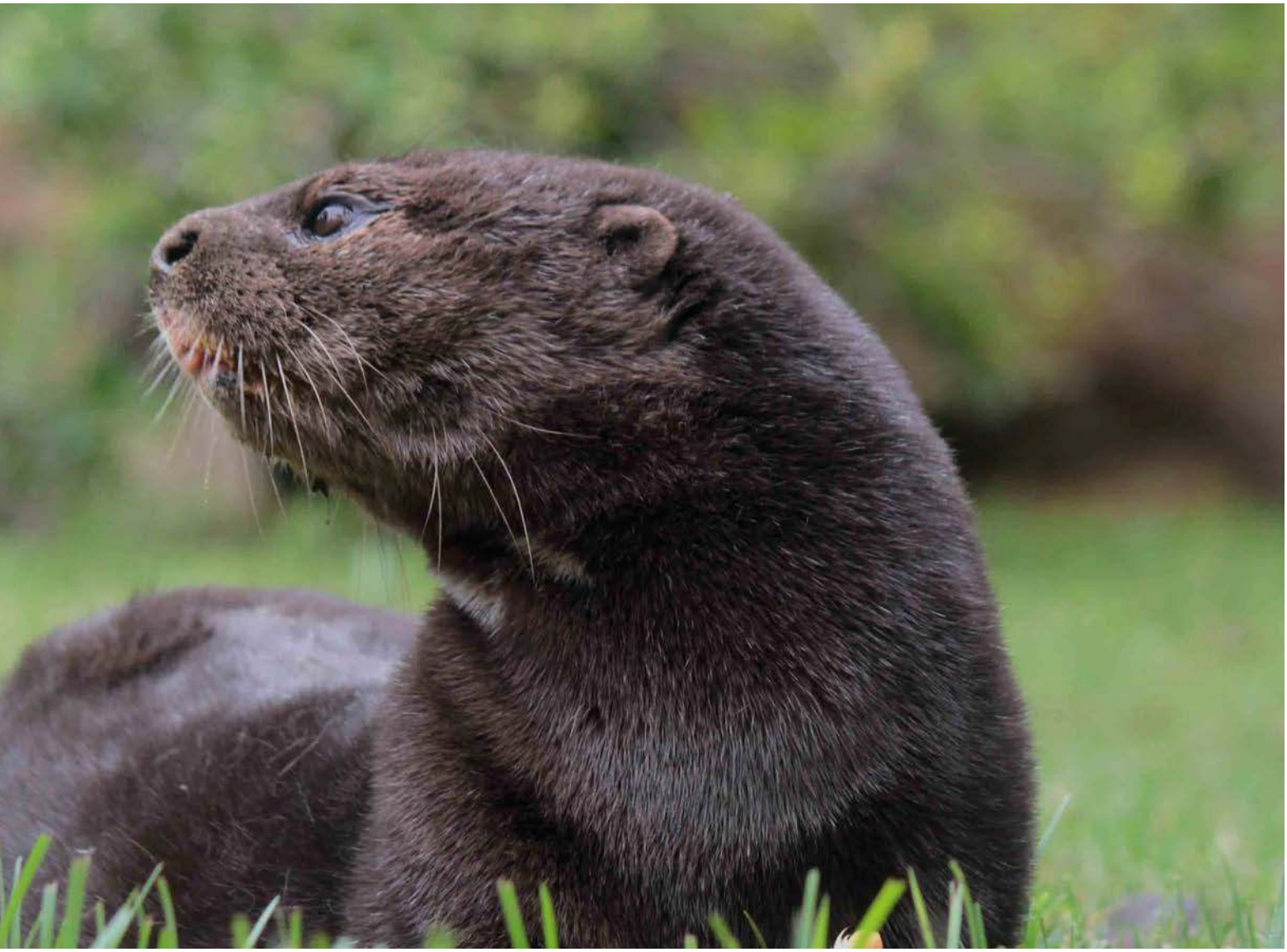
Success Stories

Thus far, the otter population on Rubondo Island National Park in Lake Victoria, Tanzania, appears to be thriving. This park includes the only actively protected and patrolled waters in Lake Victoria. An outreach program that incorporated information on otters was begun in 2009 with students from nearby communities in conjunction with the Park staff and the Mwanza area Roots & Shoots Clubs. This project has lapsed but should be restarted and work commenced to support the National Park effort to preserve and restore nearby wetlands. In the south of Tanzania (Lake Nyasa, Liparamba GR, and Mbinga area) a local conservation activist has been working to assess local attitudes towards otters, visiting local schools with education programs, and interfacing with fish pond owners to mitigate conflicts with otters. This program should be expanded and continued for the next 10 years.
In South Africa, Drakensberg Park, KwaZulu-Natal ensures the protection and future existence of the Spotted-necked otter in eastern South Africa (Rowe-Rowe *et al*. 1995). Continued protection of this area should be fostered. Outreach education programs and research efforts should be supported.

In Benin, research has led to greater understanding of the nature and extent of otter conflict with fishermen. Mitigation strategies have been identified and a model

developed to reduce conflict. The model showed that otter damage increased significantly with the number of adult fish captured by fisherman. At the same time, otter damage increased with the length of time that the fishing equipment was left unattended. It was suggested that otter damage could be reduced if fishing equipment is checked at least twice a day by fishermen, with a maximum interval between checks of 12 hours.

Long-term sustainable management of these conflicts will require an integrated approach taking into account socio-economic, political and environmental dimensions. This model has been transformed into an awareness program to educate fishermen on ways to avoid or reduce conflicts. Positive results have already been recorded on Hlan River.



Spotted-necked Otter *Hydrictis maculicollis*
Projects and Funding Opportunities

Region	Actions	Costs
Africa – all range countries	Support biologist network, coordination and meetings. Stakeholder workshops in Central and Western Africa, 30 participants for 3 days. Continental conference for field biologists, university professors, wildlife biologists to develop interest in collaborative wetland conservation . Collaborate with universities to include otter conservation in wetland, fisheries, and wildlife programs and curriculum development. National surveys to confirm presence, status, and priority areas for otter conservation where this has not been done for 15 years or more. National surveys in priority areas every five years.	Communication, material development, meeting planning: $ 20,000 Coordinator : $ 1,000/year for 5 years $ 40,000 each $ 75,000 Conferences: $ 15,000: $ 5,000/year for 3 years Equipment, training surveys and material development $ 100,000 for physical surveys. Communication costs where physical survey not possible; $ 2,000
Tanzania	Preservation of habitat and outreach to fishermen and communities to include livelihood alternatives. Two sites: Rubondo Island NP, Lake Victoria; shorelines of Lake Nyasa and southern Tanzania. Long-term monitoring of Rubondo Island National Park and nearby island populations to assess environmental disturbance impact. Basic surveys of other large lakes, rivers and water bodies; Lake Tanganyika, Lake Nyasa, Mtera Dam.	Five years. Part-time 1 person/location: $ 5,000 Outreach: $10,000/year Transport, materials: $ 20,000 per site, Monitoriing: $25,000/year/5 years Basic surveys: $ 40,000/year/5 years
Uganda	Research on the status of the three otter species present in Kibale National Park . Training programs for wildlife professionals on otter ecology and identification of human-otter conflict areas and mitigation actions - Kibale National Park and Nile River area. Survey of the Nile/northern Lake Victoria.	Researcher travel, costs: $ 75,000/3 years Training: $ 30,000 Surveys: $ 25,000 over 2 years
Ghana	Digya National Park: Surveys; training wildlife rangers and other professionals; implement conservation education programs; interview villagers; country-wide survey.	Surveys: $ 20,000 Training rangers to do surveys: $ 30,000 Education/outreach $ 10,000/year/3 years
Malawi	Nyka National Park and Vwaza Marsh Reserve areas: surveys; establish key conservation areas; establish outreach and collaborative projects to address conflict issues.	$ 15,000/year/3 years
Gambia, Senegal, Mauritania, Mali	Surveys: Northern river systems of the Casamance River in southern Senegal, the Gambia River, and the Senegal River; training wildlife professionals; awareness raising .	$ 30,000/year/5 years
West Africa	Surveys; interviews with community members; training of wildlife officials/staff on identification of otter sign; awareness raising.	$ 30,000/year/ 3 years

Spotted-necked Otter *Hydrictis maculicollis*
Projects and Funding Opportunities

Region	Actions	Costs
Benin	Hlan River area: continue work with otter/fishermen conflicts and habitat preservation.	$ 20,000/year/3 years
DRC	Surveys; create network with local biologists to obtain sightings; investigate reports of hunting for food and bushmeat markets.	$ 30,000/year/3 years
Benin and Democratic Republic of the Congo	Promoting South-South cooperation for Spotted-necked Otter conservation and management; create task force to collect information on distribution, factors determining habitat selection, local perception, conflicts; facilitate cross learning, best practices and experience exchange between Benin and DRC stakeholders; train and encourage the next generation of field biologists.	$ 50,000/year/2 years
South Africa	Work with fish farmers to minimize fish loss; monitor old and new sites to assess changes in diet, population demographics, threats; work with landowners and fish farmers to encourage sound water and soil conservation, grassland management, sustainable agricultural practices.	$ 50,000/year/3 years

Africa
African Clawless Otter
Aonyx capensis

This species, found in a wide variety of habitats, had stable populations in 29 of 35 African countries in 1990, but is now declining in many countries due to habitat loss and polluted waters.

IUCN Red List Status
The African Clawless otter is classified as Near Threatened and almost qualifies as Threatened. Populations are projected to decline by at least 20% in the next three generations (Pacifici *et al*. 2013). CITES: Appendix II (except for the populations in Nigeria and Cameroon which are CITES Appendix I)

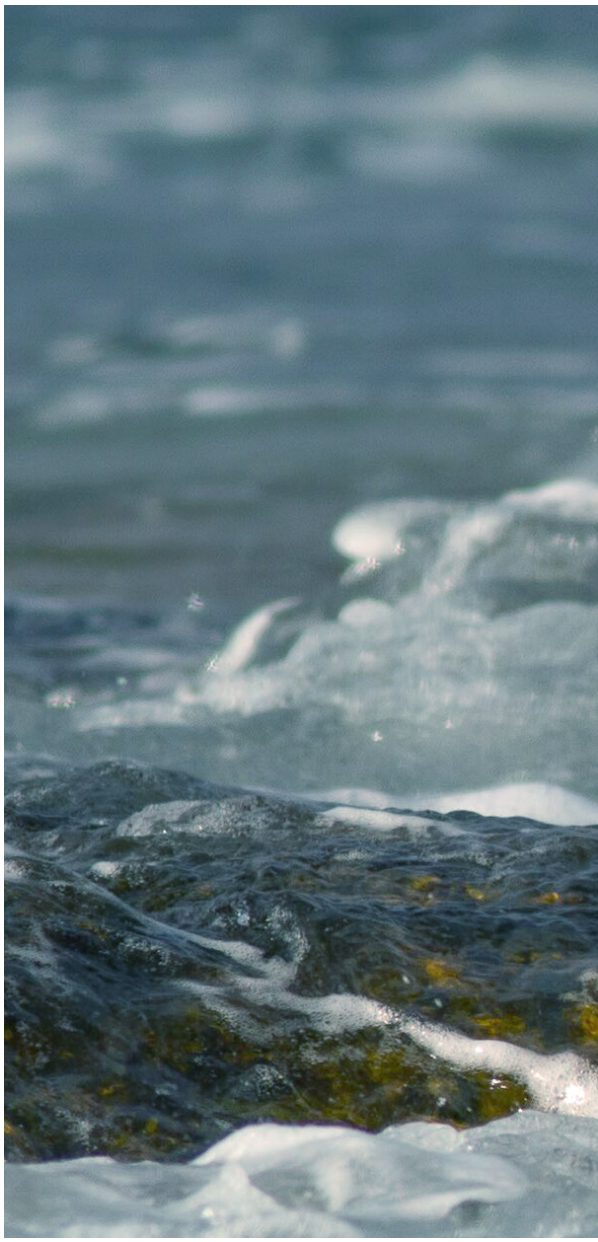
Distribution
The African Clawless Otter is the most widely distributed otter species in Africa, with a range stretching from Senegal and Mali throughout most of West Africa to Sudan and Ethiopia, and then southwards throughout East Africa to the Western Cape of South Africa. They are absent from the Congo basin, where they are replaced by the Congo clawless otter (*Aonyx congicus*), the two species being sympatric in Uganda and Rwanda (Somers and Nel 2013).

Habitat and Ecology
African clawless otters are usually found in tropical forests and lowland swamps. They are predominantly aquatic and seldom found far from water. Freshwater is an essential habitat requirement, and they live only in marine habitats where there is access to fresh water, preferring rocky shores (Van Niekerk *et al*. 1998). The species is found in diverse habitats, from impoundments, estuaries, and mangroves to desert conditions of the upper Doring River in the Western Cape of South Africa and the Fish River in southern Namibia (Nel and Somers 2007, Somers and Nel 2013).

African clawless otters are also found in many seasonal or episodic rivers in the Karoo of South Africa, such as the Sak, Vis, Riet and Gamka Rivers, provided suitable-sized pools persist (Nel and Somers 2007, Somers and Nel 2013). They have been recorded up to 3,000 m in Ethiopia (Yalden *et al*. 1996). In Nigeria they are mainly restricted to brackish water streams with mangrove vegetation along the banks, and, more occasionally, to transitional habitats between freshwater and brackish water environments (Angelici *et al*. 2005). They have been found in towns and cities and can tolerate rivers with high pollution and eutrophication levels (Somers and Nel 2013).

The species is large and heavily built, with a dark brown pelage that grades to white or pale gray on the throat, neck and face. This species is mostly solitary, but small family groups of a mother and cubs, or groups of males may occur (Wilson and Mittermeier 2009). They are mainly nocturnal but may be active in the daytime in remote areas (Wilson and Mittermeier 2009). The species is highly mobile, with a range length from 5 to 55 km, and a core territory of 0.2 to 10 km. The pattern of home-range use by females suggests territoriality. Male clawless otters have overlapping home ranges, both with other males and with females (Somers and Nel 2013). Breeding can take place year-round, but most births occur at the start of the rainy season, with a litter size of around one to three (Wilson and Mittermeier 2009).

African clawless otters are mainly crab eaters, but also consume fish, frogs and other prey (Wilson and Mittermeier 2009), while lobsters, octopus and shellfish are consumed along the seacoast. Otter



population densities vary with prey abundance, and prey preference varies widely by location. In shallow or murky water, the otters feel in underwater crevices and seize prey with their forefeet, while in deeper water, they dive and can remain underwater for up to a minute (Wilson and Mittermeier 2009).

Threats

The current status of the African clawless otter is unclear, except in South Africa, and localized areas in a few countries. All populations, however, are believed to be in decline throughout most of their range due to increasing pressures from rapidly growing human populations.

The main threat to the clawless otter is human degradation of freshwater ecosystems across the continent. The channelization of rivers, removal of bankside vegetation, draining of wetlands, coastal and riverbank development, erosion, water pollution and unsound agricultural and livestock management practices all degrade otter habitat (Veron *et al*. 2008, d'Inzillo Carranza and Rowe-Rowe 2013, Kubheka *et al*. 2013, Somers and Nel 2013, Jacques *et al*. 2015, Okes *et al*. 2016).

Human poverty has led to an increased dependence on fish as a source of protein and overfishing of freshwater ecosystems. Growing populations are causing increased development of marine and freshwater shorelines, bringing otters into closer contact with humans and their disturbances (Rowe-Rowe 1990, Somers and Nel 2013, Jacques *et al*. 2015, Okes *et al*. 2016).

Across Africa, where fishing is an important source of income for locals in rural areas, otters are considered pests as a competitor for fish. Conflicts with aquaculture activities include overfishing, drainage of water bodies and the use of poisons or dynamite to increase catch, competition with anglers, and fish farms that attract otters. Fisheries managers of the Kairezi River Protected Area in Zimbabwe blamed trout declines on otter predation, even though analysis revealed that only 1% of otter scat contained the remains of trout (Butler and du Toit 1994). Occasionally, otters are caught and drowned in gill nets and fish traps and blamed for net damage (Rowe-Rowe 1990).

Water pollution, in the form of bioaccumulation of organochlorines, and acid-rain pollution from coal mining, is a threat to otters (Stuart 1985, Mason and Rowe-Rowe 1992, Rowe-Rowe 1995), as well as runoff from agricultural activities along lakeshores and river banks is increasingly having an impact on otter habitat (Angelici *et al*. 2005, Veron *et al*. 2008) and potentially on long-term survivability of affected otter populations. Oil spills are a potential threat to water systems, particularly in southern region of Nigeria (Angelici *et al*. 2005).

Clawless otters are legally and illegally hunted for the medicinal trade and for their pelts and body parts in portions of their range (Cunningham and Zondi 1991, De Luca and Mpunga 2005). In Tanzania there is increasing evidence that killing otters for traditional medicine is increasing, without regard to species (Cunningham and Zondi 1991, Ngwenya 2001, DeLuca and Mpunga 2005, Jacques *et al*. 2015).

The extent to which there is legal and illegal hunting for the pelt and bushmeat markets is unknown, but some incidents have been documented. In southern Tanzania for example, otters are targeted for local consumption and possibly the bushmeat market (Djagoun *et al*. 2012, Flesher 2013, Jacques *et al*. 2015).

Across much of Africa, laws that protect otters are poorly enforced (Jacques *et al*. 2015). Hunting laws are difficult to enforce or ignored except in reserves, national parks, or other areas of concentrated enforcement. Internal civil conflicts and terrorism continue to be issues in many nations, putting pressure on all wildlife as sources of needed protein (Hendrix and Glaser 2007).

Threat Mitigation Measures

A general lack of knowledge about the presence, status, and in some cases, basic biological knowledge continues to be an issue for African clawless otters. Priority needs are similar across most of its range: establishing presence in areas of

historic range, networking among active researchers, identifying key conservation areas for successful refuges, and training local partners to create more community conservation outreach and ecotourism projects.

We recommend holding regional workshops for wildlife students, college/university staff, park staff, and wetland biologists from range countries, as well as meetings of otter researchers, range country biologists, and wetland conservation activists to share information, identify local problems and collaboratively design local solutions. In addition, there should be programs to educate rural people in soil and water conservation, and sound agricultural, livestock and grassland management.

Existing legislation relating to industrial and mining pollution should be strictly enforced.

Captive Populations
There are no captive breeding programs for this species. One should be encouraged but is unlikely at this point due to: 1) lack of suitable space in zoos, 2) lack of interest by zoos, 3) lack of a sustainable captive population, and 4) lack of a source for ethically caught wild otters to create a genetically viable population. Instead, zoos should be encouraged to teach their visitors about this otter species and create programs to generate funds for in-situ conservation, rehabilitation efforts, and outreach education in communities adjacent to healthy otter populations. There are a few rehabilitation facilities working with this species in South Africa.

Site-specific Conservation Locations
Drakensberg Park, KwaZulu-Natal, in South Africa, is a 240,000 ha protected area which includes the catchments of a number of major rivers. It would ensure the protection and future existence of the African clawless otter in eastern South Africa (Rowe-Rowe *et al*.1995). Continued protection of the area and otter research and education programs should be encouraged.

Coastal reserves, such as the Tsitsikamma Coastal National Park, the Pondoland Marine Protected Area (Mkambati Reserve) and the Dwesa-Cebe Marine Protected Area along the southern and south-eastern coast of South Africa offer good protection to marine-foraging populations of African clawless otter.

Success Stories
Ecotourism that includes otter observations along the Eastern Cape Wild Coast of South Africa provides an economic boost to the local Dwesa community, with tourists stating that they would be willing to pay specifically to see the otters. The potential for this project should be followed to gauge its continued success (Dumalisile *et al*. 2005).

African Clawless Otter *Aonyx capensis*
Projects and Funding Opportunities

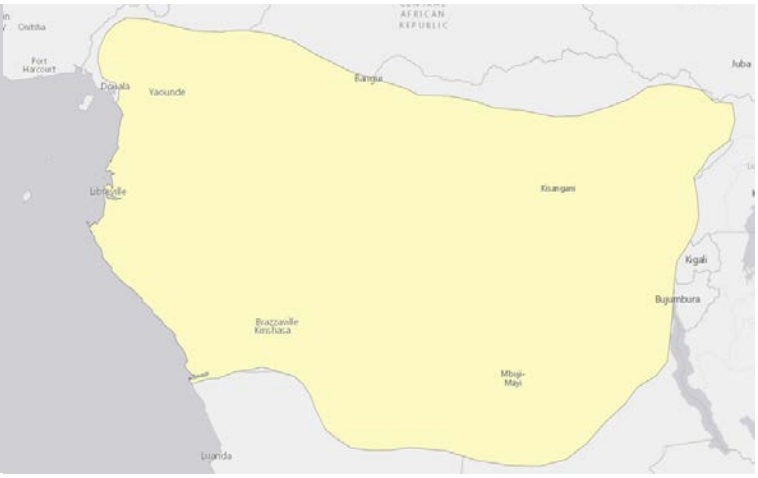
Region	Actions	Costs
Africa – all range countries	Support biologist network, coordination and meetings. Stakeholder workshops in Central and Western Africa, 30 participants for 3 days, Continental conference for field biologists, university professors, wildlife biologists to develop interest in collaborative wetland conservation, Collaborate with universities to include otter conservation in wetland, fisheries, and wildlife programs and curriculum development, National surveys to confirm presence, status, and priority areas for otter conservation in all range countries where this has not been done for 15 years. National surveys of identified priority areas every five years,	Support network: $ 20,000 Communication, material development, meeting Planning; coordinator: $ 1,000/year/5 years Conferences: $40,000 each Conservation/universities: $ 75,000 $ 15,000 for 1st year $ 5,000/year/next 3 years Equipment, training surveys and material development. Communication costs in countries where physical survey may not be possible $ 2,000 Physical surveys: $ 100,000
Kenya	Identify key areas for conservation swamps and wetlands, including Nyando Wetland; coordinate with African Otter Network, Develop cooperative education and training programs as well as wetland preservation actions with the Lake Victoria's Birder group working in Nyando wetlands,	$ 15,000/year/5 years $ 10,000/year/5 years
Malawi	Nyka NP and Vwaza Marsh Reserve areas: surveys; establish key conservation areas; establish outreach and collaborative projects to address conflict issues,	$ 15,000/year/ 3 years
South Africa	Where sub-populations are found: 1. Determine what limits otter populations 2. Determine role of African clawless otters on river ecosystem functioning and requirements of primary prey, crabs 3. Develop effective long-term monitoring programs for this species in different habitat types 4. Determine, using genetics, long-term population density and structure estimates across various habitats 5. Investigate feasibility of using camera-trap based density estimation models of otter densities 6. Ongoing survey of fly-fishing estate/ farm managers and owners to understand perceived threats that otters pose, currently implemented control measures, and efficacy assessment of interventions to reduce otter-human conflicts 7. Fecal glucocorticoid metabolites analysis as a non-invasive way to assess stress levels in populations from different environments	Surveys: $ 20,000 Training rangers to do surveys: $ 30,000 Education/outreach: $ 10,000/year/3 years

African Clawless Otter *Aonyx capensis*
Projects and Funding Opportunities

Region	Actions	Costs
South Sudan	Contact local authorities to identify freshwater ecosystems and otter presence.	$ 15,000/year/3 years
Tanzania	Preserve habitat and educate fishermen and local communities to include livelihood alternatives; Rubondo Island NP, Lake Victoria; Shorelines of Lake Nyasa and southern Tanzania. Long-term monitoring of Rubondo Island NP otters and nearby island populations to assess environmental disturbance impact. Basic surveys of other large lakes and water bodies; e.g. Lake Tanganyika, Lake Nyasa, Mtera Dam, large rivers.	$ 30,000/year/5 years
Uganda	Research on the status of the three otter species present in Kibale NP. Training programs for wildlife professionals on otter ecology and identification of human-otter conflict areas and mitigation actions - Kibale NP and Nile River area.	Researcher, travel, lodging, supplies $ 75,000 for 3 years $ 30,000

Africa
Congo Clawless Otter
Aonyx congicus

An otter with fingerlike digits that uses them with great dexterity to locate worms, crabs, and grubs in muddy swamps. It has not been studied as well as other African otter species and its habits remain poorly known.



IUCN Red List Species Status
The Congo Clawless otter is classified as Near Threatened. It almost qualifies as Threatened based on a projected 25% population decline over the next three generations (Pacifici *et al*. 2013).

Distribution
The distribution of the Congo clawless otter is very poorly known due to the remoteness and inaccessibility of the equatorial rainforest of Central Africa (Jacques *et al*. 2009). The species inhabits the rainforests and lowland swamps of the Congo River basin in parts of Equatorial Guinea, Gabon, Republic of Congo, the Democratic Republic of the Congo, southern Cameroon, southern Central African Republic, northern Angola, and into the forests and the wetlands of Rwanda, Burundi and Uganda (Rowe-Rowe 1990, Larivière 2001, Jacques *et al*. 2009). The limits of the distribution range are still unclear, partly due to the species' possible confusion with the Cape Clawless Otter (Jacques *et al*. 2009). Its distribution overlaps in Rwanda and Uganda with the African clawless otter.

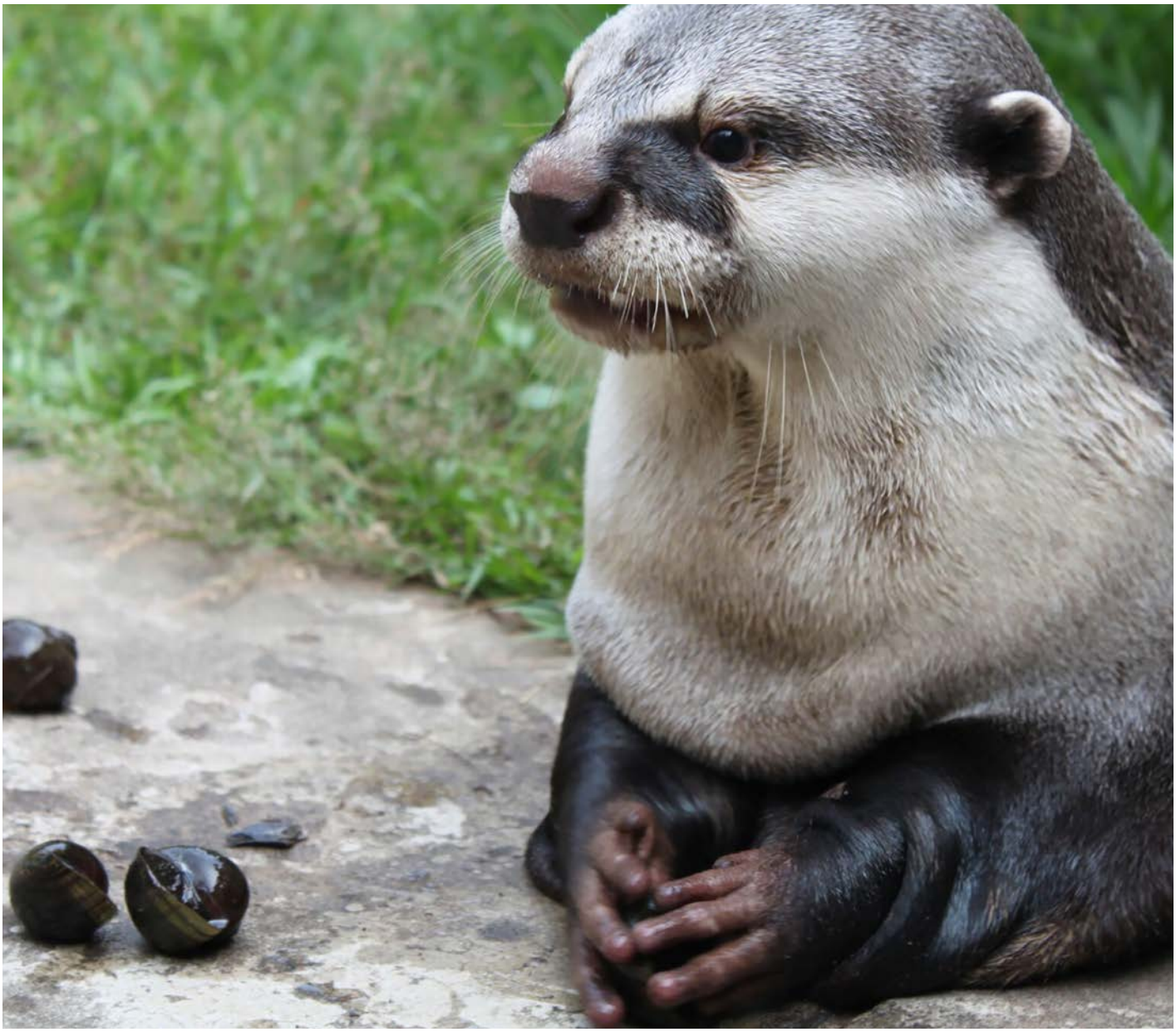
Habitat and Ecology
Congo clawless otters are thought to be rare to very rare in most of its habitats and prefer undisturbed equatorial rainforest and lowland swamps of the Congo River Basin (Jacques *et al*. 2009). The use of coastal freshwater lagoons and mangrove swamps has also been reported (M. Vacher pers. comm.). They have been observed in swampy forest clearings, for example, at Langoué Bai in Gabon, and Mbeli Bai in Nouabalé-Ndoki National Park and in Odzala National Park in the Republic of the Congo (Jacques *et al*. 2009). They also inhabit some rivers, for example Dji Dji River in Gabon (Davenport *et al*. 2011), and Sanaga River in Cameroon (Jacques 2006).

Research on this elusive species living in equatorial rainforests is challenging, and thus far little is known about its ecology. The Congo clawless otter is mostly nocturnal and solitary. The pelage is dark brown, with a silvery frost on the neck and shoulders from white guard hairs. It has a grey or white chest, white marking on the face, and a distinctive mark of black fur between the eyes. The animal forages in soft mud with sensitive, dexterous fingers that lack claws and webbing, consuming fish, crabs, frogs, and worms. Reproduction takes place throughout the year, and cubs are pure white until they attain adult coloration at about 2 months.

Threats
Although most of Africa's otters are threatened by human conflicts and habitat degradation, the Congo clawless otters have been somewhat protected by the remoteness of the Congo forest. Still, the species is impacted by similar pressures of human disturbance as those affecting other African otters, habitat loss from accelerating deforestation, removal of bankside vegetation, draining of wetlands, water pollution and construction of hydroelectric projects (Jacques *et al*. 2009, 2015). Competition with human use of fish resources is growing rapidly with the growing human population.

These otters are occasionally hunted for bushmeat, although the species has a reputation of being difficult to catch

Although most of Africa's otters are threatened by human conflicts and habitat degradation, the Congo clawless otters have been somewhat protected by the remoteness of the Congo forest.



(Jacques *et al*. 2009). Firearms are now becoming more available, increasing hunter success. New roads for timber exploitation make otters more accessible to illegal hunting. Otters may be increasingly targeted as preferred bushmeat species become rare (Jacques *et al*. 2015). Congo clawless otters are occasionally sought after for more unusual uses. Their meat has the reputation of being an aphrodisiac in Central and West Africa, and in some places their fur is believed to possess magical powers, making a wearer invisible to an opponent (Jacques *et al*. 2009).

Threat Mitigation Measures
Surveys to establish presence, distribution and status are needed in most countries of the species' range: Angola, Burundi, Cameroon, Central African Republic, Democratic Republic of Congo, Republic of the Congo, Equatorial Guinea, Gabon, Nigeria, Rwanda, Uganda. Public awareness programs and a effort to standardize adequate legal protections at the national level are urgently needed.

Captive Populations
There are no captive breeding programs for this species which is very seldom seen in zoos. It should be encouraged but is unlikely at this point due to 1) lack of suitable space in zoological facilities, 2) lack of interest by zoological facilities, 3) lack of sustainable captive population, 4) lack of a source for ethically caught wild otters (i.e. rescue animals) to create a genetically viable population. Instead, zoological facilities should be encouraged to teach their visitors about this unique otter and create programs to generate funds for in-situ conservation, rehabilitation efforts, and outreach education in communities adjacent to healthy otter populations.

Site-specific Conservation Locations
The Congo clawless otter should receive conservation attention in the following protected reserves:

- Angola - Kwango (Congo)/Cuango (Angola River)
- Burundi - Monte Allen Conservation Area
- Cameroon - Dja Reserve and Campo Reserve
- Central African Republic - Dzanga Sangha Protected Area
- Democratic Republic of Congo - Salonga National Park
- Gabon - Lope Faunal Reserve
- Republic of the Congo - Nouabale Ndoki National Park,
- Odzala National Park, and Lefini Faunal Reserve
- Rwanda - Nyungwe
- Uganda - Kibale Forest National Park

Congo Clawless Otter *Aonyx congicus* Projects and Funding Opportunities

Region	Actions	Costs
Africa – all range countries	Protect habitat and resources in key otter areas; network with local freshwater biologists to determine otter presence and collaborate on ecosystem conservation efforts.	Coordinator: $ 20,000/year for 5 years $ 1,000/year for 5 years 3-day workshops in Central and Western Africa, 30 participants : $ 40,000 each
Angola	Tunadavala National Park, Kaladula Fall National Park, Bicauri National Park, Cameia National Park, Iona National Park Surveys for presence, range and status; research on local use as food and traditional medicine source; training workshop.	Coordinator: $ 30,000/year for 2 years Training workshop: $ 30,000
Cameroon	South-east Cameroon, Mbam, Djerem National Parks, Campo Reserve, Douala-Edéa Korup National ParkSurveys for presence, range and status; research on local use as food and traditional medicine source.	$ 30,000/year for 2 years Training workshop: $ 30,000
Uganda	Kibale National Park Survey and camera trap work to establish the presence and range Marine otter of this species and *A. capensis*.	$ 30,000/year for 2 years Training workshop: $ 30,000

The Illegal Trade in Otters

Melissa Savage

Consumer demands for wildlife are intensifying across the globe, yet conservation efforts are focused largely on high profile species like tigers, elephants, and rhinos, neglecting smaller, but highly threatened mammals like otters. Otters have long been at risk from trafficking of their pelts. Their dense, durable and luxurious fur has made them valuable in commerce.

Several times in the past, trapping has brought various otter species around the globe to the brink of extinction. Sea otters in the Pacific Northwest of North America in the eighteenth century were hunted relentlessly, first by Russian and then by American trappers, for markets in Russia, China, Europe and the US. Expensive reintroduction programs in the Eastern Pacific region have now brought the species back from scattered, remnant populations. In the mid-twentieth century, trapping decimated Giant otter populations in South America, until an international treaty and national laws halted the trade, allowing a gradual recovery of the species in many parts of its historical range.

Currently, the largest market for otters takes place in Asia, where the trade in otters feeds both domestic and international markets. Otters are hunted for their fur in Asia, coveted for use in the fashion industry in clothing and hats, and as prestigious gifts and trophies. Otter furs are especially popular in the Tibetan Autonomous Region of China for trim on traditional garments like the Tibetan 'chupa.' They are also sought for their body parts, used in traditional medicines, and for consumption in the meat trade. A new and a growing trend in parts of Asia is the trade in young otters for pets.

A large portion of the trade in otter pelts is due to consumer demand in China (Ghosh 2005, Duckworth 2013) and other countries in East Asia, including Japan, South Korea and the Russian Federation (Kruuk 2006, Duckworth 2013). Much of the trade in otters as pets feeds a local demand, with exotic pet industries flourishing in countries like Indonesia and Thailand (Gomez *et al*. 2018).

Illegal hunting of otters for their pelts poses a threat to regional otter populations in parts of South Asia, particularly in India (Gomez *et al*. 2016). Early 21st century records suggest that about 50% of the South Asian otter trade originates in India (Gomez *et al*. 2016). A report summarizing otter pelt seizures from 1980 to 2015 documented the seizure of nearly 6,000 otter pelts in Asia (Gomez *et al*. 2016).

Yet, the true scope of illegal trade in Asian otters remains unclear. The clandestine nature of trafficking means that the scale is likely far greater than seizure numbers alone reveal (Gomez *et al*. 2016). Recent assessment of the pet trade in Southeast Asia reveals an extensive trade of otters on the internet for the pet trade, targeting young animals, particularly in Indonesia and Thailand. Criminal trafficking networks are becoming more sophisticated, and the dynamics of the otter trade appears shifting toward Southeast Asian countries and onto a new trading venue -- the Internet. The otter trade adds another layer of pressure on already declining otter populations.

The Pelt Trade

Three otter species are trafficked in South Asia: the Eurasian otter, Smooth-coated otter, and Small-clawed otter. The Eurasian otter is considered Near Threatened, and Smooth-coated and Small-clawed otters are considered Vulnerable by the International Union for the Conservation of Nature (IUCN 2018). Populations of all three species are inferred to have decreased in Asia at least 30% over the past 30 years (Pacifici *et al*. 2013). Based on a seizure analysis in selected Asian countries, from 1985-2015, Eurasian and Smooth-coated otters were extensively traded for their pelts, although for a large number of the seizures (>80%), the species of otter involved was not identified (Gomez *et al*. 2016). A recent assessment of the otter trade in Southeast Asia shows there is some poaching of otters for their pelts in Cambodia and Lao PDR by Vietnamese poachers, however, this is thought to be decreasing (Coudrat 2016). The fourth Asian otter species, the Hairy-nosed otter, appears to be too scarce to poach.

The sheer volume of otter pelts in trade was first revealed in a joint study by the Environmental Investigation Agency and the Wildlife Protection Society of India into the big cat skin trade (Banks *et al*. 2006). A wide-reaching study by Gomez *et al*. (2016) further detailed the volume, sources, destination, and geographic patterns of the Asian trade. Most seizures involved a small number of pelts, often one or two, but many were larger, and one notable seizure in Tibet Autonomous Region in 2003 confiscated 778 otter pelts. Trafficking of otter pelts across Asia is facilitated by long, porous borders that are, in many cases, weakly patrolled (Wright and Kumar 1997, Savage and Shrestha 2018). Pelts on their way to East Asia are often packaged and transported clandestinely with other high-value wildlife products, such as tiger, leopard and elephant skins.

The otter pelt trade is both lucrative and relatively risk free, and in many places, wildlife poaching is seen as a legitimate pursuit. The trade begins with low-income rural people poaching otters to supplement their incomes (Bhuju *et al*. 2009). In many communities, wildlife poaching is seen as a legitimate pursuit. The pelts then enter the trade and work their way up through middlemen to the international wildlife traffickers, for whom the rewards are high, but the risks of detection are low, prosecution unlikely, and penalties light. For local communities, poaching for pelts is mainly a livelihood issue. Solutions then begin with engagement with local communities and programs that provide sustainable livelihoods (Challender *et al*. 2015).

Otters as Exotic Pets

Trafficking of young otters for the pet trade is a new and rapidly escalating trend, particularly in Southeast Asia (Krishnasamy and Stoner 2016, Gomez and Bouhuys 2018), despite the animal's unsuitability as a pet. Trade research shows that an increasing number of live otters, particularly Small-clawed otters, have been observed for sale in markets or seized by authorities across the region. Cubs offered for sale, often taken as newborns from the wild, are in most cases too young to survive.

In Japan, the display of caged otters in trendy coffee shops is another recent development, with guests being encouraged to handle the animals, mostly Small-clawed otters. Their popularity has led to a boom in demand for otters in the country, boosted by social networking

sites and mass media, including a television series that features pet otters with celebrities (Kitade and Naruse 2018). Japan appears to be an end destination for many otters illegally sourced from Southeast Asian countries, particularly Indonesia and Thailand (Gomez and Bouhuys 2018). Seventy percent of seizures of live otters made in Southeast Asia were destined for Japan, with an increasing trend from 2 otters seized in 2007 to 32 otters seized in 2017 (Kitade and Naruse 2018). This trade underscores the failure of legal regulations in Japan in preventing wildlife laundering and establishing traceability (Kitade and Naruse 2018). The increasing popularity of wild otters as exotic domestic pets, coffee shop and travelling zoo exhibits, is yet another pressure on Asian otters. The true scale of this trade, including the otter café craze, warrants further investigation.

A recent shift in the trade, from physical markets to online markets, presents another new and troubling trade dynamic for otter species (Krishnasamy and Stoner 2016). The online trade is high-turnover, growing and difficult to track (Gomez and Bouhuys 2018). For example, from January to April of 2018, there were at least 560 advertisements offering for sale a minimum of 734 and a maximum of 1,189 otters, most in Indonesia by a high margin (Gomez and Bouhuys 2018). Young otters were offered on numerous websites, including Facebook, in Indonesia, Thailand, Viet Nam, and Malaysia. Otters are being hunted to supply this demand, with the species with the least legal protection, Small-clawed and Smooth-coated otters, being targeted (Gomez and Bouhuys 2018). Cambodia, reversing gains in protection, removed both of these species from its wildlife protection laws in 2007 (Gomez and Bouhuys 2018).

The online illegal otter trade, and the popularity of pet otters, are substantial new threats to otters in Southeast Asia, where an open and generally unfettered internet operates in defiance of national and international laws (Gomez and Bouhuys 2018). A greater long-term concern is that these trends may fuel demand for otters, particularly young otters, from other parts of the world.

Legal Protections

Legal protection of otter species varies widely across the globe. In Asia, native species are generally protected from hunting and trade across their range, with the exception of a few Asian otter species in some countries. But customs and law enforcement agents, trained to look for high-profile animals like tigers, are not familiar with the illegality of trade in otters.

Even where otter species are protected by national legislation, a major challenge for enforcement agencies is the difficulty of distinguishing one species of otter from another, either the pelts or the living animals, which calls for more unanimous protection of all otter species.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) prohibits commercial trade in species that cannot be sustainably hunted on Appendix I. In Asia, only the Sea otter and the Eurasian otter are listed on CITES Appendix I. Three Asian species, the Smooth-coated otter, Small-clawed otter and Hairy-nosed otter, are listed on Appendix II. An Appendix II listing permits legal trade in accordance to national legislation. The difficulty of identifying the species of cured and flattened otter pelts means that pelts of these three Asian otter species cannot be distinguished from those of Eurasian otters, a CITES Appendix I protected species. To prevent the illegal and unsustainable international trade in Asian otters, an effort is being initiated to uplist these three Asian species to CITES Appendix I.

Awareness

Awareness of the illegal trafficking of otters needs to be raised at multiple levels, starting at the community level. It should begin with programs in villages and fishing communities that offer measures to mitigate fishing and other conflicts. Educational programs in communities have proven to be highly popular. Otter identification cards, posters, programs with schoolchildren, and other approaches that increase recognition of otters in rural communities have had good results. Raising awareness of otters has been successful in urban centers as well. For example, a huge fan base for the families of otters living in the waterways that run throughout the city has evolved in the green city of Singapore.

Social research on the use of otters in the practice of traditional medicine in Southeast Asia would shed light on the impacts of cultural uses of otters, particularly for the endangered Hairy-nosed otter (Poole 2003). Such local trade may be more amenable to intervention than trade on an international scale.

The otter pelt trade is both lucrative and relatively risk free, and in many places, wildlife poaching is seen as a legitimate pursuit.

Awareness of the seriousness of otter trafficking needs to be raised with national law enforcement agencies such as wildlife, forest, and customs agencies as well as the judiciary. The illegal trade in wildlife is driven by the involvement of increasingly sophisticated criminal entities, which threatens the safety of rural communities and national security in many countries (Gomez and Bouhuys 2018). Trafficking routes, and trade hotspots and seizure records need scrutiny. Efforts to strengthen existing national, regional and international law enforcement platforms are needed to raise the profile of otter trafficking.

People and Demand

Challender *et al*. (2015) point out that efforts to reduce the illegal wildlife trade have been mainly regulatory -- protective legislation and law enforcement -- on the supply side of the market. They suggest that a more integrated approach should include greater efforts to understand and change the market itself. What governs the behavior of consumers, and how can lifestyles be influenced to reduce demand? A better understanding of what drives the demand side of the wildlife trade is crucial to ending the illegal trade in wildlife -- and otters (Challender *et al*. 2015).

Otters are resilient animals. When protected, they can return and flourish in a wide range of natural, near-natural and human-made habitats. Trapping in the past reduced otter populations in South America and the Pacific Rim, but when it was stopped, those populations began to recover. The commercial trade adds another layer of hazard to the other grave threats to wild otters -- loss of habitat, conflict with people, climate change and a suite of other pressures. Trafficking now threatens three otter species in Asia and may in the future threaten otter species in other parts of the world. But with a broad array of conservation tools, international cooperation, increased public awareness, and diminished consumer demand, we can turn the tide of the illegal trade in otters.

The Illegal Otter Trade in Southeast Asia

SEIZURE

LIVE OTTERS
59 SEIZED
2016-2017

KEY COUNTRY; SOURCE & DOMESTIC TRADE

Thailand

High volume seized
5 seizures
35 live otters

KEY DESTINATIONS

Japan

Implicated in
3 seizures
in Thailand
amounting to
32 live otters

Viet Nam

Implicated in
3 seizures
amounting to
15 live otters

ONLINE TRADE

HIGH ONLINE TRADE

in Indonesia, Malaysia, Thailand, Viet Nam

560
advertisements
over 4 months
January – April 2018

Average of
960
otters
observed
for sale

KEY COUNTRIES

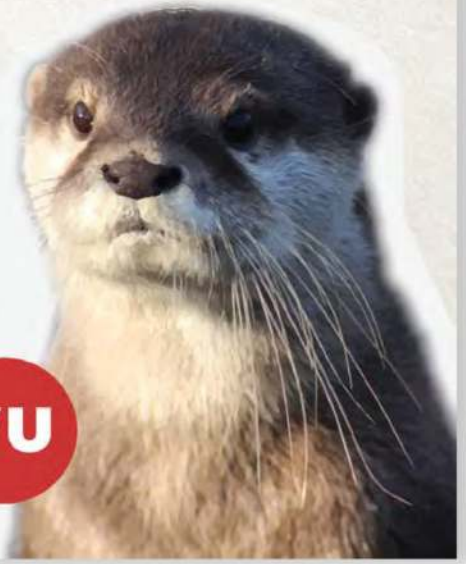
Indonesia

449 adverts with
an average of
711 otters for sale

Thailand

80 adverts with
an average of
204 otters for sale

Main species at risk:
Small-clawed Otter
International trade
regulated under CITES
Appendix II



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TRAFFIC
the wildlife trade monitoring network

Read more: TRAFFIC Report: Illegal Otter Trade in Southeast Asia at www.traffic.org

Otters' vulnerability to climate change

Anna Loy and Carmen Cianfrani

Climate change is predicted to cause changes in the phenology, ranges, and community composition of species (Chen *et al*. 2011). Vulnerability to climate change depends on species' extrinsic range exposure - how suitable climate areas will contract, shift, be fragmented or overlap with competing species, and intrinsic sensitivity and adaptation, which define the degree to which a species is affected, either adversely or beneficially, by climate variability or change and their potential capability to adjust to climate change, to moderate potential damage, to take advantage of opportunities, or to respond to the consequences (Foden and Young, 2016; Santini *et al*. 2016).

Recently Cianfrani *et al*. (2018) developed a global index of climate change vulnerability for the eleven species of freshwater otters, by combining their intrinsic sensitivity (derived from climatic niche width and marginality) and extrinsic range exposure (derived from species distribution models, protected areas and human footprint coverages). Despite uncertainties that make it essential that the model outputs are carefully interpreted (Thuiller *et al*. 2008), predictive models can help with species assessments under the Red List categories and criteria (Foden and Young 2016).

Figure 1 shows the Global Vulnerability Index (GVI) for each species, under 2050 and 2070 representative concentration pathways RCM 8.5, while Table 1 shows a tentative list and evaluation of global concern based on GVI and the other factors that could act to worse or mitigate overall climate change impacts.

The Global Vulnerability Index ranges from -100 to +100, where increasing positive values indicate an increasing positive effect of climate change and increasing negative values indicate an increasing negative effect of climate change (Cianfrani *et al*., 2018). Although vulnerability varies greatly among species, no otter species is predicted to benefit from global warming (Fig. 1).

The vulnerability of species to climate change might be exacerbated by ecological traits, potential competition, current range extension and conservation status. Table 1 shows a tentative evaluation of concern based on combination of GVI and these factors.

Fig. 1 – Freshwater otters' species distribution, IUCN RedList assessment and Global Vulnerability Index to climate change (GVI, derived from Cianfrani *et al*. 2018). GVI are reported for predicted climate scenario RCP 8.5 projected in 2050 and 2070.

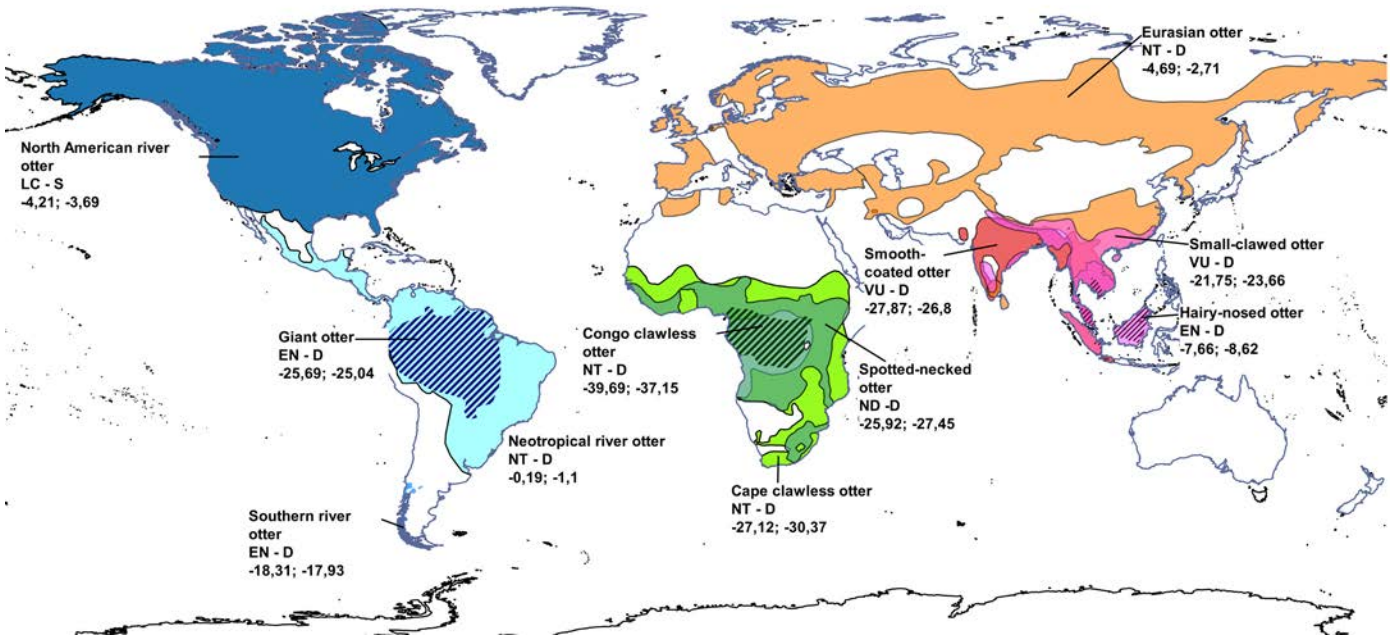


Table 1 - Details on climate change vulnerability of species (GVI), range extent, red list assessment, and ecological traits that might expose species to either minor or higher risk of extinction. Global Concern was derived from evaluation of the degree of clomate change predicted impact (GVI) and number of concerning factors (in red). L = Large; M = Medium; S= Small; HG= Habitat Generalist; HS= Habitat Specialist.

	CC GVI 2050 (2.6, 8.5)	CC GVI 2070 (2.6, 8.5)	Range Ext	Red List	Diet Spec	Habitat Spec	Climatic niche Spec	Biotic interactions	Global Concern
N. American river otter *L. canadensis*	-6,39/-4,21	-6.56/-3,69	L	LC, S	No	HG	-54,8	No	**LOW**
Neotropical river otter *L. longicaudis*	-5,66/-0,19	-5,96/-1,1	M/L	NT, D	No	HG	-17,7	No	**LEAST**
Giant otter *P. brasiliensis*	-22,94/-25,69	-23,13/-25,04	M	EN, D	Yes	HG/HS	-93,5	No	**HIGH**
Southern river otter *L. provocax*	-19,27/-18,31	-19,58/-17,93	S	EN, D	Yes	HS?	-73,5	Yes? L. *felina*	**VERY HIGH**
Cape clawless otter *A. capensis*	-23.45/27,12	-22,59/-30,37	L	NT, D	Yes	HG	-74,5	Yes? (H. maculic)	**HIGH**
Congo clawless otter *A. congicus*	-31,94/-39,69	-31,95/-37,15	M	NT, D	Yes/No	HS	-57,3	No	**HIGH**
Spotted-necked otter H. *maculicollis*	-24,31/-25,92	-24,38/-27,45	L	NT, D	Yes	HS	-75,4	YES? (*A. capensis*)	**HIGH**
Eurasian otter L. *Lutra*	-4.67/-4,69	-4,75/-2,71	L	NT, D	No	HG	-54	YES (A. cin + L. persp)	**LOW**
Smooth-coated otter *L. perspicillata*	-20,79/-23,60	-20,67/-24,09	M	VU, D	No	HG	-91,5	YES (L. *Lutra*)	**HIGH**
Small-clawed otter *A. cinereus*	-25,6/-21,75	-24,94/-23,66	M	VU, D	Yes	HG	-61,4	YES (L. *Lutra* + L. persp)	**HIGH**
Hairy-nosed otter L. sumatrana	-10,23/-7,63	-10,42/-8,62	S	EN, D	No?	HG/HS	-50,7	YES? (A. cin + L. persp)	**MED-HIGH**

Finally, it should be considered that other factors could affect otter resilience under climate change scenarios, especially frequencies and magnitude of extreme climate events, notably heavy floods and droughts. Increased frequencies and magnitude of extreme droughts may exacerbate water shortages already occurring. Nepal and Bhutan, for example, which are warming rapidly, will be highly vulnerable to extreme floodings. As an example, Quaglietta *et al*. (2018) suggested increased frequencies and magnitude of extreme flood and drought events will alter the physiology, activity rhythms and life cycles of Eurasian otters. Climate change is also expected to alter body size of otters (Yom-Tov *et al*. 2006) and promote the spread of parasites (Sherrad Smith *et al*. 2013). However, very few data are currently available on impacts of extreme droughts and flooding on otters, and further studies are urgently needed to fill this gap.

Overall, the projected potential effects of climate change on otters sensitivity and exposure were unevenly distributed among species and across continents. African species showed highest vulnerability, with GVI for 2070 ranging from -22,59 for Spotted-necked otter to-39,69 for Cape clawless otter. In Southeast Asia smooth-coated otter and Small-clawed otter are the most vulnerable species (Fig.1). American's highest vulnerable species are the Giant and Southern river otter. Least impacts are forecasted for the North American river otter, the Neotropical river otter, and the Eurasian otter. However, for this latter climate change might severely affect subspecies surviving in restricted portions of the range (below).

North American river otter
Lontra canadensis
Fig. 2 - Predicted effects of climate change on the North American river otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as follows: S = Sensitivity and its components (Sp = climatic niche specialization; M =climatic niche marginality); Ex = Exposure and its components (RC = range change; Fr = range fragmentation; PA = protected areas coverage; HF = Human Footprint).

Fig. 2 – North American river otter *Lontra canadaensis*

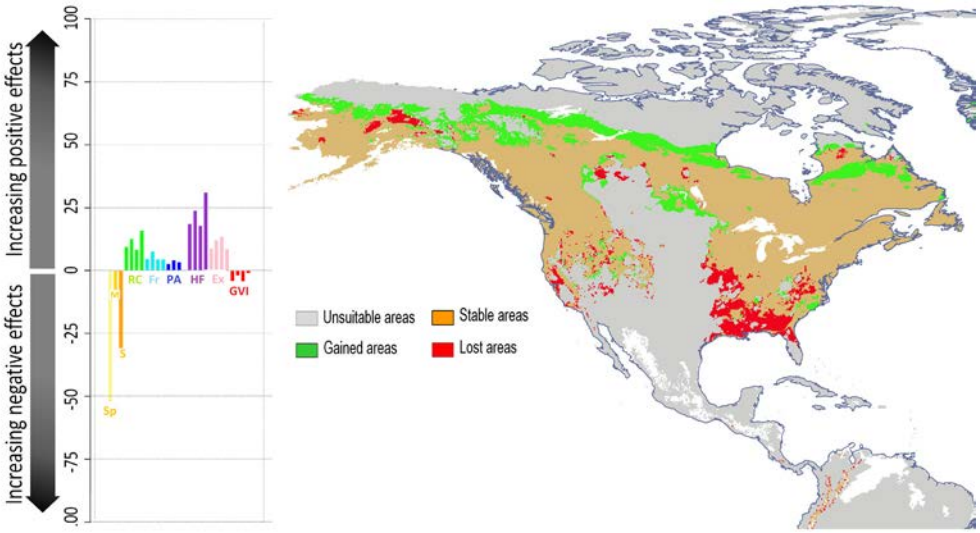
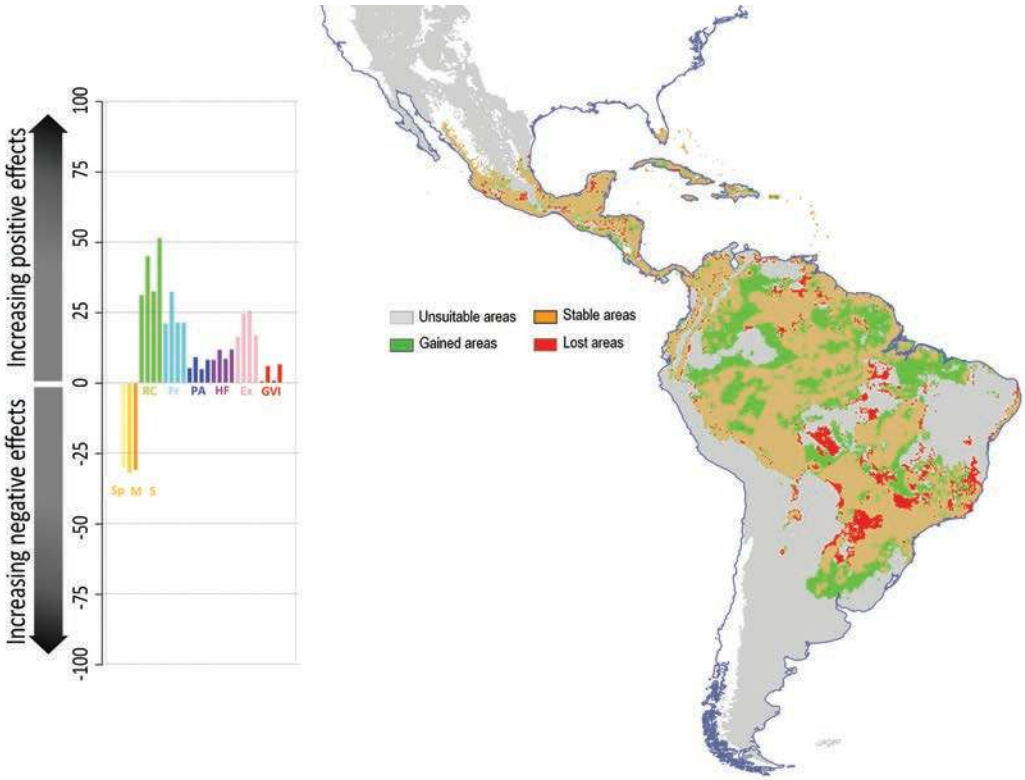


Fig. 3 – Neotropical river otter *Lontra longicaudis*



See Cianfrani *et al*. (2018) for details. A consistent increase in suitable climate areas is predicted for the North American river otter (+10% to +16%), with annual mean temperature being the most important factor affecting its distribution. Suitable habitat will also be less fragmented (Fr positive in Fig. 2), protected areas coverage is predicted to increase (PA positive) in Fig. 2, and newly gained areas will be less impacted by human disturbance (HF positive in Fig. 2). However, the high climatic niche specialization (Sp in Fig. 2) exposes this species to a moderate risk (GVI from – 3,69 to -6,59). The large range, absence of potential competitors, opportunistic habitat and diet adaptations, and current low concern make this species of lower concern as to climate change predicted impacts.

Neotropical river otter
Lontra longicaudis
Fig. 3 - Predicted effects of climate change on the Neotropical river otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

A consistent increase in suitable climate areas is expected for the Neotropical river otter (RC in Fig. 3, +31% to +52%). Precipitation during the wettest quarter is the most important climate factor affecting the distribution of this species (Cianfrani *et al*. 2018). Also, future predicted range will be less fragmented (Fr in Fig. 3) and have an high degree of protection (PA in Fig. 3), which make this species not extrinsically exposed to global warming. However, it shows the most marginal climatic niche among all species (M in Fig. 3), thus resulting in a small negative GVI (-0,19 to -5,96). Its wide range, near threatened status, low specialization of both climatic, habitat, and feeding niches contribute to evaluate this species of low least concern among all otters.

Giant otter
Pteronura brasiliensis
Fig. 4 - Predicted effects of climate change on the giant otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global

Fig. 4 – Giant otter *Pteronura brasiliensis*

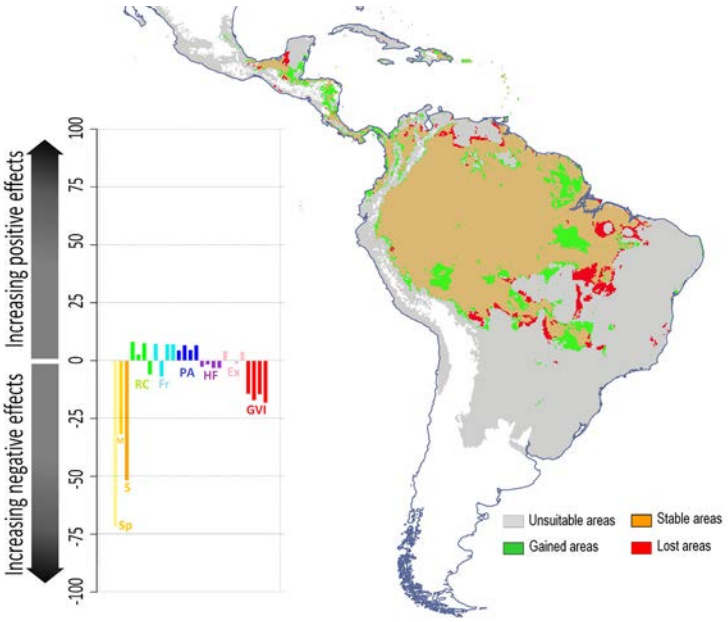
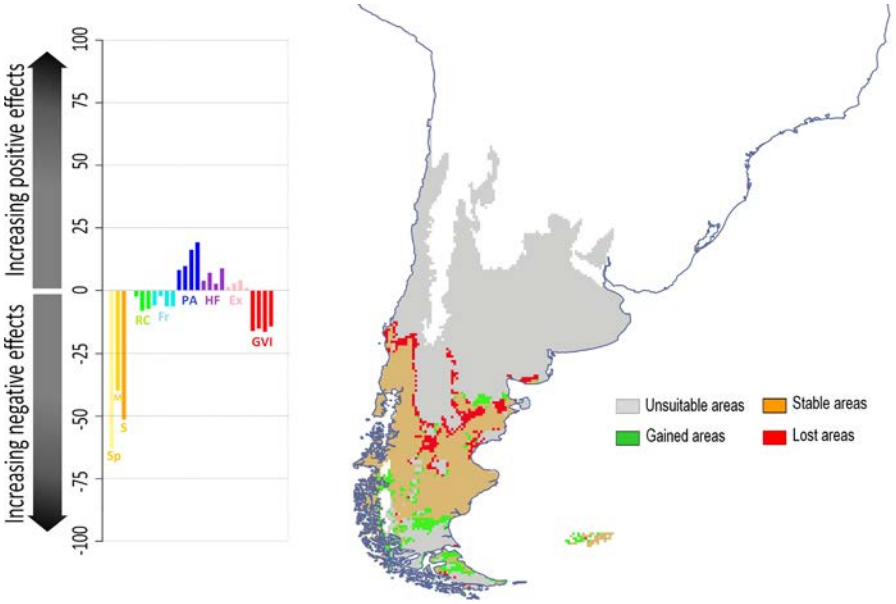


Fig. 5 – Southern river otter *Lontra provocax*



Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

The range of the giant otter is predicted to remain relatively stable over time (RC = +3% to -6%, Fig. 4), with annual mean temperature the most important climate factor affecting its distribution (Cianfrani *et al*. 2018). However, the Giant otter has one of the most specialized climatic niches among all species (Sp = -93,7, Fig. 4), which contributes the most to raise its vulnerability (GVI -22,3 to -25,69, Fig. 4). Considering its medium sized range, its endangered status, and its diet and habitat specialization the Giant otter should be considered of high concern related to the effects of climate change.

Southern river otter
Lontra provocax
Fig. 5 – Predicted effects of climate change on the Southern river otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

The suitable climatic range of the Southern river otter is predicted to remain stable or face little decrease (RC from 0 to – 8,3, Fig. 5), with the mean temperature of the wettest quarter as the most important climate factor affecting its distribution. Also, newly gained areas will be more protected and less affected by human disturbance (PA and HF in Fig. 5). However, the high specialization and marginality of its climatic niche (factors M and Sp in Fig. 5) expose this species to quite relevant predicted impact of global warming (GVI from -17,93 to -19,58). This factor, coupled with its endangered status, its small range, the highly specialized diet and likely habitat, the potential competition with *Lontra ferina* in coastal areas, make this species of highest concern among all otters (Table 1).

Fig. 6 – Congo clawless otter *Aonyx congicus*

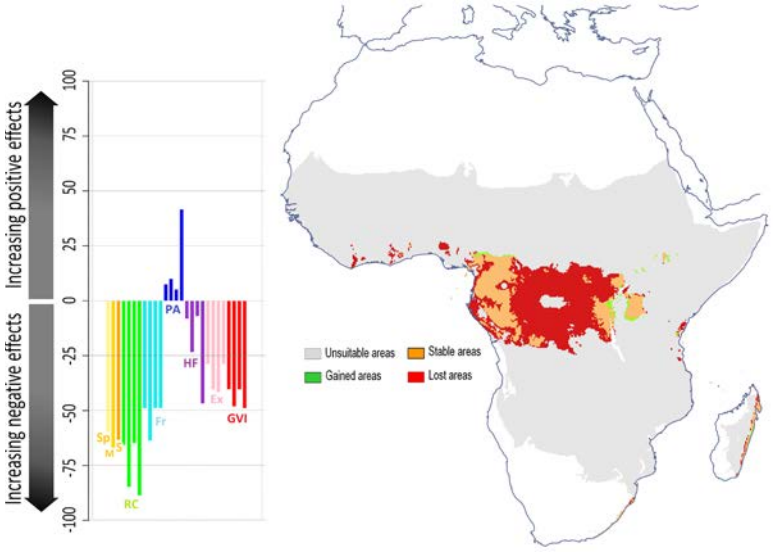
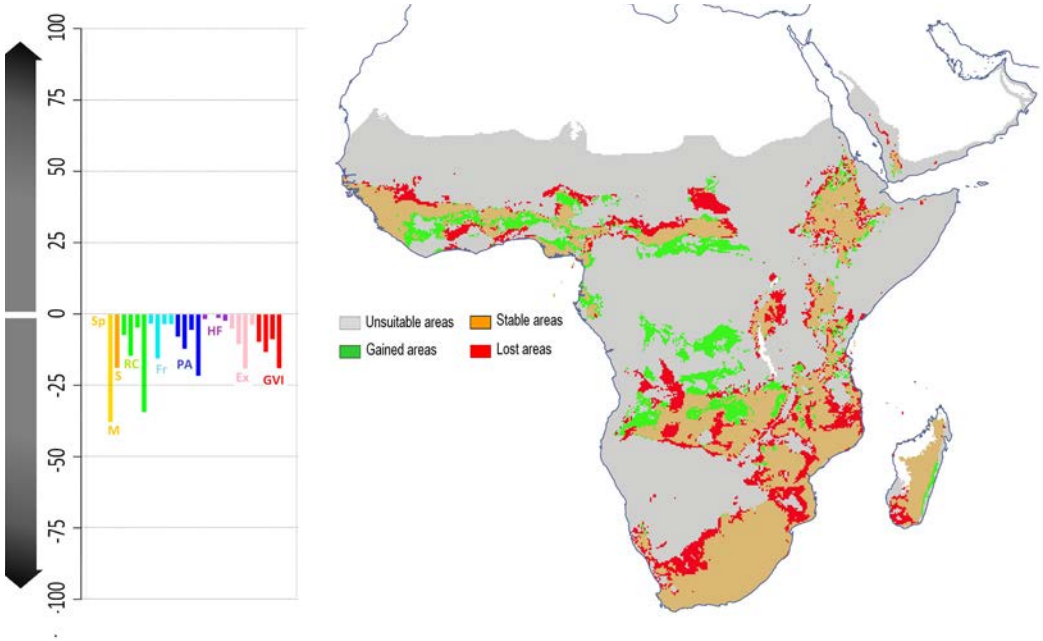


Fig. 7 – Cape clawless otter *Aonyx capensis*



Congo clawless otter
Aonyx congicus
Fig. 6 – Predicted effects of climate change on the Congo clawless otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

For the Congo clawless otter, the most severe loss of climatically suitable areas is predicted (RC from -66% in 2050 under RCP 2.6 to -93% in 2070 under RCP 8.5, Fig. 6), with precipitation during the wettest quarter as the most important climate factor affecting its distribution (Cianfrani *et al*. 2018). These factors are accompanied by a severe increase of fragmentation (FR in Fig. 6) and human disturbance (HF in Fig. 6) in its future range, contributing to make the Congo clawless otter one of the most vulnerable to climate change (GVI = -31,94 to -39,69, Fig. 6).

The only positive prediction is a predicted increase in protected areas coverage of the future range (PA in Fig. 6). Although the species is currently considered near threatened and has a medium sized range, its high specialization of habitat, climatic and feeding niches, suggests to consider the Congo clawless otter of high concern for the impacts of global warming (Table. 1).

Cape clawless otter
Aonyx capensis
Fig. 7 – Predicted effects of climate change on the Cape clawless otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

An important decrease in climatically suitable areas is expected for the Cape clawless otter (RC -7% to -35%, Fig. 7), with annual mean temperature the most important climate factor affecting its distribution. All other components of

Fig. 8 – Spotted-necked otter *Hydrictis maculicollis*

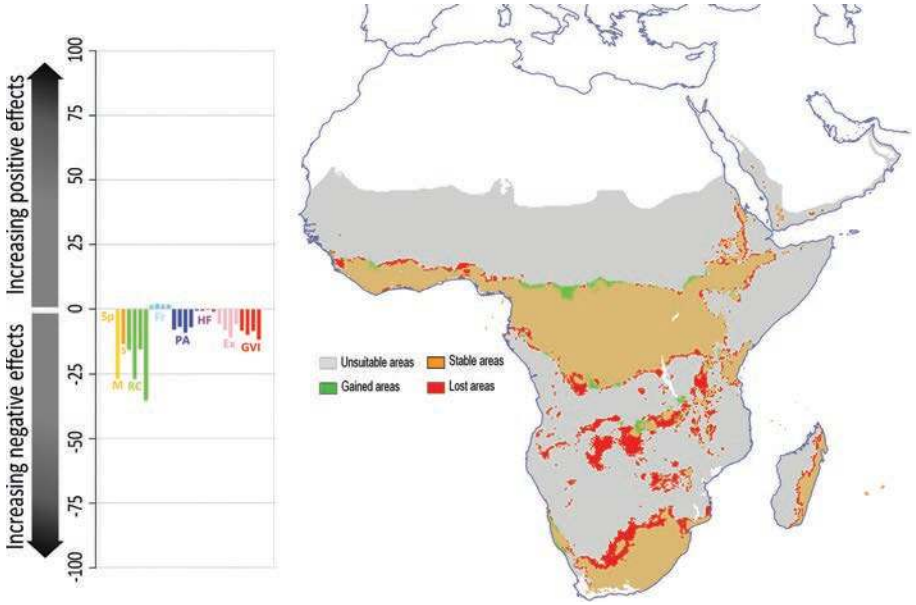
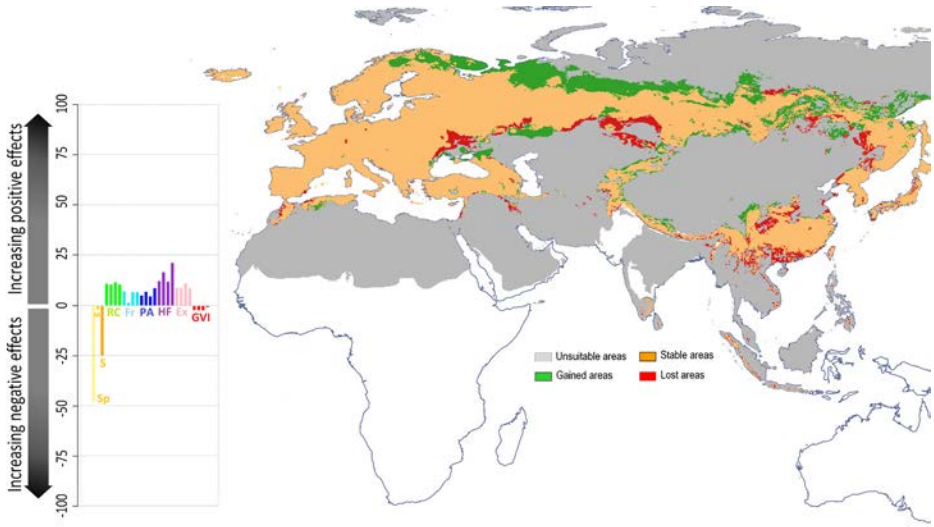


Fig. 9 – Eurasian otter *Lutra lutra*



extrinsic exposure (Fr, PA, HF in Fig. 7) will be negatively affected. These factors, coupled with a high specialization and marginality of the climatic niche, contribute to a high global vulnerability (GVI -22,59 to – 30,37, Fig. 7). Loss is widespread across the range, while gained areas are mainly concentrated within the range of the Congo clawless otter, suggesting potential future impacts of competitive interactions. In spite of its wide range and current low conservation concern, this evidence, together with its specialized feeding and, likely, habitat adaptations, pose high concern on the fate of this species (Table 1).

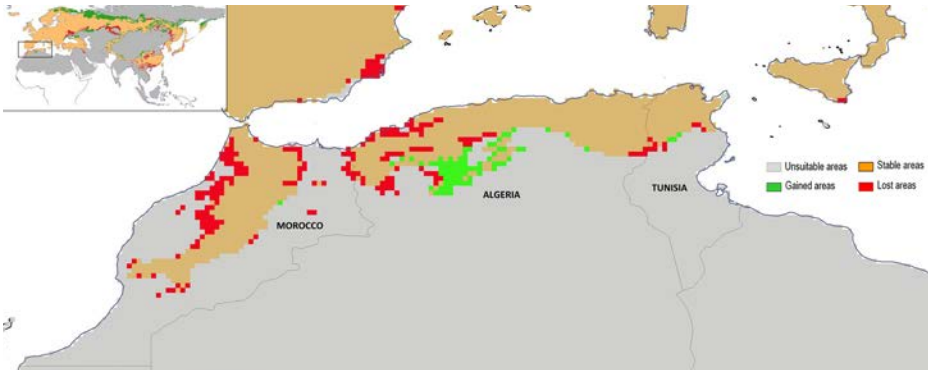


Fig. 10.

Spotted-necked otter
Hydrictis maculicollis
Fig. 8 – Predicted effects of climate change on the Spotted-necked otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right. Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

A relevant decrease in climatically suitable area is also expected for the Spotted-necked otter (RC -16 to -35, Fig. 8), with annual mean temperature is the most important climate factor affecting the distribution of the species (Cianfrani *et al* 2018). Habitat loss is mainly concentrated in south central Africa. Similar to Cape clawless otter, all components of extrinsic exposure (RC, PA, HF in Fig. 8) but fragmentation (Fr in Fig. 8) will be negatively affected, which, coupled with a high specialization and marginality of the climatic niche contribute to a GVI ranging from -24,31 to – 27,45 (Table 1). All this evidence, together with its specialized feeding and likely habitat adaptations pose high concern on the fate of this species, in spite of its wide range and current low conservation concern.

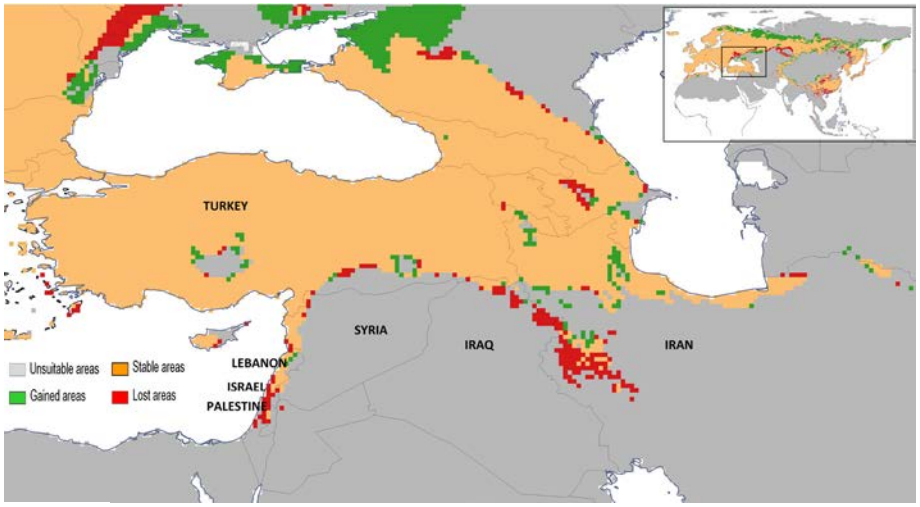


Fig. 11.

Eurasian otter
Lutra lutra
Fig. 9 – Predicted effects of climate change on the Eurasian otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6.

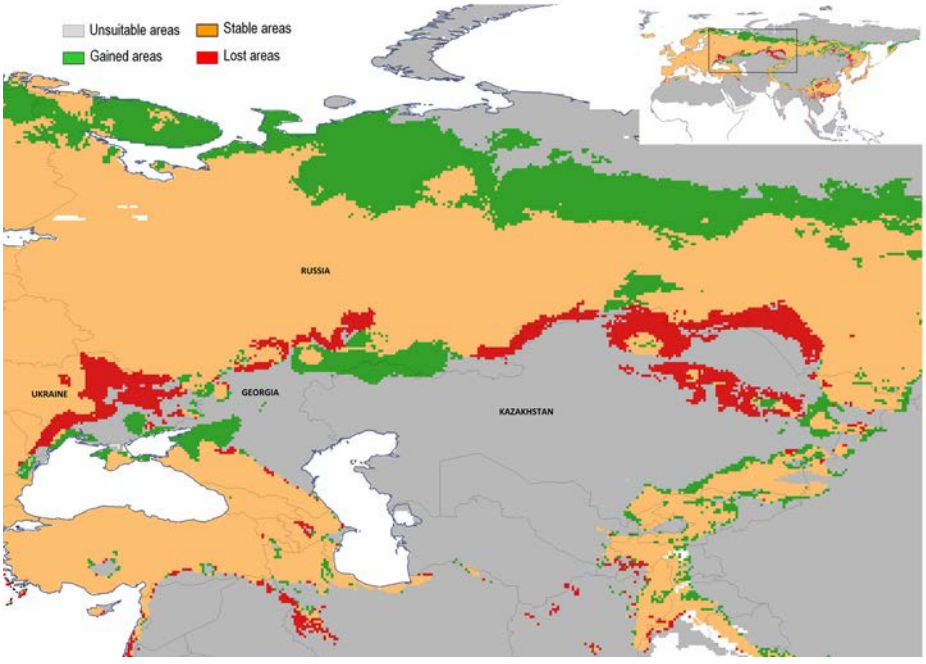


Fig. 12.

Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

A consistent increase in suitable climate areas is predicted for the Eurasian otter (RC +10 to +11, Fig. 9), with annual mean temperature the most relevant climate factor affecting its distribution (Cianfrani *et al*. 2018). Climatic suitable areas will mainly be gained in the northern portion of the range of the nominal subspecies *L. l. lutra*. The impacts of global climate change on otter populations is less imminent (GVI – 2,71 to -4,75, Fig. 9), as this species will benefit for all factors related to range exposure (RC, Fr, PA, HF in Fig. 9), has a wide range, it is an opportunistic and habitat generalist, and it is currently near threatened (Table 1). However, consistent losses are predicted for the southern portion of the range, hosting most subspecies with restricted ranges. Losses are especially concerning in North Africa, Middle East, Central Asia, eastern Himalaya, China, and South East Asia (Figs. 10-14),

Climate changes will likely create more harsh conditions in in Algeria and Morocco, where the subspecies *L. l. meridionalis* is already rare and endangered (Fig. 10), and in Middle East, where heavy droughts and losses of suitable otter habitat are expected especially in Iran, Israel, Lebanon, and Palestine, hosting *L. l. seistanica* (Fig. 11). Extensive losses of suitable climatic areas are expected in central Asia, especially in Ukraine and Kazhakstan (Fig. 12). Range loss and habitat fragmentation are also expected in the eastern Himalaya (mainly Bhutan and Bangladesh, Fig. 13), hosting *L.l.monticola*, and in south east Russia (*L. l. lutra*), China (*L. l. chinensis*), and for the island of Taiwan, hosting the highly isolated and small ranging *L. l. hinana* in (Fig. 14).

Fig. 10. Forecasted loss (in red) and fragmentation of climatic suitable for otters in 2050 in North Africa following climate change under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in orange and green (after Cianfrani *et al*. 2018).

Fig. 11. Forecasted loss (in red) of climatic suitable areas in 2050 in Middle East following climate change under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in orange and green (after Cianfrani *et al*. 2018).

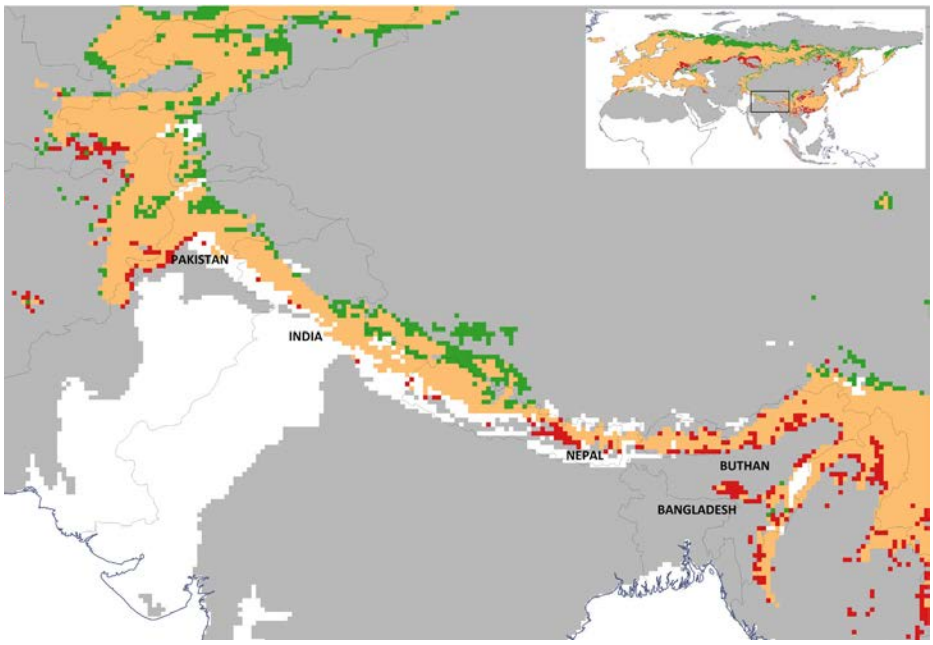


Fig. 13.

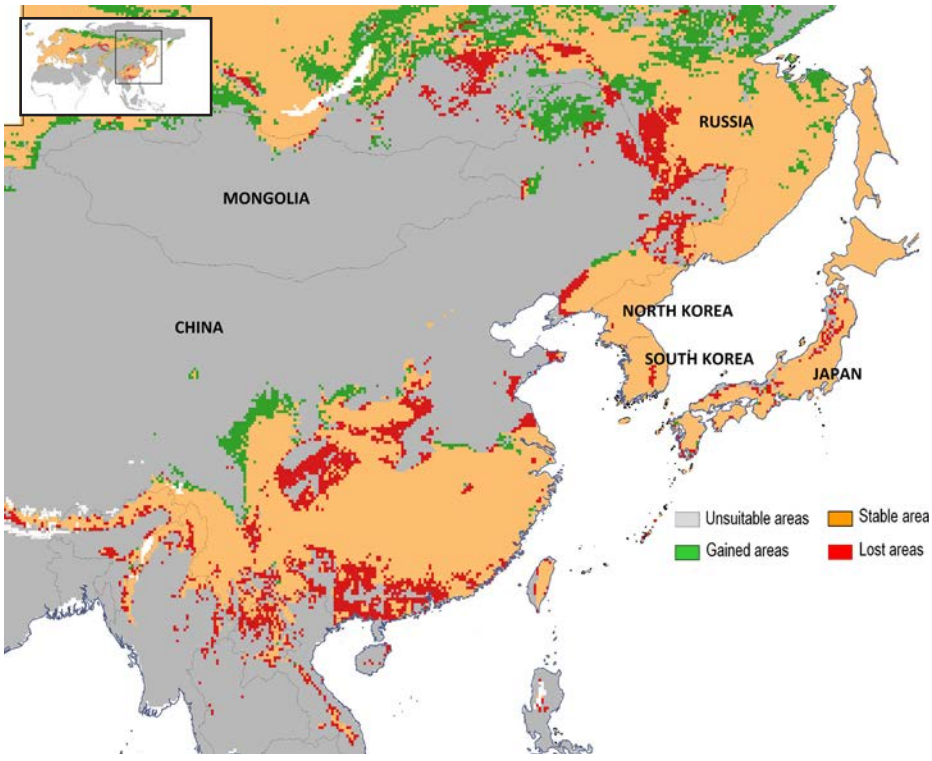


Fig. 14.

Fig. 12. Forecasted loss (in red) of climatic suitable areas in 2050 in Ukraine (above), southern Russia and Kazakhstan following climate change under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in orange and green (after Cianfrani *et al*. 2018).

Fig.13. - Forecasted loss (in red) of climatic suitable areas in 2050 in the Himalaya following climate change under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in orange and green (after Cianfrani *et al*. 2018).

Fig. 14. Forecasted loss (in red) of climatic suitable areas in 2050 in Southern China, North and south Korea, and eastern Russia following climate change under scenario RCP 2.6 (Cianfrani *et al*. 2018). Suitable areas that will remain stable or will be gained are shown respectively in orange and green (after Cianfrani *et al*. 2018).

Climate change will likely not affect most of Europe in terms of loss of climatic suitable areas, but increasing drought (Figs. 15 and 16) will likely affect food resources availability for the nominal subspecies *L. l. lutra*.

Fig. 15. Projected changes in minimum river flow in EU countries (Source: https://www.eea.europa.eu/data-and-maps/figures/mapping-of-drought-conditions-in-europe)

Fig. 16. Drought events in 2003, 2011, and 2012 in the European Union (Source: https://www.eea.europa.eu/data-and-maps/figures/mapping-of-drought-conditions-in-europe)

Fig. 17. Predicted effects of climate change on the smooth-coated otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right: Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

Only a slight decrease in climatically suitable area is predicted for the smooth-coated otter (RC -5 to -20, Fig. 17), with annual mean temperature the most important climate factor affecting its distribution. Although protection of future

Fig. 15.

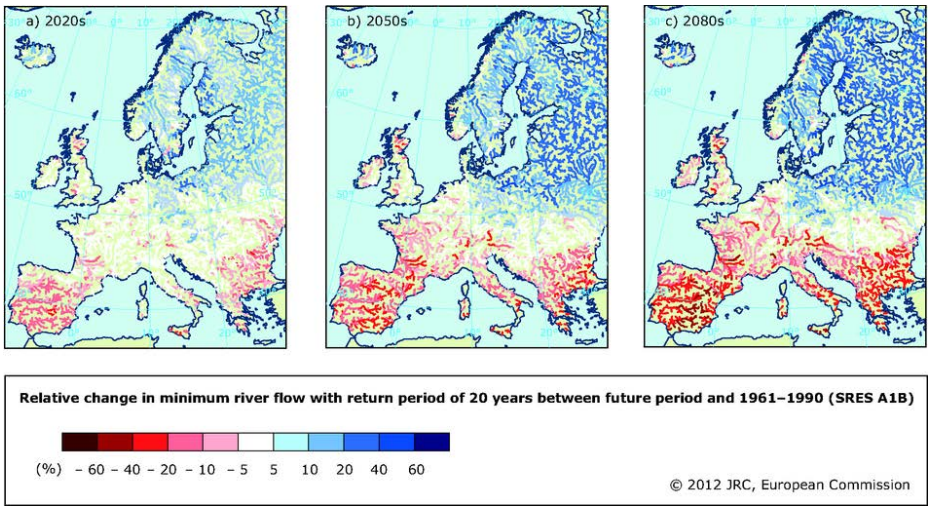
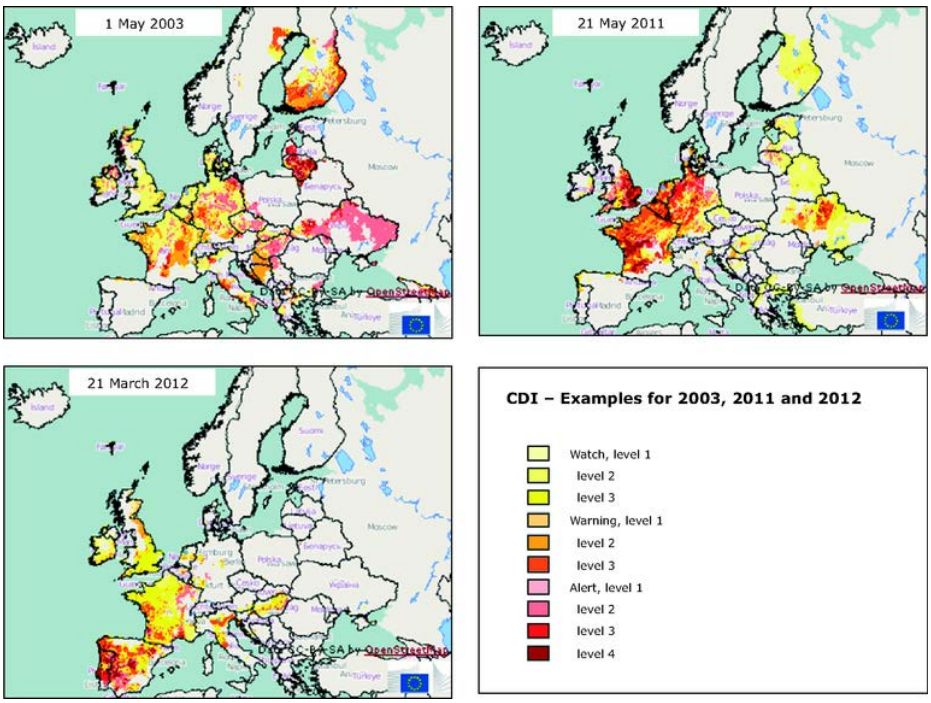


Fig. 16.



gained areas will be higher and human disturbance will decrease, this species has one of the two most specialized climatic niches (Sp = -91,5, Fig. 17) and a quite relevant marginality M in Fig. 17 and Table. 1), which contribute to a quite high degree of vulnerability (GVI -20,67 to -24,09, Fig. 17). This evidence, coupled with a medium sized range, its current vulnerable conservation status, and the potential competition with the Eurasian otter, suggest that it should be considered of high concern (Table 1).

Fig. 18. Predicted effects of climate change on the Small-clawed otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario projected in 2050 and 2070). Right. Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in pale orange and green (after Cianfrani *et al.* 2018). Acronyms are as in Fig. 2.

An important decrease in climatically suitable area is expected for the small clawed otter (RC -17% to – 41%, Fig. 18), with mean diurnal temperature range the most important climate factor affecting its distribution (Cianfrani *et al.* 2018). Losses are widespread, affecting large parts of southern China, Malaysia, as well Bangladesh, Bhutan, Nepal, and southern India. Severe losses are also predicted for Sri Lanka, Giava and Sumatra islands, where range shrinking represents a higher threat due to the stochastic effects acting on small and isolated populations. High climatic niche specialization (Sp, Fig. 18), and its relative marginality (M, Fig. 18), and increase of range fragmentation (Fr, Fig. 18) contribute to a high global vulnerability (GVI - 21,75 to - 25,6, Fig. 18 and Table 1), which, coupled with its current vulnerable conservation status, its medium sized range, feeding specialization, and potential interactions with both Eurasian a Smooth-coated otters lead to consider also this species of high concern (Table1).

Fig. 19. – Predicted effects of climate change on the Hairy-nosed otter under two climate scenarios (RCP 2.6 and RCP 8.5) projected in 2050 and 2070. Left. Trends in components contributing to the Global Vulnerability Index (GVI, red bars, one for each scenario in 2050 and 2070). Right. Forecasted loss (in red) of climatic suitable areas in 2050 under scenario RCP 2.6. Suitable areas that will remain stable

Fig 17 – Smooth-coated otter *Lutrogale perspicillata*

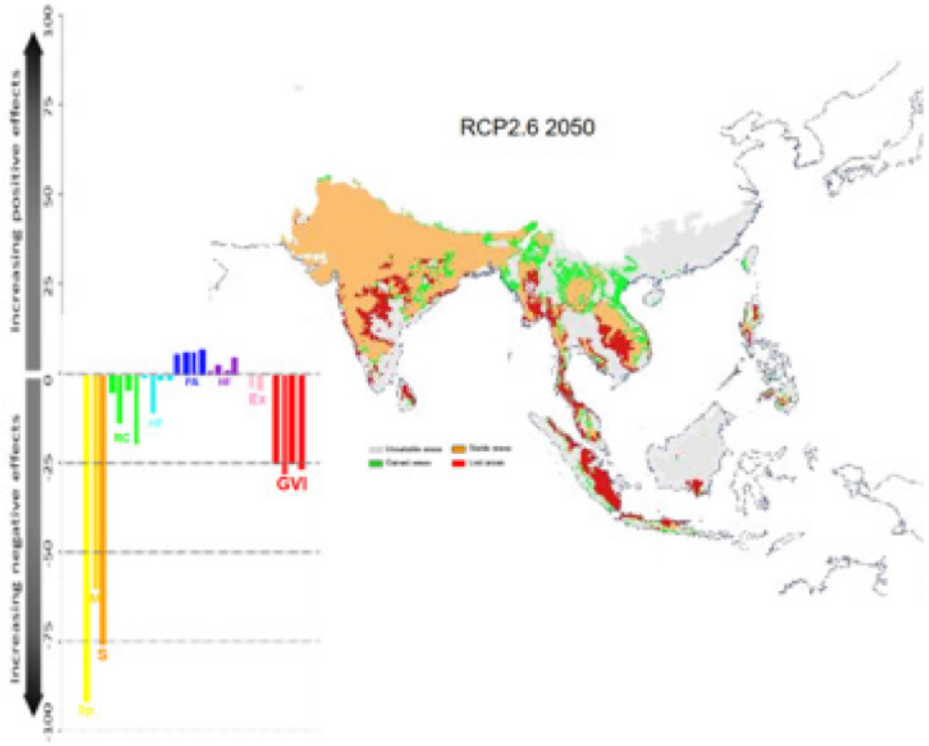
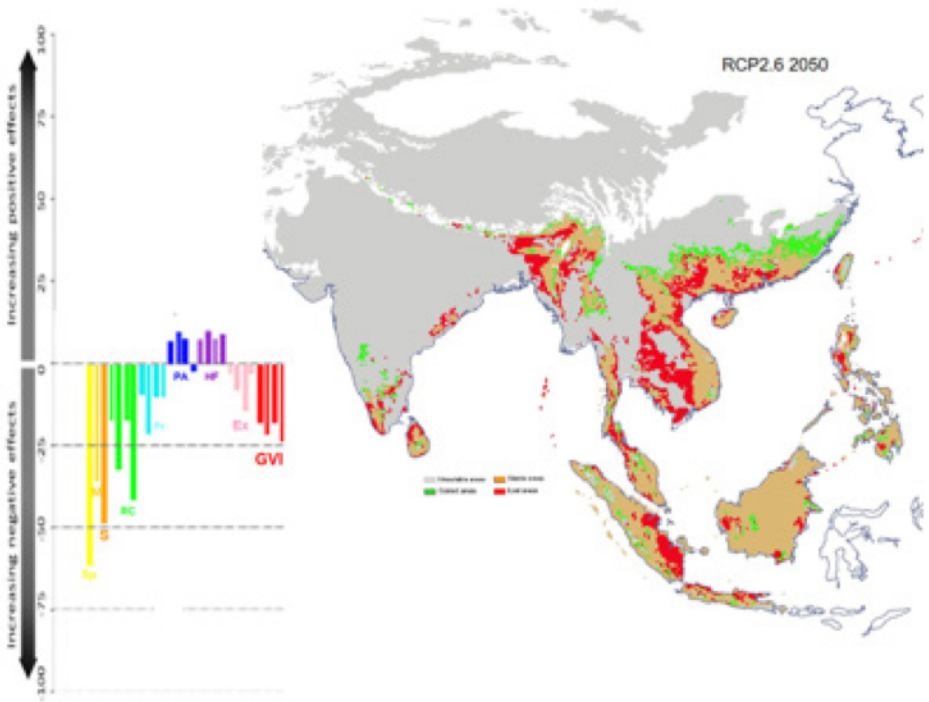


Fig 18 – Small-clawed otter *Aonyx cinereus*



or will be gained are shown respectively in pale orange and green (after Cianfrani *et al*. 2018). Acronyms are as in Fig. 2.

A consistent increase in suitable climate areas is expected for the Hairy-nosed otter (RC +13% to +18%, Fig. 19), with precipitation during the wettest quarter is the most important climate factor affecting its distribution (Cianfrani *et al*. 2018). This species will likely be the least affected by global warming among South-East Asian otters (GVI -7,63 to -10,42, Fig. 19 and Table 1), as all components of range exposure in future range (Eg, Fig. 19) but human footprint (HF) will benefit from global warming (Fig. 19). Also, and the hairy-nosed otter is characterized by a relative low specialization and marginality of climate niche. However, its small range, endangered status and potential overlapping with three other species of otters distributed in South East Asia (*Lutra lutra*, *L. perspicillata*, and *Aonyx cinereus*) suggest a medium-high concern on climate change impact.

Fig. 20. reports climate change impacts on otter diversity hotspots, shown as predicted changes in overlapping ranges of species.

Fig. 20. Forecasted loss (in red) of climatic suitable areas hosting two (light red) or three (dark red) otter species, projected in 2050 under scenario RCP 2.6. Suitable areas that will remain stable or will be gained are shown respectively in yellow (light: two species, dark: three species), and green (light: two species, dark: three species) (after Cianfrani *et al*. 2018).

Higher losses are predicted for hotspots in Africa and South East Asia, especially in Java, where most of three species suitable areas will likely be lost.

Prioritites in facing the impacts of climate change on otters include establishing protected areas in future suitable climate zones, and guaranteeing connectivity among fragmented suitable areas, especially for species of high concern, subspecies ranges of Eurasian otter, and species' hotspots. Also, collecting data on effects of extreme weather events, and adopting mitigation measures will likely allow lower their negative impacts on species.

Fig 19. – Hairy-nosed otter *Lutra sumatrana*

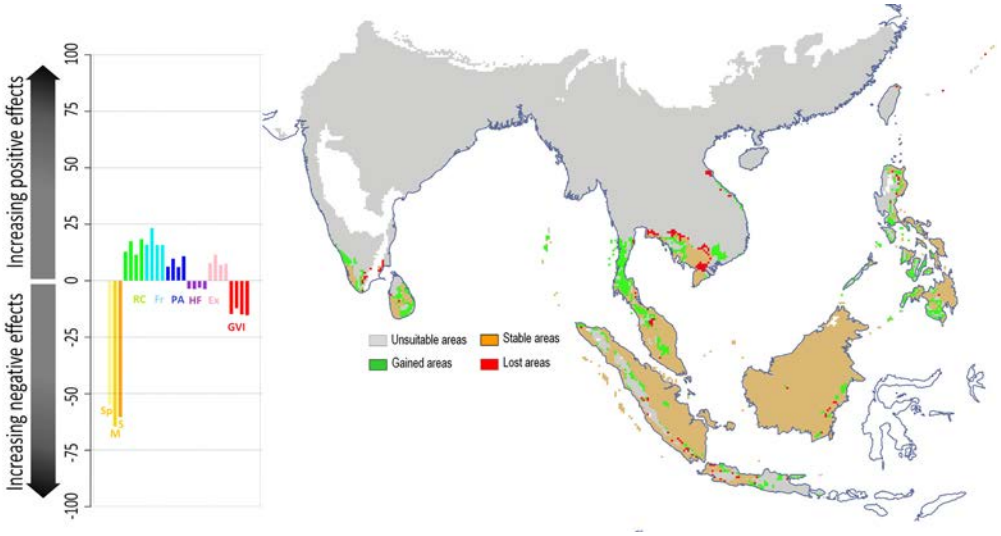
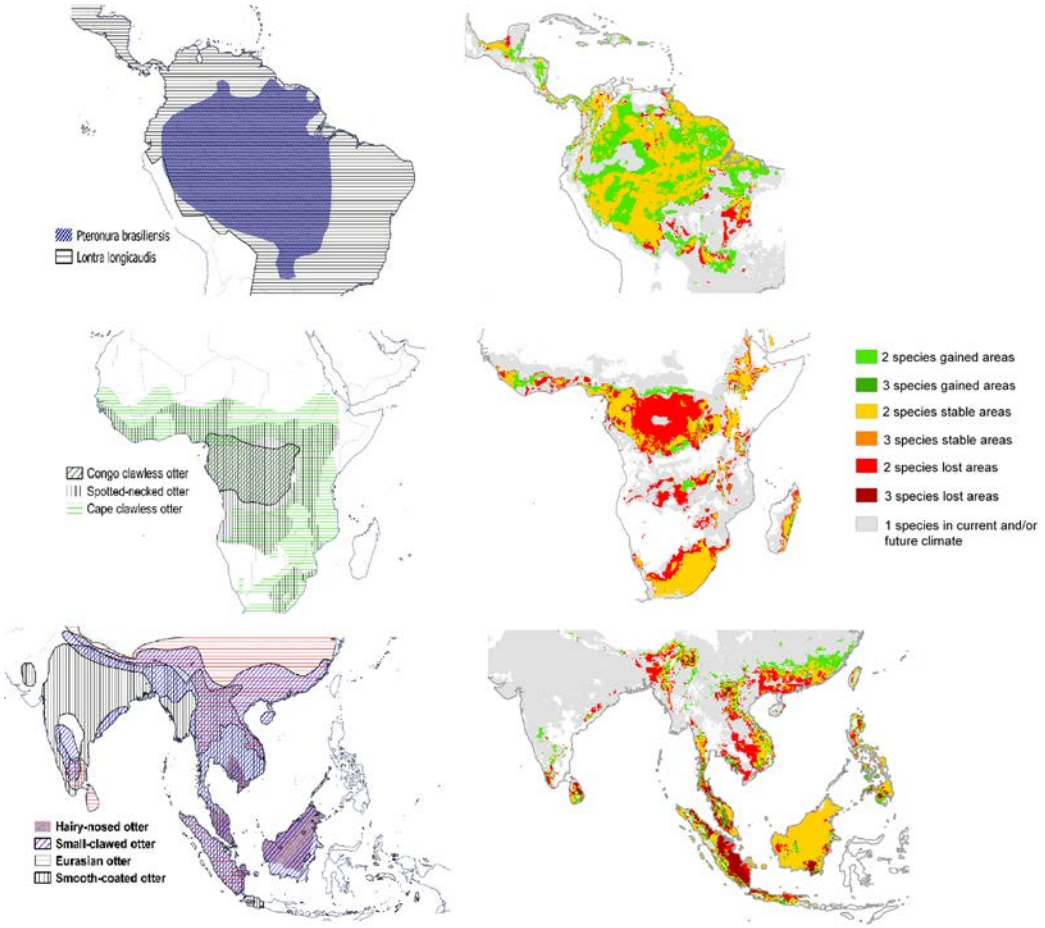


Fig 20. – Forecasted loss



How Captive Otter Populations Contribute to Otter Conservation

Sonja Luz

As otters become increasingly displaced by threats such as illegal trade, human-animal conflicts and habitat destruction, more animals require immediate rescue, rehabilitation and release (RRR) efforts. In this regard, contributions from ex-situ institutions such as modern zoos and rescue centers add significant value to comprehensive conservation plans. While many of these institutions also contribute through funding and in-kind support to conduct RRR programs alongside in situ organizations, a sound ex-situ population management strategy could be the key to ensuring species survival in the long run, should wild otter populations continue to decline.

Maintaining genetically healthy assurance colonies is vital to otter conservation. Captive populations should be integrated into established management programs with the capacity to ensure the upkeep of genetically healthy colonies, including differentiation at sub-species level. Well-managed ex situ otter conservation programs and institutions have already contributed substantial input in databases such as Species 360 (see below). Such data, when kept up to date, allows for informed breeding and management recommendations.

Apart from the potential of directly contributing to the maintenance of robust population numbers in the wild through captive breeding, rehabilitation and reintroduction, ex situ populations can be used as a conservation tool to introduce, create awareness, as well as garner public support for in situ conservation efforts.

Over the years, the role of many zoos has evolved from one which exists for entertainment purposes to one which serves to conserve, educate and inculcate the love for wildlife and biodiversity in their visitors. The educational goals placed on modern zoos do not just encompass basic information and knowledge on animals but spans broader topics such as biodiversity, conservation, ecology and environmental sustainability. Ex situ institutions can further explore the ambassadorship potential of these highly charismatic animals in wildlife education and conservation.

Publications and research conducted in ex-situ programs also contribute to education in a broader scope that is not confined to the walls of institutions. Captive populations can offer unique research opportunities not possible otherwise in wild populations. With better access to the animals and a greater control of research parameters, studies conducted on captive populations provide valuable insights into the environmental and veterinary needs and behaviour of a species, and can complement the research findings on wild otter populations. In this way, otter husbandry manuals and guidelines can be kept up to date, and welfare and management standards, advanced.

Considering the wide distribution of otters and the many threats to their populations, collaboration among numerous stakeholders from community to international bodies is required for effective otter conservation. Institutions that are better equipped or have more resources can be platforms for national, regional and global collaborations and also extend their resources to build capacity in holding institutions with less experience and fewer resources, especially those in range countries.

Fig.1. Status of otters in the wild and captive population programs

Scientific name	*Red List Status*	*CITES*	*Ex Situ*	*Captive Population*	*TAG*	*Managed Program (s)*	*Stud Books*	*Number in captivity*
Aonyx cinereus	VU	2	Y	Excellent	Y	SSP, ZAA SP	Y	960
Lutrogale perspicillata	VU	2	Y	Increasing	N	None	N	68
Lutra sumatrana	EN	2	N	None	N	None	N	0
Lutra lutra	NT	1	Y	Good	Y	SSP, EEP	Y	225
Aonyx capensis	NT	2	N	Few	N	None	N	Few
Aonyx congicus	NT	2	N	None	N	None	N	0
Hydrictis maculicollis	NT	2	Y	Few	Y	SSP	Y	25
Lontra canadensis	LC	2	Y	Good	Y	SSP	Y	332
Enhydra lutris	EN	1	Y	Few	N	None	N	18
Pteronura brasiliensis	EN	1	Y	Good	Y	SSP, EEP	Y	99
Lontra longicaudis	NT	1	N	Very Few	N	None	N	<5
Lontra felina	EN	1	N	Very Few	N	None	N	<5
Lontra provocax	EN	1	N	None	N	None	N	?

Conclusions

In this Global Conservation Strategy we have emphasized that otters are **resilient**, that given protection, community involvement, and good habitat quality they will return to their former habitats. We have witnessed this in North America, Europe, and South America. Good otter conservation programs can succeed, and can be duplicated widely.

We have provided the guidelines and proposed the projects to create regional and local otter conservation programs to guide and stimulate the efforts required to improve the conservation status of all 13 otter species.

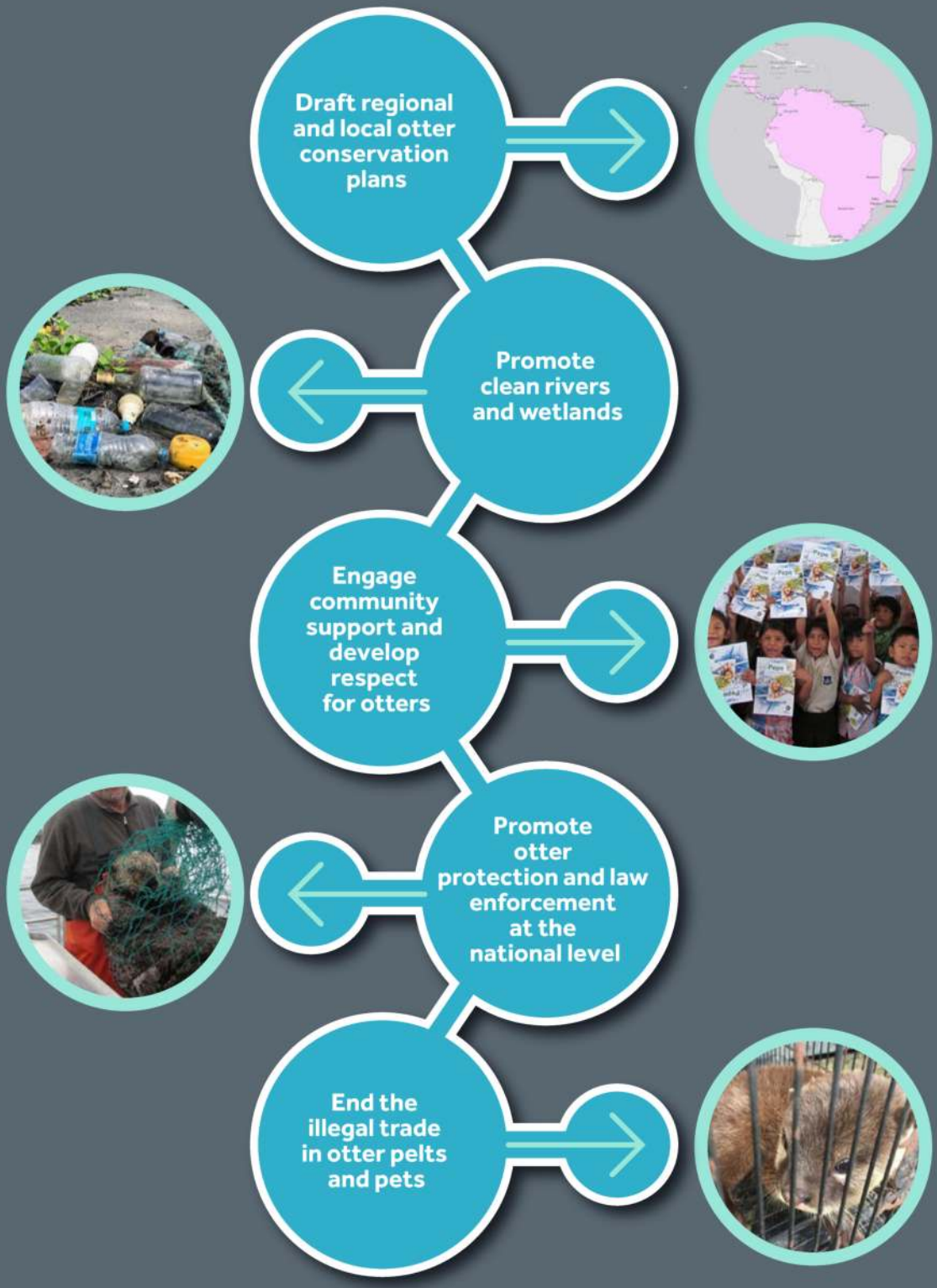
Next Steps

The Strategy provides a global overview of the status of otters and sets the goals and actions required to reverse their current decline. It is a first and important step. Developing strong regional capacity, drafting detailed local conservation strategies and training a new generation of otter biologists is the next step.

The members of the IUCN/SSC Otter Specialist Group are here to help and support these new initiatives.

Visit our website: www.iucnotterspecialistgroup.org

Stepping stones of Otter conservation success



Legal protection by species and country

Asia
Smooth-coated otter *Lutrogale perspicillata*
Short-clawed otter *Aonyx cinereus*
Hairy-nosed otter *Lutra sumatrana*

Eurasia
Eurasian otter *Lutra lutra*

North America
North American river otter *Lontra canadensis*
Sea otter *Enhydra lutris*

South America
Giant otter *Pteronura brasiliensis*
Neotropical otter *Lontra longicaudis*
Marine otter *Lontra felina*
Southern river otter *Lontra provocax*

Africa
Spotted-necked otter *Hydrictis maculicollis*
African clawless otter *Aonyx capensis*
Congo clawless otter *Aonyx congicus*

Smooth-coated otter

Country	Legal protection	Legislation
Bangladesh	Not protected	Unknown
Bhutan	Not protected	Unknown
Cambodia	Not protected	Unknown
China	Protected	Law of the People's Republic of China on the Protection of Wildlife, 1989
India	Protected	Indian Wild Life (Protection) Act, 1972
Indonesia	Protected	Ministry of Environment and Forestry Decree No. P.20/MENLHK/SETJEN/KUM.1/6/2018
Lao PDR	Protected	Wildlife and Aquatic Law, 2007
Nepal	Protected	Aquatic Life Protection Act 1961, National Parks and Wildlife Conservation Act, 1973
Malaysia	Protected	Wildlife Conservation Act, 2010; Wild Life Protection Ordinance, 1998; Wildlife Conservation Enactment, 1997
Myanmar	Protected	Endangered Species of Wild Fauna and Flora, 1992
Pakistan	Protected	Punjab Wildlife Protection, Preservation, Conservation and Management Act, 1974. The North Western Frontier Province Wild-Life (Protection, Preservation, Conservation and Management) Act, 1975
Singapore	Protected	Wild Animals and Birds Act, 1965
Thailand	Protected	Wild Animals Preservation and Protection Act, 1992
Viet Nam	Protected	Decree No.32/2006/ND-CP, Decree No.59/2005/ND-CP; Decree 157/2013/ND-CP

Small-clawed Otter

Country	Legal protection	Legislation	Remarks
Indonesia	Not protected	Act No. 5, 990; Government Regulation no. 7, 1999	Only Eurasian otter and Hairy-nosed otter are protected
Malaysia	Partially protected	Wildlife Conservation Act, 2010 (Peninsular Malaysia and Labuan); Wild Life Protection Ordinance, 1998 (Sarawak); Wildlife Conservation Enactment, 1997 (Sabah)	Protected only in the States of Sabah and Sarawak
Singapore	Protected	Wild Animals and Birds Act, 1965	
Brunei Darussalam	Partially protected	Wild Life Protection Act, 1978	Only in Wildlife Sanctuaries
Philippines	Protected	Wildlife Resources Conservation and Protection Act RA 9147, 2001; Strategic Environmental Plan for Palawan RA 7611, 1992	Classified as Endangered in the list of threatened species in Palawan, 2014
Thailand	Protected	Wild Animals Preservation and Protection Act, 1992	
Cambodia	Not protected	Forestry Law, 2002	Under Fisheries Administration management, which has not yet produced a list of threatened species
Lao PDR	Protected	Wildlife and Aquatic Law, 2007	

Small-clawed Otter

Country	Legal protection	Legislation	Remarks
Viet Nam	Protected	Decree No.32/2006/ND-CP; Decree No.59/2005/ND-CP; Decree 157/2013/ND-CP	
Myanmar	Protected	Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law, 1994	
Bangladesh	Protected	Wildlife (Conservation and Security) Act, 2012	
India	Protected	The Indian Wildlife (Protection) Act 1972, Schedule I and II	
Nepal	Not protected	Aquatic Life Protection Act, 1961; National Parks and Wildlife Conservation Act, 1973	Only Eurasian and Smooth-coated otter within protected areas
China	Protected	Listed as Category II species under China's State Key Protected Animal List, 1989	All three otter species in China are protected

Hairy-nosed Otter

Country	Legal protection	Legislation	Remarks
Cambodia	Protected	Law on Forestry, 2002	
Indonesia	Protected	Law Number 7, 1999	
Malaysia	Protected	Wildlife Conservation Act 2010	Sabah: Protected; Wildlife Conservation Enactment, 1997; Sarawak: Wildlife Protection Ordinance, 1998
Myanmar	Not Protected	The Indian Wildlife (Protection) Act 1972, Schedule I and II	
Thailand	Protected	Wildlife Preservation and Protection Act, 1961	
Viet Nam	Protected	Government Decree 32, 2006	

Eurasian Otter

Country	Legal protection	Legislation	Remarks
Russia	Partially protected		Hunting and trapping regulated on a Provincial basis; harvesting intensity is low
Uzbekistan	Protected	Law Number 7, 1999	Protected as *L.l. seistanica*
Kazakhstan	Protected	Wildlife Conservation Act 2010	*L.l. seistanica* is in the Red Data Books of Kazakhstan, Turkmenistan, Tajikistan, Uzbekistan, Kyrgyzstan
Turkmenistan	Protected	The Indian Wildlife (Protection) Act 1972, Schedule I and II	Protected as *L.l. seistanica* in the Amudariynsky and Kelifsky Preserves, Amudariya River, Amudariya River Islands, Karakumsky Canal, Amudariynsky Reserve; possibly in Lebapsky Velayat
Tajikistan	Protected		Protected as *L.l. seistanica*
Kyrgyzstan	Protected		Protected as *L.l. seistanica*
Mongolia	Protected	Listed in the Red Data Book of Mongolia, 1987	
India	Protected	Wildlife Protection Act 1972	
Sri Lanka	Protected	Fauna and Flora Protection Act, 1937; amended to cover *L. lutra*, No. 22, Schedule 2, 2009	
Nepal	Protected	Aquatic Life Protection Act, 1961, National Parks and Wildlife Conservation Act, 1973	
China	Protected	Law of the People's Republic of China on the Protection of Wildlife, 1989; Class II Schedules of Nationally Protected Fauna and Flora in China	Heavily harvested; species has undergone a dramatic decline throughout the 20th century, especially in the North East
Indonesia	Protected	Act No. 5, 1990; Government Reg. No. 7 of 1999	*L. lutra* occurs in Sumatra and Borneo
Thailand	Protected	Listed on Schedule 1 of the Wild Animals Preservation and Protection Act 1961	
Viet Nam	Not protected		Species range may be restricted to north of the 17th Parallel
Korea, South	Protected	National Treasure, No. 330 (Cultural Heritage Administration)	
Japan	Extinct		
Israel	Protected		
Lebanon	Not Protected	Lebanese Law on the Protection of the Environment No. 444, 2002	Hunting banned by a law in 1995, but the law is almost totally ignored; Lebanon signed CITES in 2013
European Union	Protected	Habitat Directive EC/43/92 – Appendix II and IV; Water Framework Directive EC/6/2000; Water Framework Directive	Habitat Directive protects species and their habitats; EC/6/2000 protects all freshwater ecosystems in the EU; legally protected by country laws in Italy (157/1992) and Greece, P.D. 67/1981

The legal protection status of the Eurasian otter in the following countries is unknown: Afghanistan, Albania, Algeria, Azerbaijan, Bangladesh, Belarus, Bhutan, Bosnia, Bulgaria, Cambodia, Croatia, Georgia, Iran, Iraq, Jordan, Korea PDR, Laos, Montenegro, Morocco, Myanmar, Norway, Pakistan, Serbia, Syria, Switzerland, Tunisia, Turkey, Ukraine.

North American River otter

The river otter is categorized as a fur bearing animal in North America (NA), reflecting historic and current use of its pelt in the fur industry. Management of the river otter is overseen within geopolitical boundaries (i.e., at the state level in the United States of America (USA) and province/territory levels in Canada) by wildlife agencies representing those jurisdictions. Legal trapping is permitted if populations are considered able to be sustainably harvested. However, wildlife agencies may categorize otters with a protected status (e.g., endangered, threatened, species of special concern) within their jurisdictions if populations are considered unable to sustain a harvest. The river otter is a trapped furbearer in 37 states and all provinces/territories, except Prince Edward Island. Wildlife agencies report harvested and protected populations as stable, expanding, or a combination of both within their jurisdictions (see Bricker *et al*. In press) for a complete review of the current status of river otter populations in NA).

Sea Otter

Country	Legal protection	Legislation	Remarks
Japan–Hokkaido (*Enhydra lutris lutris*)	Partially protected		Hunting and trapping regulated on a Provincial basis; harvesting intensity is low
Russia (*E. l. lutris*)	Protected	Law Number 7, 1999	Protected as *L.l. seistanica*
Russia: Commander Islands	Protected	Wildlife Conservation Act 2010	*L.l. seistanica* is in the Red Data Books of Kazakhstan, Turkmenistan, Tajikistan, Uzbekistan, Kyrgyzstan
Russia: Kamchatka Peninsula	Protected	The Indian Wildlife (Protection) Act 1972, Schedule I and II	Protected as *L.l. seistanica* in the Amudariynsky and Kelifsky Preserves, Amudariya River, Amudariya River Islands, Karakumsky Canal, Amudariynsky Reserve; possibly in Lebapsky Velayat
Russia: Kuril Islands	Protected		Protected as *L.l. seistanica*
United States: (*E. l. kenyoni* & *E. l. nereis*)	Protected		Protected as *L.l. seistanica*
United States: Southwest Alaska	Protected	Listed in the Red Data Book of Mongolia, 1987	
United States: South Central Alaska	Protected	Marine Mammal Protection Act, 1972	
United States: Southeast Alaska	Protected	Marine Mammal Protection Act, 1972	Translocated from Alaskan population stocks; Not a MMPA strategic stock (2000-2010)
United States: Washington State	Nationally and State protected	Marine Mammal Protection Act, 1972; "State endangered" under Revised Code of Washington 77.12.020 and Washington Administrative Code 232.12.014	Translocated from population stocks in Alaska; not a MMPA strategic stock (2000-2010); protected by State of Washington laws
United States: State of Oregon	Protected	Marine Mammal Protection Act, 1972	Extirpated in 1911; translocations from Alaska 1970 - 1971 failed to establish a population
United States: State of California	Nationally and State protected	Marine Mammal Protection Act, 1972; Endangered Species Act (42 FR 2965), as amended (16 USC 1531 et seq.); California Fish and Game Code (§4700)	*L. lutra* occurs in Sumatra and Borneo
Canada	Protected	Species of Special Concern under Canada's Species-at-Risk Act; Canada's Fisheries Act; British Columbia's Wildlife Act	Translocated from Alaska population stocks
Mexico	Not protected	No species- specific legislation	EN Listed as "probably extinct"

South America – Giant otter

Country	Legal protection	Legislation	Remarks
Argentina	Protected	National Law No. 22.344, 22.421, 24.375; National Decree No. 522/1997, 666/1997; Resol. SAyDS n.91/2003, 1030/2004; Provincial Law XVI-N° 11, XVI-N° 29, XVI-N° 44, Provincial Decree No. 2.874/1988	
Bolivia		Decree No. 22641 (8/ November/1990)	
Brazil	Protected	Wildlife Conservation Act 2010	Law No. 5197/1967; Decreto No.76623,1975
Colombia	Protected	The Indian Wildlife (Protection) Act 1972, Schedule I and II	Decree No. 2811, 1974; Decree 1608, 1978, Law 17 (1981 CITES in Colombia); Law 84 for Animal Protection, 1989; Resolution 192, 2014 for endangered species including Pteronura; Resolution 2064, 2010 for post-confiscation management of confiscated terrestrial and aquatic species
Ecuador	Protected	Official Register No. 2 (31 March 2003) Article 247 - Comprehensive Organic Penal Code, 2014 Article 31 – Organic Code on the Environment, 2017	
French Guiana	Protected	Arrêté Ministériel du 15 Mai, 1986	
Guyana	Unknown	Listed in the Red Data Book, 1987	
Paraguay	Unknown		
Peru	Protected	Decree No. 004-2014-MINAGRI	
Suriname	Protected	In Wildlife Reserves and National Parks	
Uruguay	Protected	Ley No. 9.481, Law of Indigenous Fauna	Heavily harvested; species has undergone a dramatic decline throughout the 20th century, especially in the North East
Venezuela	Protected	Act No. 5, 1990; Government Reg. No. 7 of 1999	Decree No. 1485, 1996 Decree No. 1486, 1996

Marine otter

Country	Legal protection	Legislation	Remarks
Peru	Protected	DS 004-2014-MINAGRI, 2014	Peruvian law follows IUCN standards
Chile	Protected	Wildlife Protection Act Chapter 220, 2010	Chilean law follows IUCN standards
Argentina	Protected	Resolución SAyDS 1030/2004, 2004	

Neotropical otter

Country	Legal protection	Legislation	Remarks
Argentina	Protected	Resolution 1030, 2007	
Bolivia		Wildlife Protection Act Chapter 220, 2010	
Brazil	Protected	Law 1255. 1991; Supreme Decree 3048/2017, Indigenous Council of the Takana People (CIPTA), 2008	
Colombia	Protected	Ordinance 64, 13/4/1963; Law 5197/1967; Decree 76623, 1975	
Costa Rica	Protected	Wildlife Conservation Law No. 7317, 2005	
Ecuador	Protected	Official Register No. 2, 31 March 2003; Article 247 - Comprehensive Organic Penal Code, 2014; Article 31 – Organic Code on the Environment, 2017	
El Salvador	Protected	Biodiversity Law No. 844/1994; Agreement 74, 2015	
French Guiana	Protected	Ministerial Decree May, 15, 1986	
Guatemala	Protected	Red List Endangered Species of Guatemala, 2000	
Guyana	Unknown	Wildlife Regulation No. 6, 2013	
Honduras	Protected	Species of Special Concern, 2000	
Mexico	Protected	Official Mexican Rule NOM-059-SEMARNAT, 2010	
Nicaragua	Protected	Endangered Species Red List, 2013	
Panama	Protected	Wildlife Law 24, 1995	
Paraguay	Unknown	Law 96, 1992	
Peru	Protected	Decree No. 004-2014-MINAGRI	
Suriname	Unknown	In Wildlife Reserves and National Parks	
Trinidad Tobago	Protected	EMA, 2001	
Uruguay	Protected	Indigenous Wildlife Law 9.481, 1935	
Venezuela	Protected	Decree 1.486, 1996, Wildlife Protection Law 4.925, 1995	

Southern river otter

Chile

In Chile, the conservation status is listed by the Reglamento de Clasificación de Especies as Endangered (2011). The Subsecretaria de Pesca is the governmental agency responsible for their conservation and management, prohibiting trapping until 2025. In those populations inside official protected areas, the Corporacion Nacional Forestal is responsible for their conservation. National Action Plans in Chile are developed by the Ministerio del Medio Ambiente, but despite the conservation status of the otter, no Action Plan exists for this species at present, an urgent conservation action priority. Hunting has been prohibited since 1929 in Chile (Iriarte and Jaksic 1986) and the governmental agency responsible for hunting permits and enforcement is the Servicio Agricola y Ganadero.

Argentina

In Argentina the conservation status is Endangered (Valenzuela *et al*. 2012). At the national level, the governmental agency responsible for native wildlife conservation and management is the Ministerio de Ambiente y Desarrollo Sustentable de la Nación through the Dirección de Fauna Silvestre y Conservación de la Biodiversidad. The Administración de Parques Nacionales (National Parks Administration) is responsible for conservation of those populations inside national protected areas, where the species is classified as Special Value Species (APN 1994). The two populations in Argentina from freshwater and marine habitats are mainly inside national protected areas.

Country	Legal protection	Legislation	Remarks
Chile	Hunting prohibited	Decreto Supremo 225/1995 Ministerio de Economía	Hunting prohibited for 30 years, from 1995 to 2025
Argentina	Hunting prohibited	Ley Nacional 22421 de Conservación de la Fauna	

Africa

Spotted-necked otter

Due to the lack of infrastructure and adequate enforcement, protection in national parks or reserves is limited and not well enforced. Their protected status outside of parks and licensing requirements, if they exist, are poorly enforced across the continent. For most countries there is no new information since 1990. However, there are increasing reports of conflicts with fishermen resulting in intentional persecution of otters

Country	Legal protection	Legislation	Remarks
Angola	Not protected	Law No 6/17 Forest and Wildlife Basic Legislation, 2017	Due to Civil war in recent years any pertinent laws probably have not been enforced.
Benin	Partially protected	Signatory to the African Convention on the Conservation of Nature and Natural Resources, March 07, 2017	
Botswana	Protected	Wildlife Conservation and National Parks Act, 1992	Protected in National Parks
Burkina Faso	Partially protected		Protected in National Parks
Burundi	Not protected	Loi No. 1/010 du 30 Juin 2000 Portant Code de l'Environnement de la République du Burundi	
Cameroon	Not protected	Law No. 94/01, January 20, 1994; Decree No. 95/466, July 20, 1995; Order No. 0648/ MINFOF, December 18, 2006	
Central African Republic	Partially protected	Ordinance No. 84.045, 27 July 1984	Protected in Nature Reserves
Chad	Unknown		Nature conservation ordinance only
Democratic Republic of Congo	Partially protected	Law No 11-009, 9 July 2011. Arrêté ministériel No. 102 /CAB MIN/ECN-T/15/JEB/16 June 2009	Protected in National Parks; permit required for take elsewhere

Country	Legal protection	Legislation	Remarks
Republic of Congo	Partially protected	Law No. 4883, Conservation and Exploitation of Wildlife 1983	Protected in some parks and faunal reserves but distribution is not known
Cote d'Ivoire	Partially protected	Loi No. 65-255, 4 August 1965, relative à la protection de la faune et à l'exercice de la chasse modifiée et complétée par la loi No. 94-442, 16 August 1994	Protected in National Parks; partially protected elsewhere
Equatorial Guinea	Partially protected	Law No. 8/1988, Regulatory Wildlife Hunting and Protected Areas	
Ethiopia	Partially protected	Wildlife Development and Conservation Authority Establishment Proclamation No. 5752008, 2008	Protected in National Parks
Gabon	Partially protected	Decree No. 115/PR/MAEFDR 1981	
Ghana	Partially protected	Wild Animals Preservation Act, 1961, Act 43; Wildlife Reserves Regulations 1971, L.I. 710 and Wildlife Conservation Regulations 1971, L.I. 685	National Parks and reserves if present
Guinea-Bissau	Not protected		Spotted-necked otter is not protected (*Aonyx capensis* is protected)
Kenya	Protected	Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing, 2006	License required to capture or kill; The Wildlife (Conservation and Management) Act 1985 (Revised 2009)
Lesotho	Possibly extirpated	Game Preservation Proclamation, 1951	The Red List of Mammals of South Africa, Lesotho and Swaziland 2016
Liberia	Partially protected	Environmental Protection and Management Law, 2002	Protected in national park; partially elsewhere
Malawi	Protected	National Parks and Wildlife Act No. 11, 1992	
Mali	Partially protected	Law No. 95031 Establishing the Conditions for Management of Wildlife and Its Habitat, 1995	
Mozambique	Partially protected	The Forestry and Wildlife Law (Law 10/1999) Regulation of Forestry and Wildlife Decree No. 12/2002	Protected in National Parks and reserves; hunting controlled by legislation elsewhere
Namibia	Protected	Animals Protection Act 71 of 1962 Nature Conservation Ordinance, 1975 Nature Conservation General Amendment Act No. 31, 1990	Protected in National Parks and reserves
Niger	Protected	Law No. 98-07 of 29 April 1998 Concerning the Regime of Hunting and Wildlife Protection	
Rwanda	Partially protected	Wildlife Ordinance No 41/222 1948 Ministerial Order No. 004/16.01 2010 Export of Wildlife	Protected in two National Parks
Sierra Leone	Partially protected	Wildlife Conservation Act 1972	Protected in nature reserve; hunting regulations elsewhere

Spotted-necked otter, continued

Country	Legal protection	Legislation	Remarks
South Africa	Partially protected	National Environmental Management: Biodiversity Act 10 of 2004; GNR.152 of 23 February 2007: Threatened or Protected Species Regulation	Protected in National Parks and game reserves; skin or live animals cannot be sold elsewhere; The Red List of Mammals of South Africa, Lesotho and Swaziland, 2016
South Sudan	Partially protected	Unknown	Protected in National Parks and areas outside reserves in former Sudan, 1990, 1993
Swaziland	Partially protected	The Game Act, 1991	The Red List of Mammals of South Africa, Lesotho and Swaziland 2016
Tanzania	Partially protected	The Wildlife Conservation Act, 2009	Protected in National Parks; illegal to hunt or capture elsewhere without permit.
Togo	Partially protected	Ordinance 4 /16, 1968 Wildlife Protection and Hunting	Possibly extirpated; protected nationally if present
Uganda	Partially protected	The Uganda Wildlife Statute 1996; National Biodiversity Strategy 2003	Protected in National Parks
Zambia	Partially protected	The Zambia Wildlife No.14, Act, 2015	Protected in National Parks; license required to hunt elsewhere
Zimbabwe	Partially protected	Parks and Wildlife Act 14/1975; Protection of Wild Life (Indemnity) Act 21/1989	Protected in National Parks; landowners may hunt but wildlife regulations in place

African clawless otter

Country	Legal protection	Legislation	Remarks
Angola	Unknown	Law No. 6/17 Forest and Wildlife Basic Legislation 2017	No information since 1989
Benin	Partial protection	Signatory to the African Convention on the Conservation of Nature and Natural Resources, March 07, 2017	Protected in National Parks
Botswana	Protected	Wildlife Conservation and National Parks Act, 1992	
Cameroon	Unknown	Law No. 94/01, January 20, 1994; Decree No. 95/466, July 20, 1995 wildlife legislation; Order No. 0648/ MINFOF, December 18, 2006	
Central African Republic	Partially protected	Ordinance No. 84.045, 27 July, 1984	Protected in reserves, illegal to hunt elsewhere; presence unknown
Chad	Partially protected	Unknown	Nature Conservation Ordinance only
Côte d'Ivoire	Partially protected	Law No. 65-255 du 4 août 1965 relative à la protection de la faune et à l'exercice de la chasse modifiée et complétée par la loi n°94-442 du 16 août, 1994	Protected in National Parks; partially protected elsewhere
Democratic Republic of Congo	Partially protected	Law No 11-009, 9 July 2011, Arrêté ministériel n° 102 /CAB MIN/ECN-T/15/JEB/16 June 2009	Protected in National Parks; permit required elsewhere
Eritrea	Unknown		
Ethiopia	Partially protected	Wildlife Development and Conservation Authority Establishment Proclamation No. 5752008, 2008	Protected in National Parks; partial protection elsewhere
The Gambia	Unknown		
Ghana	Partially protected	Wild Animals Preservation Act, 1961, Act 43; Wildlife Reserves Regulations 1971, L.I. 710 and Wildlife Conservation Regulations 1971, L.I. 685	Protected in National Parks and reserves
Guinea	Partially protected		Protected in National Parks and reserves; permit needed to hunt
Guinea-Bissau	Not protected		
Kenya	Protected	Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing 2006; The Wildlife (Conservation and Management) Act 1985 (Revised 2009)	License required to capture or kill
Lesotho	Protected	Game Preservation Proclamation 1951	Protected in one National Park (Near Threatened)
Liberia	Partially protected	Environmental Protection and Management Law, 2002	Protected in the one National Park; partial protection elsewhere
Malawi	Protected	National Parks and Wildlife Act No. 11, 1992	

African clawless otter

Due to the lack of infrastructure and adequate enforcement, protection in national parks or reserves is limited, if they exist, and not well enforced. Their protected status outside of parks and licensing requirements are poorly enforced across the continent.

Country	Legal protection	Legislation	Remarks
Mali	Unknown	Law No. 95031 Establishing the Conditions for Management of Wildlife and Its Habitat, 1995	Presence unknown
Mozambique	Partial protection	The Forestry and Wildlife Law (Law 10/1999); Regulation of Forestry and Wildlife Decree No. 12, 2002	Protected in National Parks and reserves; hunting elsewhere controlled by legislation
Namibia	Protected	Animals Protection Act 71 of 1962; Nature Conservation Ordinance, 1975; Nature Conservation General Amendment Act No. 31, 1990	Protected in National Parks and reserves
Niger	Protected	Law No. 98-07 of 29 April 1998, Concerning the Regime of Hunting and Wildlife Protection	
Nigeria	Fully Protected	Endangered Species Act, 1985	
Rwanda	Partially protected	Wildlife Ordinance No 41/222 1948; Ministerial Order No. 004/16.01 2010, Export of Wildlife	Protected in two National Parks
Senegal	Protected	Decree No. 87-1044 Establishing the List of Protected Animals, 1987	
Sierra Leone	Partially protected	Wildlife Conservation Act, 1972	Protected in nature reserves; hunting permits needed elsewhere
South Africa	Partially protected	National Environmental Management: Biodiversity Act 10 of 2004; GNR.152 of 23 February 2007: Threatened or Protected Species Regulation	Protected in five Game Reserves; unprotected elsewhere
South Sudan	Unknown		
Swaziland	Protected	The Game Act, 1991	Protected in five Game Reserves; no protection elsewhere
Tanzania	Partially protected	The Wildlife Conservation Act, 2009	Protected in National Parks; permit needed to hunt or capture elsewhere
Togo	Protected	Ordinance 4 /16 1968, Wildlife Protection and Hunting	Presence unknown
Uganda	Partially protected	Ordinance 4 /16 1968, Wildlife Protection and Hunting	Presence unknown
Zambia	Partially protected	The Zambia Wildlife No.14, Act, 2015	Protected in National Parks where they occur; permit needed to hunt elsewhere
Zimbabwe	Partially protected	Parks and Wildlife Act Act 14/1975; Protection of Wild Life (Indemnity) Act 21/1989	Protected in National Parks; landowners may hunt but wildlife regulations in place

Congo clawless otter

Country	Legal protection	Legislation	Remarks
Angola	Not protected	Law No. 6/17 on Forest and Wildlife Basic Legislation	Very low wildlife protection due to long-term civil strife and poaching
Burundi	Not protected	Loi No. 1/010 du 30 Juin 2000 Portant Code de l'Environnement de la République du Burundi	
Cameroon	Not protected	Law No. 94/01, January 20, 1994 Decree No. 95/466, 1995; Order No. 0648/ MINFOF, 2006	
Central African Republic	Partially protected	Ordinance No. 84.045, 1984	Nature reserves; may not be hunted elsewhere unless accidentally caught in fish traps or nets
Democratic Republic of the Congo	Partially protected	Law No. 11-009, 9 July 2011; Arrêté ministériel n° 102 /CAB MIN/ECN-T/15/JEB/16, June 2009	National parks; permit needed for hunting elsewhere; protracted civil war
Republic of Congo	Partially protected	Law No. 4883 Conservation and Exploitation of Wildlife, 1983	National Parks and nature reserves
Equatorial Guinea	Partially protected	Law No. 8/1988 Regulatory Wildlife Hunting and Protected Areas	
Gabon	Partially protected	Decree No. 115/PR/MAEFDR, 1981	Protected in conservation areas
Nigeria	Protected	Endangered Species Act, 1985	All 3 otter species protected; hunting prohibited
Rwanda	Partially protected	Wildlife Policy, 2013	Protection in two National Parks
Uganda	Partially protected	Wildlife Statute No. 14, 1996; Game Preservation and Control Act, 1959	Otters are generally covered by wildlife laws

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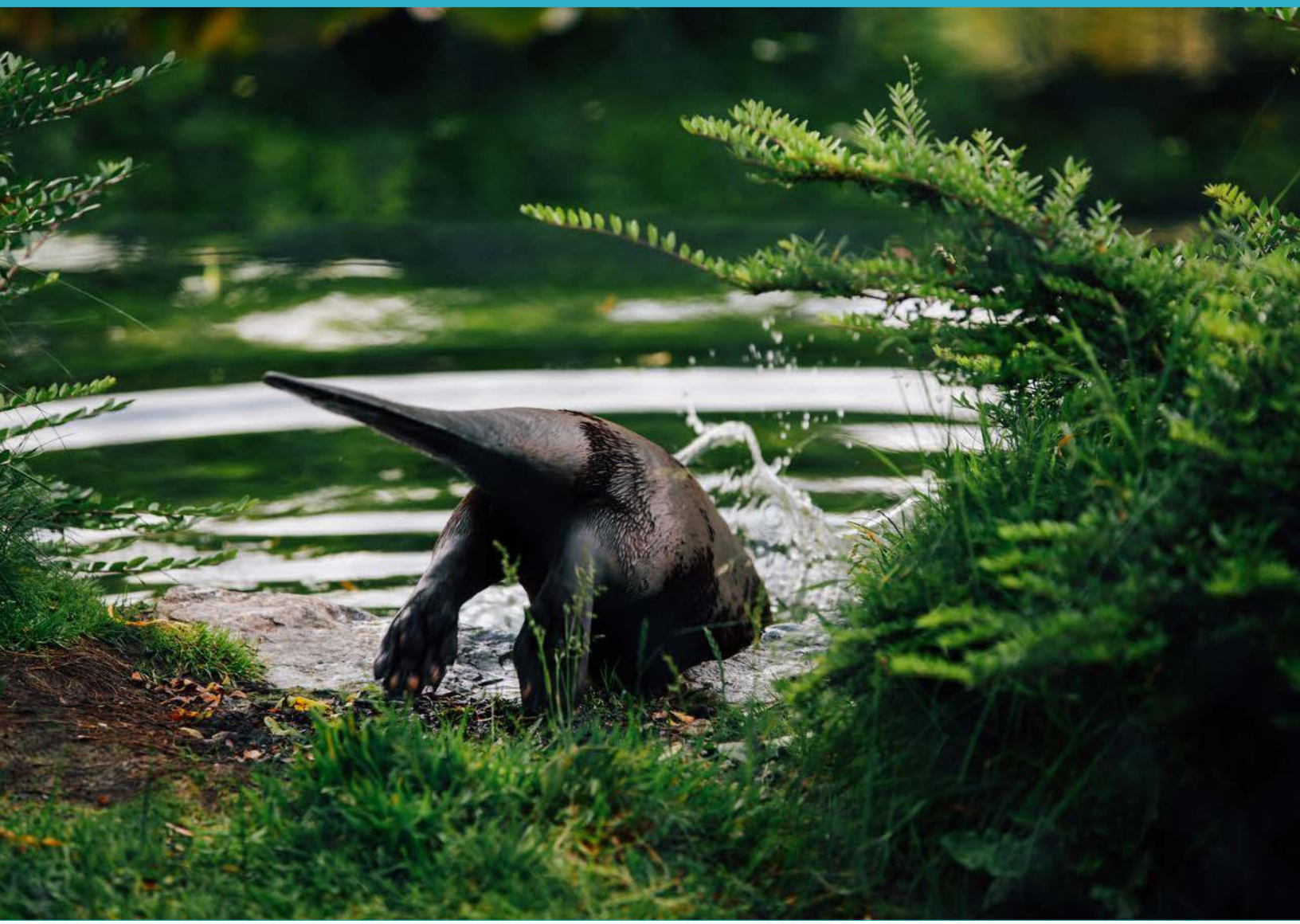

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