Pteronura brasiliensis - (Gmelin, 1788)

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - MUSTELIDAE - *Pteronura - brasiliensis*

Common Names: Giant Otter (English), Arirai (Spanish; Castilian), Ariranha (Portuguese), Giant Brazilian Otter (English), Lobito de Cola Ancha (Spanish; Castilian), Lobo Gargantilla (Spanish; Castilian), Lobo de Rio (Spanish; Castilian), Lobo de Río Grande (Spanish; Castilian), Lobo del Río (Spanish; Castilian), Loutre géante du Brésil (French), Perro de Agua (Spanish; Castilian)
Synonyms: *Mustela brasilinensis* Gmelin, 1788; *Pteronura sambachii* Gray, 1837

Taxonomic Note:
Two subspecies have been described (Duplaix 1980): (1) *P. b. brasiliensis* (Gmelin, 1788) from Suriname, the Guianas, southern Venezuela, southern Colombia, eastern Ecuador, eastern Peru, Bolivia, Paraguay, and Brazil; (2) *P. b. paranensis* (Rengger, 1830) from the Paraguay and Parana rivers in Brazil, northern Argentina and Uruguay. However, this subspecific division was rejected by Carter and Rosas (1997) and described as being of "doubtful value" by Duplaix (1980). Wozencraft (2005) treated subspecies *paranensis* as a synonym of a different subspecies *P. b. paraguensis* (Schinz, 1821). Subsequent mitochondrial DNA and microsatellite analysis supports subdivision of the species into four evolutionary distinct units (ESUs). These comprise: (1) the Rio Madre de Dios with the Rio Madeira (2); the Pantanal (3) the Amazon with the Orinoco and Guianas drainages (4) The Itenez/Guapore basin (Garcia *et al.* 2007; Pickles *et al.* 2011, 2012).

Red List Status
EN - Endangered, A2cde+3ce (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 07/03/2020

Reviewed: 09/03/2020

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Facilitators/Compilers: NA

Assessment Rationale

The status of Giant Otter is regularly monitored by its range countries. Of the 12 national assessments on the distribution and conservation status of the Giant Otter that were prepared, in two countries the species has been categorized in national Red Lists as Critically Endangered (Paraguay and Ecuador), in four countries as Endangered (Peru, Colombia, Venezuela, Bolivia), and as Vulnerable in Brazil; it is considered Extinct in Uruguay, and probably Extinct in Argentina. In the Guianas, the Giant Otter is also protected by law though this is rarely enforced. There was a strong consensus among workers on Giant Otter that it should be considered as Endangered on a continental level. The total global Giant Otter population size is low but, more critically, individual subpopulations are fragmented and most are small. Because of its conspicuous behaviour and social nature, this species is easy to extirpate and is therefore extremely vulnerable. It remains highly susceptible to hunting (though currently hunting of Giant Otters is not a common practice). The killing of individuals and entire groups continues in some areas where fishermen are active, including in protected areas. Moreover, the Giant Otter is intrinsically vulnerable to extinction: combined with low habitat resilience and the fact that only a quarter to a third of the total population reproduces, the species also shows late maturity, late breeding age, suspected low transient survival, and low cub survival - all are traits which limit Giant Otter recovery and re-colonization. Although widely distributed on a continental scale, overall, they may occupy less than 5%, often less than 1% of a given watershed. This means that changes in this specific habitat, or impacts there-in, will have severe effects even if only a fraction of the overall area is affected. Rivers are roads into the forest, this is where people settle, where gold mining takes place, where there is competition for fish or overfishing, where "green" energy can be harvested, where climate change will have strong impacts, where contamination can be spread rapidly, and so on. This vital link to rivers and wetlands renders the Giant Otter much more susceptible than most other comparable large predators of the Amazon, such as the Jaguar.

In South America, only 13 years from now (about half the time-span considered for this assessment) there will be an increase of 44 million people, much more than the total population of Peru. Brazil has seen the highest

deforestation rate in the world and just in 2019 the deforestation of the Amazon represented almost 2,900 km² and at least 1.5 million hectares of the Pantanal have burned. There are estimates that the Amazon rainforest will be reduced by 40% in 2030. If just one or two of the Giant Otter's strongholds is affected, this may be enough to lead to heavy declines in overall population numbers. Further, once remote watersheds are now accessible so that Giant Otters can no longer retreat to 'safe zones'.

Many emerging and/or growing threats pose serious problems for Giant Otters including contamination, overfishing and conflict with fishermen, and infrastructure such as roads and hydroelectric dams. With their preference for lowland wetlands, rivers, and lakes, their prime habitat overlaps completely with the demands of humans (gold mining, fishing, deforestation, mega infrastructure and energy developments, settlement, transport, tourism, etc.). The effects of climate change are already being felt, with Brazil recently suffering severe droughts. Large-scale deforestation in the Amazon could reduce basin-wide rainfall by 12% during the wet season and by 21% in the dry season by 2050 (Spracklen *et al.* 2012) with unknown impacts on (semi) aquatic species.

In summary, three Giant Otter generation lengths approximately represent a 25 year period. Accelerating habitat destruction, degradation, and exploitation throughout the Giant Otter's range represents the greatest threat to the species, and is suspected to have caused a population decline of more than 50% in the past 25 years (criterion A2), also potentially leading to a future reduction in population size of 50% or more over the next 25 years (criterion A3), suspected through a decline in area of occupancy, extent of occurrence, and quality of habitat (subcriterion c), exploitation (subcriterion d), pollutants (especially mercury and fossil fuels), pathogens (domestic animal diseases), and competitors (fishermen) (subcriterion e) potentially playing important roles. Therefore, the species is listed as Endangered under criteria A2cde+3ce.

Reasons for Change

Reason(s) for Change in Red List Category from the Previous Assessment: NA

Distribution

Geographic Range

Pteronura brasiliensis is endemic to South America and is distributed east of the Andes in the Orinoco, Amazonas, and Parana basins, and the hydrographic networks of the Guianas. The northern limit of its distribution range occurs in northern Venezuela, and the southern limit in Misiones, Argentina. The Giant Otter's range has become discontinuous and fragmented due to local extinctions; the Uruguayan and Argentine populations are extinct or nearly so (Gil pers. comm., Buschiazzo pers. comm.), and the species is reduced to a single, small subpopulation in Paraguay, occupying less than 2% of its former distributional range. It is also extinct to the east of the Tocantins and Parana basins in Brazil. In the Brazilian Cerrado a population persists in the face of intense habitat modification. Important subpopulations are still found in parts of the Amazon, in the Pantanal region, and, possibly, in the Guianas.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2: NA

Continuing decline in area of occupancy (AOO): NA

Extreme fluctuations in area of occupancy (AOO): NA

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO) - in km2: NA

Continuing decline in extent of occurrence (EOO): NA

Extreme fluctuations in extent of occurrence (EOO): NA

Locations Information

Number of Locations: NA

Continuing decline in number of locations: NA

Extreme fluctuations in the number of locations: NA

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations: NA

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 0

Elevation Upper Limit (in metres above sea level): 1000

Depth Lower Limit (in metres below sea level): 0

Depth Upper Limit (in metres below sea level): 0

Depth Zone: Shallow photic (0-50m)

Map Status

Map Status	How the map was created, including data sources/ methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Argentina	Presence Uncertain	Native	-	-
Bolivia, Plurinational State of	Extant	Native	-	Resident
Brazil	Extant	Native	-	Resident
Colombia	Extant	Native	-	Resident
Ecuador	Extant	Native	-	Resident
French Guiana	Extant	Native	-	Resident
Guyana	Extant	Native	-	Resident
Paraguay	Extant	Native	-	Resident
Peru	Extant	Native	-	Resident
Suriname	Extant	Native	-	Resident
Uruguay	Presence Uncertain	Native	-	-
Venezuela, Bolivarian Republic of	Extant	Native	-	Resident

Population

There is no current total population estimate and current population trends are unknown: however, there is evidence that populations may be recovering in the Yavarí-Mirín River in northern Peru (Recharte and Bodmer 2010, Deza pers. comm. 2012), the Madidi and Itenéz or Guaporé Rivers in Bolivia (Ayala *et al.* 2015, Zambrana Rojas *et al.* 2012), the Lagarto-Cocha and Cuyabeno rivers in the northeastern Ecuadorian Amazon (Utreras pers. comm. 2018), in the Amanã Reserve in Brazil Amazon (Marmontel *et al.* 2015) and the Brazilian Pantanal (Leuchtenberger & Mourão 2008, Ribas *et al.* 2012, Tomás *et al.* 2015). Although in other regions, such as in the

Department of Madre de Dios in southeastern Peru (R. Williams pers. comm. 2012) and in western Colombia (J.C. Botello pers. comm. 2012) populations are on the decline due to habitat loss and degradation, and other human activities. Most populations remain isolated from each other. Population estimates based on surveys exist for some areas:

1)Brazil: In the Pantanal, 1,100 breeding individuals or 3,950 individuals in 7,350 km of rivers (Tomas *et al.* 2015); Xixuaú River in Amazon, 15 groups (30 breeding individuals, 80 individuals) in 40 km of river (Evangelista & Rosas 2011); Balbina lake in Amazon, 67 groups (134 breeding individuals, 280 individuals) (Palmeirim *et al.* 2014); Amanã Reserve in Amazon: 12 groups (24 breeding individuals, 75 individuals) (Lima *et al.* 2014); Araguaia, above Bananal Island, Brazil: upper Araguaia basin in Cerrado: 200 individuals (G. Georgiadis pers. comm. 2018); Cantão State Park: 4 groups (8 breeding individuals, 20 individuals), (Georgiadis *et al.* 2015). These surveys suggest a population of at least 1,296 breeding individuals, and total population size of 4,659 individuals in Brazil.

2)Bolivia: in the northwest, Madre de Dios-Beni sub-basin: 271 individuals in 1318.6 km of rivers and streams and 42.14 km² of lakes (Ayala *et al.* 2015); in the Pantanal (Paraguay river sub-basin), 50 individuals in 118,031 km²; and in the northeast (Itenez sub-basin), 600 individuals in 186,460 km², totalling an estimated 1,021 individuals in Bolivia.

3)Peru: southeastern Peru, Madre de Dios: 180-400 individuals (R. Williams pers. comm. 2012); Manu National Park: 81 individuals and 11 groups in 2006 (Groenendijk *et al.* 2014);

4) Ecuador: Cuyabeno Wildlife Reserve, 9 groups (18 breeding individuals, 45 individuals), but Utreras and Tirica (2011) suggest that the Ecuador population is less than 250 individuals;

5)French Guiana: at least 200 individuals (Benoit de Thoisy pers. comm. 2012);

6)Paraguay: 24-32 individuals (Cartes and R. Pickles pers. comm. 2011);

7)Guyana: Rewa Head: minimum of 35 individuals (Pickles *et al.* 2011).

Although the distribution range of giant otters is apparently large, their occurrence is irregular making overall population size estimates a challenge, especially because the number of groups is not available for all surveyed areas. Also due to their social organization, the total number of adult individuals does not represent the effective population size, as only the alpha couple of a given group reproduces.

Population Information

Current Population Trend: Decreasing

Number of mature individuals (=population size): NA

Extreme fluctuations? (in # of mature individuals): NA

Severely fragmented?	Justification
No	-

Continuing decline in mature individuals? NA

Continuing decline % in mature individuals within 1 generation or 3 years, whichever is longer (up to max. of 100 years in the future): NA

Continuing decline % in mature individuals within 2 generations or 5 years, whichever is longer (up to max. of 100 years in the future): NA

Continuing decline % in mature individuals within 3 generations or 10 years, whichever is longer (up to max. of 100 years in the future): NA

Extreme fluctuations in the number of subpopulations: NA

Continuing decline in number of subpopulations: NA

All individuals in one subpopulation: NA

Number of mature individuals in largest subpopulation: NA

Number of Subpopulations: NA

Population Reduction - Past

Percent Change in past: NA

Past Population Reduction Basis: NA

Causes of past reduction reversible? No.

Causes of past reduction understood? Yes.

Causes of past reduction ceased? No.

Population Reduction - Future

Percent Change in future	Reduction or Increase	Qualifier	Justification
50%	Reduction	Suspected	-

Basis?
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat, e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites)

Population Reduction - Ongoing

Both: Percent Change over any 10 year or 3 generation period, whichever is longer, and must include both past and future, future can't go beyond 100 years: NA

Both Population Reduction Basis: NA

Reversible?
No.

Understood?
Yes

Ceased?
No

Quantitative Analysis

Probability of extinction in the wild within 3 generations or 10 years, whichever is longer, maximum 100 years: NA

Probability of extinction in the wild within 5 generations or 20 years, whichever is longer, maximum 100 years: NA

Probability of extinction in the wild within 100 years: NA

Habitats 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 white water 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 and 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 (Leuchtenberger *et al.* 2013). During the peak inundation in the southern Pantanal, when no banks were available, giant otter groups used 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 (Leuchtenberger *et al.* 2013), even adapting their diet (Ribas *et al.* 2012). 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 16 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.* 2015, 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 2.5 years old (Oliveira *et al.* 2011, Sykes-Gatz 2005), and the earliest breeding may occur at age 3 (Groenendijk *et al.* 2015). A group usually produces one litter a year, ranging from 1-6 young, but averaging 2 (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.* 2014a, Mumm 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 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.* 2015; Leuchtenberger *et al.* 2015). The size of neighbouring 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.

The average lifespan is about 5 years for females and males (Groenendijk *et al.* 2014). This, in tandem with a mortality of about 50% (Groenendijk *et al.* 2014), a suspected high transient mortality, and difficulty to establish new groups (Schenck *et al.* 2003), means that population recovery and colonization of new areas can be slow.

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.7. Forest -> Forest - Subtropical/Tropical Mangrove Vegetation Above High Tide Level	Resident	Suitable	No
5.1. Wetlands (inland) -> Wetlands (inland) - Permanent Rivers/ Streams/Creeks (includes waterfalls)	Resident	Suitable	Yes
5.2. Wetlands (inland) -> Wetlands (inland) - Seasonal/Intermittent/ Irregular Rivers/Streams/Creeks	-	Marginal	-
5.3. Wetlands (inland) -> Wetlands (inland) - Shrub Dominated Wetlands	Resident	Suitable	Yes
5.4. Wetlands (inland) -> Wetlands (inland) - Bogs, Marshes, Swamps, Fens, Peatlands	Resident	Suitable	Yes
5.5. Wetlands (inland) -> Wetlands (inland) - Permanent Freshwater Lakes (over 8ha)	Resident	Suitable	Yes
5.6. Wetlands (inland) -> Wetlands (inland) - Seasonal/Intermittent Freshwater Lakes (over 8ha)	-	Marginal	-
5.7. Wetlands (inland) -> Wetlands (inland) - Permanent Freshwater Marshes/Pools (under 8ha)	-	Marginal	-
5.8. Wetlands (inland) -> Wetlands (inland) - Seasonal/Intermittent Freshwater Marshes/Pools (under 8ha)	-	Marginal	-
5.9. Wetlands (inland) -> Wetlands (inland) - Freshwater Springs and Oases	-	Unknown	-
9.10. Marine Neritic -> Marine Neritic - Estuaries	-	Unknown	-
13.5. Marine Coastal/Supratidal -> Marine Coastal/Supratidal - Coastal Freshwater Lakes	Resident	Suitable	No
15. Artificial/Aquatic & Marine	-	Unknown	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
No	Observed	-

Life History

Generation Length	Justification	Data Quality
8.2	based on study in Peru	good

Movement Patterns

Movement Patterns: Not a migrant.

Congregatory: NA

Systems

System: Terrestrial, Freshwater (=Inland waters)

Use and Trade

General Use and Trade Information

Species not utilized: False

No use/trade information for this species: False

Hunting for the pelt trade was the single, 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 Brazil (Duplaix 1980). The inclusion of the Giant Otter on Appendix I of CITES in 1973, and the coming into force of international trade restrictions on Giant Otter skins in 1975 finally ended the economic benefits of Giant Otter hunting (Recharte and Bodmer 2009) and commercial hunting ceased shortly after. There is no current trade, although there have been reports of skins being displayed in homes as decoration (M. Marmontel and Lima pers. comms. 2012).

Subsistence:	Rationale:	Local Commercial:	Further detail including information on economic value if available:
Yes	-	-	-

National Commercial Value: No

International Commercial Value: No

End Use	Subsistence	National	International	Other (please specify)
1. Food – human	True	-	-	-
10. Wearing apparel, accessories	True	-	-	-

Is there harvest from captive/cultivated sources of this species? No

Trend in level of total offtake from wild sources: Stable

Trend in level of total offtake from domesticated sources: Not domesticated

Harvest Trend Comments: NA

Non- Consumptive Use

Non-consumptive use of the species? True.

Explanation of non-consumptive use: As apex predators, the giant otter may serve as indicators to healthy wetland ecosystems. The species may also serve as a flagship species for conserving wetlands and associated wildlife.

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, diseases spread by domestic animals, and mismanaged tourism (Duplaix 1980, Schenck 1999, Utreras and Tirira 2011). Human populations are increasing and expanding. 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 habitats. Changes in

government and environmental protection policies in Brazil endanger the pristine areas of the Amazon, Pantanal and Cerrado. Between 2017 and 2019 4,500 km² of the Amazon were lost due to deforestation and burning, of which 65% occurred in 2019 (Cannon 2019, https://news.mongabay.com/2019/11/deforestation-preceded-fires-in-massive-area-of-amazon-in-2019/). From August to November of 2019 at least 1,5 million hectares of Brazilian Pantanal were burned (https://www.dw.com/en/brazils-next-fire-disaster-in-the-pantanal-wetlands/a-51199164).

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).

The giant otter remains endangered because of the low recuperation rate of relict populations now also under pressure from human activities (Groenendijk *et al.* 2015). Direct conflict between humans and otters is an increasing problem. Otters may be killed for fun or out of fear, or, more often, because they are seen as competitors for fish by loggers, miners, and fishermen, who often blame them for depleting fish resources used for local and commercial consumption (Gómez and Jorgensen 1999, Recharte *et al.* 2008, Rosas-Ribeiro *et al.* 2012, Utreras and Tirira 2011). Giant otters can drown in fishing nets and traps and are also 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 at 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 pelt trade years, these life history attributes made them 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. obs.). 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, artisanal as well as industrial, is a significant threat to the species, particularly in the Guiana Shield region, in southeastern Peru, the western region of the Ecuadorian Amazon, and northern Pantanal. 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 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 re-colonized by otters. In areas of gold mining, fish are contaminated with mercury. Gutleb *et al.* (1997) found that mercury concentrations in the majority of 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.

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 are able to 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. 2012).

Giant otters are vulnerable to disturbance 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, and all mustelids are susceptible to canine distemper, 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 *et al.* 1999).

Climatic changes are predicted to increase suitable areas for giant otters (Cianfrani *et al.* 2018). However, long-term habitat and climatic modifications will increase the exposure of suitable 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.

Threats Classification Scheme

No past, ongoing, or future threats exist to this species. False

The threats to this species are unknown. False

Threat	Timing	Timing score	Scope	Severity	Impact Score	Impact category
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	3	3	2	9	High
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
1.3. Residential & commercial development -> Tourism & recreation areas	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
2.1.2. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Small-holder farming	Ongoing	3	3	3	9	High
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
2.2.2. Agriculture & aquaculture -> Wood & pulp plantations -> Agro-industry plantations	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
2.4.3. Agriculture & aquaculture -> Marine & freshwater aquaculture -> Scale Unknown/ Unrecorded	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
3.2. Energy production & mining -> Mining & quarrying	Ongoing	3	3	3	9	High

Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
4.2 Transportation & service corridors -> Utility and service lines (deforestation for oil pipeline routes, oil roads, logging)	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
5.1.1. Biological resource use -> Hunting & trapping terrestrial animals -> Intentional use (species is the target)	Ongoing	3	3	1	7	Medium
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species stresses -> 2.1. Species mortality					
5.3.5. Biological resource use -> Logging & wood harvesting -> Motivation Unknown/ Unrecorded	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species stresses -> 2.1. Species mortality					
5.4.4. Biological resource use -> Fishing & harvesting aquatic resources -> Unintentional effects: (large scale) [harvest]	Ongoing	3	3	3	9	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species stresses -> 2.1. Species mortality 2. Species stresses -> 2.3. Indirect species effects -> 2.3.2. Competition					
7.2.10. Dams & water management/ use -> Large dams	Ongoing	3	2	3	9	High
Stresses;	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
8.1.1. Invasive and other problematic species, genes & diseases ->Diseases -> diseases transmitted between wildlife-livestock interface	Ongoing	3	1	1	5	Low
Stresses:	2. Species stresses -> 2.1. Species mortality					
9.2.1. Pollution -> Industrial & military effluents -> Oil spills	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species stresses -> 2.1. Species mortality					
9.3.2. Pollution -> Agricultural & forestry effluents -> Soil erosion, sedimentation	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species stresses -> 2.1. Species mortality					
11. Climate change -> 11.2. Droughts	Ongoing	3	1	3	7	Medium
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects					
11. Climate change -> 11.1. Habitat shifting and alteration	Future	1	3	2	6	Medium

Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects

Conservation

The Giant Otter is listed on Appendix I of the Convention on International Trade in Endangered Species (CITES) and as Endangered under the United States Endangered Species Act, 1973. The Global Otter Conservation Strategy for the species (Leuchtenberger *et al.* 2018) recommends priority actions that include:

- Establish protected areas in all range countries, including fish corridors to connect fragmented populations and protect stable populations.
- Implement reintroduction programs to recover lost historical populations in Argentina (Corrientes) and Brazil (Paraná Basin).
- Establish national conservation plans throughout the species range.
- Foster multinational cooperation (i.e. 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.
- Create protocols in all range countries to regulate mitigation and compensation for projects like hydroelectric dams, gold mining, agriculture, deforestation and overfishing in giant otter habitat.
- Implement resilience/recovery projects in areas of human activities to help the return of giant otters after threat mitigation.
- Create global guidelines for giant otter watching by ecotourists including mandatory responsible behaviour.
- Train locals to participate as field assistants in research activities, or as ecotourism guides.
- Promote the value of giant otters through environmental education programs in communities that coexist with otters.
- Develop management plans to regulate overfishing to reduce conflicts and protect the prey base.
- 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.
- Create a map of risk and decision scenarios for stakeholders, incorporating otter presence and the current and future threats.
- Conduct population surveys in areas with poor or no knowledge about giant otter occurrence in the last 10 years.
- Establish long-term giant otter conservation programs for key populations in Brazil (Pantanal, Amazonia, Cerrado), Bolivia (Amazonia), Peru (Amazonia), and Colombia (Orinoco).
- Conduct population surveys in parts of Uruguay, Argentina, Brazil (Paraná Basin) where there is little or no knowledge about giant otter presence in the last decade.
- Document the illegal trade in Guyana where animals are taken from the wild by traders either to trade or breed for pets.
- Build strong local networks to create the capacity for local communities to participate in the regional decision-making process.

Conservation Actions In- Place

Action Recovery Plan	Note
No	-

Systematic monitoring scheme	Note
No	-

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	-

Percentage of population protected by PAs (0-100): NA

Area based regional management plan	Note
No	-

Invasive species control or prevention	Note
No	-

Harvest management plan	Note
No	-

Successfully reintroduced or introduced benignly	Note
No	-

Subject to ex-situ conservation	Note
No	-

Subject to recent education and awareness programmes	Note
Yes	-

Included in international legislation	Note
Yes	CITES Appendix I

Subject to any international management/trade controls	Note
Yes	CITES Appendix I

Important Conservation Actions Needed

Conservation Actions	Note
1.1. Land/water protection -> Site/area protection	-
1.2. Land/water protection -> Resource & habitat protection	-
2.1. Land/water management -> Site/area management	-
2.3. Land/water management -> Habitat & natural process restoration	-
3.2. Species management -> Species recovery	-
4.2. Education & awareness -> Training	-
5.4.2. Law & policy -> Compliance and enforcement -> National level	-
5.4.3. Law & policy -> Compliance and enforcement -> Sub-national level	-

Research Needed

Research	Note

1.2. Research -> Population size, distribution & trends	-
1.5. Research -> Threats	-
2.1. Conservation Planning -> Species Action/Recovery Plan	-
3.1. Monitoring -> Population trends	-

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