Lutra lutra - (Linnaeus, 1758)

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - MUSTELIDAE - *Lutra* - *lutra*

Common Names: Eurasian Otter (English), Common Otter (English), European Otter (English), European River Otter (English), Loutre commune (French), Loutre d'Europe (French), Loutre de rivière (French), Nutria (Spanish; Castilian), Nutria Común (Spanish; Castilian), Old World Otter (English)
Synonyms: *Viverra lutra* Linnaeus, 1758; *Lutra nippon* Imaizumi & Yoshiyuki, 1989

Taxonomic Note:
Twelve subspecies were recognised by Hung and Law (2016) (1) *L. l. angustifrons* in North Africa; (2) *L. l. aurobrunneus* in Garhwal Himalayas in northern India and higher altitudes in Nepal; (3) *L. l. barang* in southeast Asia (Thailand, Viet nam, Indonesia and Sumatra); (4) *L. l. chinensis* in southern China and Taiwan; (5) *L. l. hainana* in Hainan Island, China; (6) *L. l. kutab* in northern India (Kashmir); (7) *L. l. lutra* is the most widely distributed spanning from Portugal to South Korea ; (8) *L. l. meridionalis* in from Georgia through Armenia, Azerbaijan and Iran (9) *L. l. monticolus* in northern India (Punjab, Kumaon, Himachal Pradesh, Sikkim and Assam) Nepal, Bhutan and Myanmar; (10) *L. l. nair* in in southern India and Sri Lanka; (11) *L. l. seistanica* in Afghanistan, Eastern Iran, Kazakhstan, Uzbekistan, and Turkmenistan and (12) the Japanese *L. l. whiteleyi*, was considered a distinct species (*L. nippon*) by Suzuki et al. (1996).

Red List Status
NT, A2c (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 31/01/2020

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Assessment Rationale

The Eurasian Otter was listed in the IUCN Red List as Near Threatened in 2004 and 2008 based on declines in parts of the range, lack of information from many parts of the range, and the sensitivity of the species to pollution, prey base depletion and habitat degradation. The only monitored and well know population trend is the population from Europe (Loy 2018), where the Eurasian otter had undergone a strong decline between 1970 and 2000 (Macdonald & Mason 1994). Following strict protection and environmental regulations, the species is increasing in both AOO and EOO in most countries (Conroy & Chanin 2001), although at different rates in each country. In 2015 the proportion where otters were believed to be threatened, declining, very rare or extinct had gone down from 40% to 22% (Roos et al., 2015). However, increasing rates are only available for European Union countries, following monitoring obligations under Habitat Directive 92/43/EEC, whereas for the largest part of the range either decreasing or increasing rates have not been quantified.

Clear evidences of conservation dependence come from the European Union where the adoption of strict legal protection of both the species and its habitat (Habitat Directive 92/43/EC, Appendix II, IV https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm), and banning of harmful pollutants, especially polychlorinated biphenyls and polychlorinated terphenyls (PCBs / PCTs, EU Directive 96/59/EC https://ec.europa.eu/environment/waste/pcbs/index.htm), prompted a reversal of the declining trend and the recovery in most of its former range (Elmeros et al. 2006; Cortes 1998; Kranz and Toman 2000; Prigioni et al. 2007; Loy 2018). The same occurred for the Republic of South Korea, where law enforcement (Wild Fauna & Flora Act 2004, National treasure n.330 by Cultural Heritage Administration), and habitat improvement (actions for forests and water quality) allowed the recovery of *Lutra lutra* in most of the country (Hong 2016, Hong et al., 2017, 2020).
There is ample evidence that the population in western Europe is still recovering and returning to its historical range. The Eurasian otter is now common in Austria, Bulgaria, Czechia, Estonia, Hungary, Ireland, Latvia, Lithuania, Montenegro, North Macedonia, Norway, Poland, Portugal, Slovakia, Spain, Sweden, and UK, and it is likely common in Albania and Serbia. The expansion in France, Netherlands, Germany, Austria, and Slovenia have likely driven the reappearance in Switzerland, north Italy, and Belgium (see the last HD report https://ec.europa.eu/environment/nature/knowledge/rep_habitats/index_en.htm#heading2013/18). However, the otters

are still extinct in Luxembourg, endangered in Italy, very rare in Switzerland and Belgium, and rare in west Germany and east France. Its status is unknown in Bosnia Hercegovina, Croatia, and Kosovo. Viable subpopulations occur in Russia, hosting about 40% of the range with an estimated population of 60-80,000 individuals (Olyenikov and Savaljev 2015). The otter is included in Red Data Books of 48 regions of Russia and is harvested in 21 regions (Olyenikov and Savaljev 2015). Its status is unknown in Belarus but is likely decreasing.

In Central Asia, it is rare or endangered in Kazakhstan (around 100 individuals left), Armenia, Azerbaijan Tajikistan, Uzbekistan. It is vulnerable in Afghanistan, and vulnerable but likely increasing in Georgia (Goradze, 2010). It is declining and becoming rare in Iran and Iraq (Mirzaei et al., 2010; Al-Sheikhly et al. 2014). It is likely declining in Turkey. Its status is unknown in Turkmenistan and Kyrgyzstan. It is becoming rare outside protected areas in India. It is endangered in Sri Lanka, decreasing in Pakistan, and rare in Bangladesh. It is common in Nepal and likely common in Bhutan.

The situation in South East Asia is complex, also as a consequence of range overlap among three otter species (*Lutra lutra, Lutrogale perspicillata*, and *Aonyx cinereus*), which makes surveys through indirect signs (mainly spraints) often uncertain. The Eurasian otter is considered rare in Cambodia and Thailand, vulnerable in Vietnam, threatened in Sumatra and very rare in Borneo where it was just discovered. It is likely common in North Korea. Its status is unknown in Laos and Myanmar.

In North Africa it is common in north Tunisia, but endangered in Algeria, and likely declining in Morocco (Delibes et al., 2013).

The most critical situation is found in China and in the Near East. The Eurasian otter underwent a dramatic decline in China throughout the 20th century and the population declined by 92%, especially in the North East, and it is now extirpated over much of its former range (Li and Chan, 2017). Residual populations are fragmented and mainly restricted to national nature reserves (Zhang et al., 2016). In 2016, the species was listed as endangered in the red list of China (Li and Chan, 2017). It is also endangered in Taiwan. In Near East the Eurasian otter is very rare. It is critically endangered in Lebanon and Israel. It is threatened in Jordan and likely rare and declining in Syria.
The low population density at which otters occur makes them particularly prone to the removal of even a seemingly small proportion of breeding aged adults due to different levels of threats. As adults get removed and territories become empty, the population collapses into smaller fragments, consequently leading to the smaller populations becoming non-viable due to lack of connectivity between populations (Jefferies 1988). Evidences suggest that there is an ongoing population decline at specific portions of its range (Loy 2018), but at a rate no longer exceeding 30% over the past three generations or 23 years (generation length based on Pacifici et al. 2013). This reduction in population (A2c) is suspected from the continuing decline in area of occupancy, extent of occurrence, and habitat loss. This Near Threatened assessment is more of a precautionary listing, as it indicates that while the recovery in western Europe and South Korea is genuine, the conservation actions for this species need to be sustained. Besides, there is still concern about what is happening in parts of its range in Near East and Asia due to increasing habitat loss, water pollution, and poaching (Gomez and Bouhuys 2018).

Reasons for Change

Reason(s) for Change in Red List Category from the Previous Assessment: (No change)

Distribution

Geographic Range

The Eurasian Otter has one of the widest distributions of all Palaearctic mammals (Ando and Corbet 1966). Its range covers parts of three continents: Europe, Asia and Africa. The nominal subspecies *L. l. lutra* has the widest distribution, occurring throughout Europe, Turkey, Ukraine, Belarus, Georgia (Goradze 2010), Russia, North and South Korea. According to Olyenikov and Savaljev (2015) it is widespread northwest of Russia along the coast of the Barents Sea from Murmansk to the east, to the mouth of the Pechora River (except for the easternmost tip of the Kola Peninsula and the Kanin Nose Peninsula). To the east, the border of the species' geographic range crosses Polar Ural Mountains, around Gulf of Ob and the Yenisei Gulf of the Kara Sea, pressing to the north of the line of the Polar circle, and covers the basins of the Heth and Kotuy Rivers. Further the border of distribution crosses the middle stretch of the Lena River, further to the mouth of the Kolyma River, then to the coast of the Bering Sea to the south of Anadyr Bay. The species can be found on Kamchatka Peninsula, Sakhalin Island and Bolshoy Shantar Island, the islands in the Peter the Great Bay, and some islands of the Barents Sea including Kildin, Kharlov, Maly Zelenets Islands. It went extinct in Kuril Islands of Kunashiri and Iturup during the 1950s as a result of trade and harvesting (Oleynikov et al., 2015). It occurs along the coastline of the Sea of Japan and Strait of Tartary approximately up to 51°N. Further north it is only occasionally found in the littoral areas.

The ongoing recovery in Europe is filling the gap in central Europe, as the species is expanding from Austria, Slovenia, Denmark, Netherlands, east Germany, and west France. Following this expansion, it returned to Switzerland in 2016 and North Italy in 2011 (Righetti et al., Pavanello et al. 2015). A gap still exists in Northwest and central Italy, as the southern Italian population is expanding but is still highly isolated from other European populations (Giovacchini et al. 2018).

In the Near and Middle East it occurs with isolated populations in Israel (northern Jordan basin, Hula Valley, Harod Valley, and Golan Heights, Guter et al. 2005, likely extinct in Zvulun Valley and Carmel coastal areas, Ben Ari et al. 2008, Dolev et al. 2006, Guter et al. 2008), Lebanon (river Litani, Bekaa valley and northern Lebanon), Jordan (rivers Jordan and Yarmuk, Reuther et al., 2001), and Syria (eastern Syria, between the Euphrates, its tributary, the Khabur up to Abu Kamal at the Iraqi border, Masseti 2009), south east Iraq. In Iran, it is known from Jajrood River of Tehran Province (Mirzaei et al. 2009), in the Dorfak region Hamzehpour, 2006) and in the Amirkelayeh wetland (Hadipour et al., 2011) of Guilan Province, and Anzali wetland (Naderi et al., 2017). The subspecies *L.l. angustifrons* is reported from Africa, north of the Sahara in Morocco (Delibes et al. 2013), Algeria and Tunisia.

In Central Asia the two subspecies *L. l. meridionalis* and *L. l seistanica* occur in Armenia (Paul Buzzard, pers. com), Kazakhstan, Azerbaijan Tajikistan, Uzbekistan, Afghanistan, Turkmenistan and Kyrgyzstan. It is declining and becoming rare in Iran and Iraq (Karami et al., 2006; Mirzaei et al., 2010; Al-Sheikhly et al. 2014). In Mongolia, it has been reported in the basins of the Onon, Selemdzha, and Tes Tsagaan Gol, Tengis River Eröö rivers basins, Numrug and Khalkh Rivers, Shishged and main tributaries (Byaran, Jamsai, Bus and Tengis Rivers), as well as in the Hovsgol, Ubsu-Nur , and Dayan lakes (Tsendjav 2005, Batsaikhan et al., 2010, Olyenikov and Savaljev 2015, Shar et al., 2018)

In China, relict populations of *L. l. chinensis* persist in well-protected nature reserves, in sparsely populated headwaters of the Qinghai–Tibetan Plateau, at remote sites along international borders, and in densely populated deltas and floodplains (Li and Chan, 2017). Hainan Island hosts the endemic subspecies *L. l. hainana* (Hung and Law 2016). A remnant population has been discovered in Hengqin Island (Li et al., 2017).

Three subspecies, *L.l. kutab*, *L.l aurobrunnea* and *L.l. monticolus* are distributed in the Himalayan river systems in Pakistan, India, Nepal, Bhutan (sporadic small population found in Chittagong and Chittagong hill tracts and in the wetlands of Mymensingh and Syhet, de Silva 2006).

In India, it is also found in the Satpura Tiger Reserve in Madhya Pradesh located in Central India, where it was historically not reported (Joshi et al. 2016). In southern Western Ghats and Sri Lanka,as the subspecies *L. l. nair* occurs. Despite the otters recently rediscovered in Tsushima Island, which have possibly migrated from South Korea, have been identified as *L. l. lutra* (Nakanishi and Izawa, 2019), the native population belonging to *L. l. whiteleyi* is believed to be extinct (Ando *et al.* 2007).

South Asia hosts the subspecies *L. l barang*. Its occurrence has been confirmed from Viet Nam, Cambodia, Lao PDR, Thailand (in Uthai Thani province in southern Thailand, IOSF), Myanmar and Bangladesh (Lekagul and McNeely 1988, Hussain 1999). It reached the islands of Sumatra and Borneo but did not reach the island of Java.

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): 4120

Depth Lower Limit (in metres below sea level): 10

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	- hand correction in QGIS to include most recent records, following MCP approach	-	-no	- new occurrences, more information from some countries, especially China and Russia	-	-

Biogeographic Realms

Biogeographic Realm: Indomalayan, Palearctic

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Afghanistan	Extant	Native	-	-
Albania	Extant	Native	-	-
Algeria	Extant	Native	-	-
Andorra	Extant	Native	-	-
Armenia	Extant	Native	-	-
Austria	Extant	Native	-	-
Azerbaijan	Extant	Native	-	-
Bangladesh	Extant	Native	-	-
Belarus	Extant	Native	-	-
Belgium	Extant	Native	-	-
Bhutan	Extant	Native	-	-
Bosnia and Herzegovina	Extant	Native	-	-
Bulgaria	Extant	Native	-	-
Cambodia	Extant	Native	-	-
China	Extant	Native	-	-
Croatia	Extant	Native	-	-
Czechia	Extant	Native	-	-
Denmark	Extant	Native	-	-

Estonia	Extant	Native	-	-
Finland	Extant	Native	-	-
France	Extant	Native	-	-
Georgia	Extant	Native	-	-
Germany	Extant	Native	-	-
Gibraltar	Extant	Native	-	-
Greece	Extant	Native	-	-
Hong Kong	Extant	Native	-	-
Hungary	Extant	Native	-	-
India	Extant	Native	-	-
Indonesia	Extant	Native	-	-
Iran, Islamic Republic of	Extant	Native	-	-
Iraq	Extant	Native	-	-
Ireland	Extant	Native		-
Israel	Extant	Native	-	-
Italy	Extant	Native	-	-
Japan	Extant	Native	-	-
Jordan	Extant	Native	-	-
Kazakhstan	Extant	Native	-	-
Korea, Democratic People's Republic of	Extant	Native	-	-
Korea, Republic of	Extant	Native	-	-
Kyrgyzstan	Extant	Native	-	-
Lao People's Democratic Republic	Extant	Native	-	-
Latvia	Extant	Native	-	-
Lebanon	Extant	Native	-	-
Liechtenstein	Extant	Native	-	-
Lithuania	Extant	Native	-	-
Luxembourg	Extinct	Native	-	-
Malaysia	No recent evidence	Native	-	-
Moldova	Extant	Native	-	-
Mongolia	Extant	Native	-	-
Montenegro	Extant	Native	-	-
Morocco	Extant	Native	-	-
Myanmar	Extant	Native	-	-
Nepal	Extant	Native	-	-

Netherlands	Extant	Reintroduce d	-	-
North Macedonia	Extant	Native	-	-
Norway	Extant	Native	-	-
Pakistan	Extant	Native	-	-
Palestine	Extant	Native		
Poland	Extant	Native	-	-
Portugal	Extant	Native	-	-
Romania	Extant	Native	-	-
Russian Federation	Extant	Native	-	-
San Marino	Extinct	Native	-	-
Serbia	Extant	Native	-	-
Slovakia	Extant	Native	-	-
Slovenia	Extant	Native	-	-
Spain	Extant	Native	-	-
Sri Lanka	Extant	Native	-	-
Sweden	Extant	Native	-	-
Switzerland	Extant	Native	-	-
Syrian Arab Republic	Extant	Native	-	-
Taiwan, Province of China	Extant	Native	-	-
Tajikistan	Extant	Native	-	-
Thailand	Extant	Native	-	-
Tunisia	Extant	Native	-	-
Turkey	Extant	Native	-	-
Turkmenistan	Extant	Native	-	-
Ukraine	Extant	Native	-	-
United Kingdom	Extant	Native	-	-
Uzbekistan	Extant	Native	-	-
Viet Nam	Extant	Native	-	-

FAO Area Occurrence

FAO Marine Areas: NA

Population

In spite of several studies, the status of its population is not known in many parts of the range, particularly in North Africa, and Central and South East Asia. The overall estimate of the population in United Kingdom was around 10,395 individuals in 2004 (JNCC 2007), around 75-80,000 individuals in Russia in 2015 (Olyenikov and Savaljev 2015), around 1000 in Italy (Loy et al., 2019). The status of its distribution has been reviewed by Loy (2018), though information on its abundance is still lacking due to knowledge gap on population size and AOO in many countries.

Density of otters may vary from 0.010 to 0.04 individuals/km in recently colonized areas (Saavedra 2002, Bonesi et al. 2004; Janssens et al. 2008), and from 0.15 to 0.72 - individuals/km in established populations

(Erlinge 1967; Hung and Lee 2004; Jansman et al., 2002; Ulevičius and Balčiauskas 1996; Sidorovich 2000; Hauer et al. 2002; Prigioni et al., 2006 a,b; Freitas et al. 2007), mainly as a function of prey availability (Ruiz-Olmo et al. 2001; Kruuk 2006). According to Koelewijnr et al. (2010). The effective population size *Ne*, i.e. the most reliable indicator of the effective number of breeding individuals in a population was estimated for the Eurasian otter as 8 N/ (4 + 4.92 + 24.71); thus, about 24% of the observed population size. The main cause of this reduction is the high variance in both female reproductive rate (30-75%, Kruuk et al., 2006, Ansorge et al., 1997) and male reproductive success (Seignobosc et al., 2011). The real effective number will be even lower after correcting for the other factors. Thus, despite the increase observed in the number of animals in many populations, the populations might still be vulnerable because the effective population size is small. Population Viability Analyses suggested that long term persistence of populations in Sweden depends on female survival, the age of first reproduction and, to a lesser extent, to stochastic demographic factors (Björklund and Arrendal 2008; Seignobosc et al., 2011). A Minimum Viable Population was recently estimated in about 4,500 individuals (Loy et al., 2019). The low population density at which otters occur makes them particularly prone to the removal of even a seemingly small proportion of breeding aged adults due to different levels of threats. As adults get removed and territories become empty, the population collapses into smaller fragments, consequently leading to the smaller populations becoming non-viable due to lack of connectivity between populations (Jefferies 1988).

An estimated nine adult female produced a mean of total 5.6 litters/year. However, the net reproduction per female per year of cubs that survived the first half year was estimated 1.38 by Seignobosc et al. (2011) in a reintroduced population in the Netherlands. The estimated juvenile female per 100 females attaining the first reproduction was 33.7 individuals in Shetland (Kruuk *et al.* 1989). In central Finland between 1985 and 2003 the temporal and spatial variation in the density of otter population was 52 otters, including 16 cubs in 11 litters in an area of 1,650 km² in 2002–2003.

Population Information

Current Population Trend: Decreasing

Number of mature individuals (=population size): 57880 - 361140

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

Severely fragmented? NA

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	Reduction or Increase	Qualifier	Justification
25-29%	Reduction	Estimated	-

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

Reversible?
Yes

Understood ?
Yes

Ceased ?
No

Population Reduction - Future

Percent Change in future: NA

Future Population Reduction Basis: NA

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

Causes of both (past and future) reduction reversible? NA

Causes of both (past and future) reduction understood? NA

Causes of both (past and future) reduction ceased? NA

Quantitative Analysis

Probability of extinction in the wild within 3 generations or 10 years, whichever is longer, maximum 100 years: NO

Probability of extinction in the wild within 5 generations or 20 years, whichever is longer, maximum 100 years: NO

Probability of extinction in the wild within 100 years: NO

Habitats and Ecology

The Eurasian Otter lives in a wide variety of aquatic habitats, including highland and lowland lakes, rivers, streams, marshes, swamp forests and coastal areas independent of their size, origin or latitude (Mason and Macdonald 1986, Kruuk, 2006). In Europe, they are found in the brackish waters from the sea level up to 1,000 m in the Alps (Ruiz-Olmo and Gosalbez 1997) and above 3,500 m in the Himalayas (Prater 1971) or 4,120 m in Tibet (Mason and Macdonald 1986). In the Indian sub-continent, Eurasian Otters occur in cold hill and mountain streams. During summer (April - June) in the Himalayas they may ascend up to 3,660 m. These upward movements probably coincide with the upstream migration of fish for spawning. With the advent of winter, the otters come down to lower altitudes (Prater 1971). In a study conducted in Thailand in Huai Kha Khaeng where the Eurasian, Smooth-coated and Small-clawed Otters live sympatrically, Kruuk *et al.* (1994) found that the Eurasian otters used rapidly flowing upper parts of the river. In Sri Lanka, the Eurasian otter inhabits the headwaters of all the five river systems but is not found in the estuaries (de Silva 1996).

Otters are well adapted to modified landscapes (Bueno-Enciso et al., 2014, Kloskowski et al., 2013, Pedroso et al. 2014; Sales-Luís et al. 2007; Weber 2011). However, in most parts of its range, its occurrence is correlated with bank side vegetation providing dens and reproductive holts (Mason and Macdonald 1986; Loy et al., 2004; Carone et al. 2014). The Eurasian Otters are closely connected to a linear living space. Most portion of their activity is concentrated to a narrow strip on either side of the interface between water and land (Kruuk 2006). Otter distribution in coastal areas especially the location of holts, is strongly correlated with the presence of freshwater (Kruuk *et al.* 1989, Beja 1992).

Green et al. (1984) and Kruuk (2006) found that adult males spent most of their time along the main rivers, whereas adult females occupied tributaries or lakes, as they did in Austria (Kranz 1995). Rosoux (1995) found no differences in habitat utilization between sexes and considerable overlaps in range. Young animals usually occupied peripheral habitat, but Green and Green (1983) found differences between immature and mature young males, the latter having access to all available habitats and the other restricted to marginal habitats, supplemented by visits to the main river when vacant, temporally or spatially. While males generally have larger ranges than females in the same habitat, sizes vary according to the type and productivity of the habitat, and methods of measuring ranges vary from study to study.

Like most *Lutra* species, fish is the major prey of Eurasian otters, sometimes comprising more than 80% of their diet (Erlinge 1969, Webb 1975, Ruiz-Olmo and Palazon 1997). In addition to fish, a whole range of other prey items have been recorded in their diet in variable proportions, accounting for the high plasticity of otter foraging behaviour and the varying importance of alternative food types in the species' diet (Remonti et al.

2008; Krawczyk et al. 2016). These include aquatic insects, reptiles, amphibians, birds, small mammals, and crustaceans (Jenkins et al. 1980, Adrian and Delibes 1987, Skaren 1993). Non-native fish species and crayfish may form the bulk of the diet (Bueno–Enciso et al., 2014; Blanco-Garrido et al. 2008; Britton et al. 2017).

A review by Clavero et al. (2003) revealed a latitudinal gradient in diet composition being more diverse in southern localities and more piscivorous towards the north. These authors also found that Mediterranean otters are more generalist predators than temperate ones, relying less on fish, and more on aquatic invertebrates and reptiles. In a study conducted in Sri Lanka, deSilva (1996) reported that the overall diet of the Eurasian otters consisted of 81.2% of crab, 37.5% fish and 8.7% frog. There was significant seasonal variation in the diet in different habitats. The relative importance of fish in the diet was significantly higher in the reservoirs and lakes than the rivers and streams. Crabs were eaten more than fish during the monsoon (de Silva 1997). Seasonal variation in diet was also reported by many authors in Europe (Brzeziński et al. 2006). Otters living in riverine habitats compared to backwaters in Hungary, consumed more birds (3.9%and 0.7%, respectively), less mammals (0.5% and 0.9%, respectively), less reptiles and amphibians (5.6% and 10.2%, respectively) and less invertebrates (0.1% and 0.6%, respectively (Lanszki et al 2006). In riverine habitats, otters preyed more frequently on larger fish than in backwaters, but the main fish prey was small-sized (below 100 g in weight, 85.6% and 91.7%, respectively) (Lanszki et al 2006). In Turkey, otter diet was composed 69.91% of fish, 18.80% invertebrate, 4.39% bird, and 4.39% mammal (Toyran and Albayrak 2019). In South Korea Hong et al. (2019) fish formed the bulk of otter diet, which included also frogs, mammals, and reptiles. Also, the fish fauna and otter diet composition differed significantly, suggesting a preference for slowly moving prey. Fish (PO = 56.1%) and amphibians (PO = 22.5%) were the primary diet components of otters in Putna-Vrancea in Romania while in Lower Siret Valley, fish (PO = 36.7%) and crayfish (PO = 32.6%) formed the mass of the diet (Bouroş and Murariu, 20 17). Fish consumption was all seasons high in Putna-Vrancea, except in winter. In Lower Siret Valley, the highest fish consumption was in the autumn and the lowest in the summer. In a study in Ukraine the otter diet included fish (55.24%), mammals (18.20%), reptiles (8.72%), as well as crustaceans (5.81%) and amphibians (5.58%) (Mikheyev 2017).

The Eurasian otter is capable of taking fish as large as 9 kg, which is a rare occurrence (Chanin 1985), however, many studies in Europe have revealed that the fish consumed by the Eurasian Otters are relatively small with a median length of 13 cm (Kruuk 2006).

The Eurasian otter has been long considered largely solitary (Kruuk, 1995). Erlinge (1969) suggested that males were hierarchical and territorial, influenced by sexual factors, while female ranges were influenced by food and shelter requirements of the family group. However, a field and genetic tracking of a population in Portugal revealed that Eurasian otters are more social than previously thought, with adult males and females with cubs overlapping spatially and temporally, and sharing diurnal resting sites more often than expected (Quaglietta et al. 2014). Ranges of males overlapped with those of 1– 3 females, whereas dyads of the same sex exhibited almost no overlap, confirming the classic mustelid intrasexual territoriality and a polygynous mating system (Quaglietta et al., 2014). Also, Kranz (2006) found evidence of social group formation beyond the occasional associations of two or more family groups, which suggests that under some circumstances, otters of all ages and sexes may form temporary mutually tolerant gatherings. In contrast, in Shetland, where several adult animals used the same stretch of coast, the species was strikingly non-social (Kruuk 1995). The family group of mother and offspring is the most important unit of otter society.

Within the group home range, shared by resident adult females, each had her own core area. Resident males had larger home ranges in more exposed parts of the coast which overlapped with other males and with at least two female group ranges. Male and female transients moved through group ranges, relegated to less favoured holts, habitat and food. In freshwater home ranges are longer for both sexes (Kruuk 1995). Both genetic and field data gathered in Portugal by Quaglietta et al. (2013, 2014) revealed a male-biased dispersal and female philopatry. Subadult males dispersed for an average distance of 21 km (Quaglietta et al., 2013).

In most of its range the Eurasian Otter is predominantly nocturnal (Green *et al.* 1984). In Portugal, Quaglietta et al. (2018) found that the markedly nocturnal activity in a population was affected by seasonality and air temperature. In particular, otters lowered their daylight activity and increased their nocturnal activity during the dry season, being generally less active under higher air temperatures. Other extrinsic factors affecting otters' daily rhythms were moon phase, habitat type and wind, whereas differences in activity patterns according to intrinsic factors were mainly related to males' ranging behaviour and females 'reproductive status. Green *et al.* (1984) found that activity was largely circumscribed by the solar rhythm so that the duration of activity varied through the year with night length. The reverse situation was found in Shetland with activity restricted by the day length (Kruuk 2006), which was linked to activity of prey species, with the favoured marine species more vulnerable in daylight and those in freshwater easier to catch at night. In coastal habitats, tidal patterns influence otter activity, with significant preference shown for feeding at low tide, both in Shetland and on the Scottish west coast (Kruuk 1995).

The Eurasian Otter attains sexual maturity at around 18 months in males and 24 months in the case of females, but in captivity it is usually three to four years (Reuther 1991). They are non-seasonally polyoestrous (Trowbridge 1983), mating in captivity has been observed at all times of the year (Reuther 1999). The gestation period is approximately 63-65 days, the litter size varies from 1 to 5, and the life expectancy is up to 17 years in captivity (Acharjyo and Mishra 1983) but drops to 5-7 years in wild populations (Ansorge et al. 1997; Kruuk 2006; Hauer et al. 2000, 2002).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.5. Forest -> Forest - Subtropical/Tropical Dry	-	Marginal	-
1.6. Forest -> Forest - Subtropical/Tropical Moist Lowland	-	Marginal	-
1.7. Forest -> Forest - Subtropical/Tropical Mangrove Vegetation Above High Tide Level	-	Marginal	-
1.8. Forest -> Forest - Subtropical/Tropical Swamp	-	Marginal	-
3.6. Shrubland -> Shrubland - Subtropical/Tropical Moist	-	Marginal	-
4.6. Grassland -> Grassland - Subtropical/Tropical Seasonally Wet/Flooded	-	Marginal	-
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	-	Marginal	-
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)	Resident	Suitable	Yes
5.7. Wetlands (inland) -> Wetlands (inland) - Permanent Freshwater Marshes/Pools (under 8ha)	Resident	Suitable	Yes
5.8. Wetlands (inland) -> Wetlands (inland) - Seasonal/ Intermittent Freshwater Marshes/Pools (under 8ha)	Resident	Suitable	Yes
5.9. Wetlands (inland) -> Wetlands (inland) - Freshwater Springs and Oases	-	Unknown	-
5.10. Wetlands (inland) -> Wetlands (inland) - Tundra Wetlands (incl. pools and temporary waters from snowmelt)	-	Marginal	-
5.11. Wetlands (inland) -> Wetlands (inland) - Alpine Wetlands (includes temporary waters from snowmelt)	-	Marginal	-
5.13. Wetlands (inland) -> Wetlands (inland) - Permanent Inland Deltas	Resident	Suitable	Yes
5.14. Wetlands (inland) -> Wetlands (inland) - Permanent Saline, Brackish or Alkaline Lakes	-	Marginal	-
5.15. Wetlands (inland) -> Wetlands (inland) - Seasonal/ Intermittent Saline, Brackish or Alkaline Lakes and Flats	-	Marginal	-
5.16. Wetlands (inland) -> Wetlands (inland) - Permanent Saline, Brackish or Alkaline Marshes/Pools	-	Marginal	-
5.17. Wetlands (inland) -> Wetlands (inland) - Seasonal/ Intermittent Saline, Brackish or Alkaline Marshes/Pools	-	Marginal	-
9.10. Marine Neritic -> Marine Neritic - Estuaries	Resident	Suitable	Yes

12.5. Marine Intertidal -> Marine Intertidal - Salt Marshes (Emergent Grasses)	Resident	Suitable	Yes
13.4. Marine Coastal/Supratidal -> Marine Coastal/Supratidal - Coastal Brackish/Saline Lagoons/Marine Lakes	Resident	Suitable	Yes
13.5. Marine Coastal/Supratidal -> Marine Coastal/Supratidal - Coastal Freshwater Lakes	Resident	Suitable	Yes
15.1. Artificial/Aquatic & Marine -> Artificial/Aquatic - Water Storage Areas (over 8ha)	Resident	Suitable	Yes
15.2. Artificial/Aquatic & Marine -> Artificial/Aquatic - Ponds (below 8ha)	Resident	Suitable	Yes
15.3. Artificial/Aquatic & Marine -> Artificial/Aquatic - Aquaculture Ponds	-	Suitable	Yes
15.7. Artificial/Aquatic & Marine -> Artificial/Aquatic - Irrigated Land (includes irrigation channels)	-	Marginal	-
15.8. Artificial/Aquatic & Marine -> Artificial/Aquatic - Seasonally Flooded Agricultural Land	-	Marginal	-
15.9. Artificial/Aquatic & Marine -> Artificial/Aquatic - Canals and Drainage Channels, Ditches	Resident	Suitable	Yes

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Estimated	-

Life History

Generation Length	Justification	Data Quality
7.6	Based on Pacifici et al. 2013	good

Movement Patterns

Movement Patterns: Not a Migrant

Congregatory: NA

Systems

System: Terrestrial, Freshwater (=Inland waters), Marine

Use and Trade

General Use and Trade Information

Species not utilized: False

No use/trade information for this species: False

Animals are hunted for their pelts and for used as food.

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

Yes	-	Hunting and trapping regulated in 21 regions in Russia, according to the game bag regulation of the Federal Game and Hunting Management Department	-up to 500 USD for an otter fur hat

National Commercial Value: Yes

International Commercial Value: Yes

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

Is there harvest from captive/cultivated sources of this species? Unknown

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: Tourism

Threats

The aquatic habitats of otters are extremely vulnerable to man-made changes. Canalization of rivers, removal of bank side vegetation, dam construction, draining of wetlands, aquaculture activities and associated man-made impacts on aquatic systems are all unfavourable to otter populations (Reuther and Hilton-Taylor 2004). In south and southeast Asia, the decrease in prey species due to extensive removal and overfishing in wetlands and water ways had reduced the population to an unsustainable threshold leading to local extinctions. Poaching is one of the main causes of its decline in south and southeast Asia, and possibly also in north Asia.

Pollution is major threat to the otters in western and central Europe, the main pollutants posing a major risk to otters are the organochlorines dieldrin (HEOD) and DDT/DDE, polychlorinated biphenyls (PCBs) and the heavy metal, mercury. Coastal populations are particularly vulnerable to oil spills. Acidification of rivers and lakes results in the decline of fish biomass and reduces the food resources of the otters. The same effects are known to result from organic pollution by nitrate fertilizers, untreated sewage, or farm slurry.

In addition, major causes of mortality from range countries are drowning and road kills. Fyke nets set for eels or for fish as well as creels set for marine crustaceans have a great attraction to otters and a high risk to those that successfully try to enter these traps.

A further potential threat is strangulation by transparent, monofilament drift net. A potential risk comes from traps designed to kill other species; especially underwater cages constructed to drown muskrats. Illegal hunting is still a problem in many parts of their distribution range. In several European countries political pressure especially by fishermen has resulted in granting of licenses for killing otters (Reuther and Hilton-Taylor 2004). Illegal trade for medicinal use and pet market is growing in South East Asia (Gomez and Bouhuys 2018).

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	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					
1.2. Residential & commercial development -> Commercial & industrial areas	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					
2.1.3 Agro-industry farming -> Removal of bank side vegetation, illegal logging of riparian forests	Ongoing	3	3	2	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					
4.1. Transportation & service corridors -> Roads & railroads	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 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	1	3	7	Medium
Stresses:	2. Species stresses-> 2.1. Species mortality					
5.4.4. Biological resource use -> Fishing & harvesting aquatic resources -> Unintentional effects: (large scale) [harvest]	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 2. Species stresses-> 2.1. Species mortality 2. Species stresses -> 2.3. Indirect species effects -> 2.3.2. Competition					
5.4.5. Biological resource use -> Fishing & harvesting aquatic resources -> Persecution/control	Ongoing	3	3	3	9	High
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 2. Species stresses-> 2.1. Species mortality					
7.2.1 Abstraction of surface water (domestic use)	Ongoing	3	1	1	5	Low
Stresses:	1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
7.2.2 Abstraction of surface water (commercial use)	Ongoing	3	2	1	6	Medium
Stresses:	1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
7.2.3. Abstraction of surface water (agricultural use)	Ongoing	3	2	1	6	Medium
Stresses:	1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
7.2.9. Natural system modifications -> Dams & water management/use -> small dams	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					
9.1.1. Pollution -> Domestic & urban waste water -> Sewage	Ongoing	3	2	1	6	Medium
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects 2. Species stresses-> 2.1. Species mortality					
9.1.3. Pollution -> Domestic & urban waste water -> Type Unknown/ Unrecorded	Ongoing	3	2	1	6	Medium
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects 2. Species stresses-> 2.1. Species mortality					
9.2.1. Pollution -> Industrial & military effluents -> Oil spills	Ongoing	3	1	3	7	Medium
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects 2. Species stresses-> 2.1. Species mortality					
9.2.2. Pollution -> Industrial & military effluents -> Seepage from mining: arsenic, cyanide	Ongoing	3	1	1	5	Low
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects 2. Species stresses-> 2.1. Species mortality					
9.3.3. Pollution -> Agricultural & forestry effluents -> Water pollution -Herbicides and pesticides	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					
9.5.1. Pollution -> Air-borne pollutants -> Acid rain	Only in the past but now suspended	1	1	1	3	Low
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects 2. Species stresses-> 2.1. Species mortality					
11.1 Habitat shifting & alteration	Future	3	3	2	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					
11.2 Droughts	Future	3	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					
11.4 Storms & flooding	Future	3	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					
11.5 Other impacts (spreading of parasites)	Ongoing	3	1	2	6	Medium
Stresses:	2. Species stresses-> 2.2 Species disturbance					
12.1 Other threats (dog attacks)	Ongoing	3	2	1	6	Medium
Stresses:	2. Species stresses-> 2.1. Species mortality					

Conservation

The Eurasian Otter is strictly protected under international legislation and conventions. It is listed on Appendix I of CITES, Appendix II of the Berne Convention, Annexes II and IV of the EU Habitat Directive (43/92/CEE). It is also listed as an either critically endangered, endangered or vulnerable species in some countries in Europe (Bulgaria, Denmark, Greece, Italy, Romania), many countries in Asia (Armenia, Azerbaijan, Afghanistan, Georgia, Ukraine, Pakistan, China, India, Bangladesh, Myanmar, Mongolia Thailand, South Korea, Vietnam), in Israel, Algeria, Jordan, and in some Russian regions.

There is an ongoing discussion about the feasibility and effectiveness of reintroduction of otters. Otters have been successfully reintroduced to reinforce populations in Spain, Sweden, Netherlands, and UK (refs). However, the contribution of reintroduced population to the recovery of native populations seems limited (Saavedra 1998; Saavedra and Sargatal 2002; Arrendal et al., 2004; et al., 2006; Hobbs Morell 2008; Koelewijn et al., 2010)

A European Breeding Programme (EEP) for self-sustaining captive populations was started in 1985. Monitoring programmes have been established in the European Union (28 member states). Several reintroduction programmes have been initiated in Europe such as in UK, Sweden, Spain and Netherlands which have been successful in restoring otters back into their former habitats.

Action plans have been developed in Italy (Loy et al., 2010), Latvia, Ireland, Czechia, France (Kuhn and Jacques, 2011)

Conservation Actions In- Place

Action Recovery Plan	**Note**
No	-

Systematic monitoring scheme	**Note**
Yes (Europe)	-

Conservation sites identified: NA

Occur in at least one PA	**Note**
Yes	-

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

Area based regional management plan: NA

Invasive species control or prevention: NA

Harvest management plan: NA

Successfully reintroduced or introduced benignly	**Note**
Yes	-

Subject to ex-situ conservation	Note
Yes	-

Subject to recent education and awareness programmes	Note
Yes	-

Included in international legislation	Note
Yes	CITES Appendix I Bern Convention Appendix II EU Habitats and Species Directive 92/43/CEE Annexes II and IV

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

Important Conservation Actions Needed

Conservation Actions	Note
2.1. Land/water management -> Site/area management	-
2.3. Land/water management -> Habitat & natural process restoration	-
3.2. Species management -> Species recovery	-
4.1. Education & awareness -> Formal education	-
4.2. Education & awareness -> Training	-
5.1.3. Law & policy -> Legislation -> Sub-national level	-
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
1.1. Research -> Taxonomy	-
1.2. Research -> Population size, distribution & trends	-
1.3. Research -> Life history & ecology	-
1.4. Research -> Harvest, use & livelihoods	-
1.5. Research -> Threats	-
1.6. Research -> Actions	-
3.1. Monitoring -> Population trends	-

Bibliography

Acharjyo, L.N. and Mishra. C.G. 1983. A note on the longevity of two species of Indian otters in captivity. *Journal of the Bombay Natural History Society* 80(3): 636.

Al-Sheikhly O. F., Haba M. K., Barbanera F. 2014. Otter hunting and trapping, a traditional practice of Marsh Arabs of Iraq. IUCN Otter Specialist Group Bulletin, 31(2), 80-88.

Adrian, M.I. and Delibes, M. 1987. Food habits of the otter (*Lutra lutra*) in two habitats of the Donana National Park, SW Spain. *Journal of Zoology (London)* 212: 399-406.

Ando, M. and Corbet, G.B. 1966. *The Terrestrial Mammals of Western Europe*. G.T. Foulis & Co., London, UK.

Ando, M., Yoshiyuki, M., Han, S. and Kim, H. 2007. Extinction of the Japanese Otter. Paper presented in Xth International Otter Colloquium, Hwacheon, South Korea.

Ansorge, H., Schipke, R., Zinke, O. 1997 Population stucture of the otter, Lutra lutra. Parameters and model for a Central European region, Gustav Fischer. International Journal of Mammalian Biology Population structure of the otter.

Arrendal J., Walker C. W., Sundqvist A. K., Hellborg L., Vilà C. 2004. Genetic evaluation of an otter translocation program. Conservation Genetics, 5(1): 79-88.

Bannikov, A.G. 1954. *Mammals of the Mongolian People's Republic*. Nauka, Moscow, Russia. Seignobosc M. Hemerik L., Koelewijn H. P. 2011. Demo-Genetic Analysis of a Small Reintroduced Carnivore Population: The Otter (*Lutra lutra*) in The Netherlands, International Journal of Ecology, 10.1155/2011/870853, 1-11.

Beja, P.R. 1991. Diet of otters (*Lutra lutra*) in closely associated freshwater, brackish, and marine habitats in south-west Portugal. *Journal of Zoology (London)* 225: 141-152.

Björklund, M., & Arrendal, J. 2008. Demo–genetic analysis of a recovering population of otters in Central Sweden. Animal conservation, 11(6), 529-534.

Bonesi L., Macdonald D.W. 2004. Impact of released Eurasian otters on a population of American mink: a test using an experimental approach. Oikos, 106(1): 9-18

Björklund, M., & Arrendal, J. 2008. Demo–genetic analysis of a recovering population of otters in Central Sweden. Animal conservation, 11(6), 529-534.

Blanco-Garrido F., Prenda J., Narvaez M. 2008. Eurasian otter (Lutra lutra) diet and prey selection in Mediterranean streams invaded by centrarchid fishes. Biological Invasions, 10(5): 641-648.

Bueno–Enciso, J., Díaz–Ruiz, F., Almeida, D., & Ferreras, P. (2014). Effects of flow regulation and non–native species on feeding habits of Eurasian otter Lutra lutra in Mediterranean temporary rivers. River research and applications, 30(10), 1296-1308

Brzeziński M., Romanowski J., Kopczyński Ł., Kurowicka E. 2006. Habitat and seasonal variations in diet of otters, Lutra lutra in eastern Poland. Folia Zool, 55(4), 337-348.

Bouroş G., Murariu D. 2017. Comparative diet analysis of the Eurasian otter (*Lutra lutra*) in different habitats: Putna-Vrancea Natural Park and Lower Siret Valley, south-eastern Romania. North-Western Journal of Zoology, 13(2).

Britton J. R., Berry M., Sewell S., Lees C., Reading P. 2017. Importance of small fishes and invasive crayfish in otter Lutra lutra diet in an English chalk stream. Knowledge & Management of Aquatic Ecosystems, (418), 13.

Carone M.T., Guisan A., Cianfrani C., Simoniello T., Loy A., Carranza M.L. .2014. A multi-temporal approach to model endangered species distribution in Europe: the case of the Eurasian otter in Italy. Ecological Modelling 274: 21-28

Cianfrani C., Le Lay G., Maiorano L., Satizábal H. F, Loy A., Guisan A. 2011. Adapting global conservation strategies to climate change at the European scale: the otter as a flagship species. Biological Conservation. 144 2068–2080

Cianfrani, C., Broennimann, O., Loy, A., Guisan, A. 2018. More than range exposure: Global otter vulnerability to climate change. Biological Conservation, 221: 103-113. 103-113.

Clavero M., Prenda J., Delibes M. 2003. Trophic diversity of the otter (*Lutra lutra* L.) in temperate and Mediterranean freshwater habitats. Journal of Biogeography, 30(5), 761-769.

Conroy, J.W.H. and Chanin, P.R.F. 1998. The Status of the Eurasian Otter (*Lutra lutra*). *Otter Specialist Group Bulletin* 7: 9-12.

Conroy J and Chanin P. 2001.The distribution and status of the European Otter (Lutra lutra) – a Review. In: Conroy JWH, Gutleb A & Yoxon P (eds). Proceedings of the Otter Toxicology Conference, Skye 2000. International Otter Survival Fund. Broadford, Skye

Corbet, G.B. and Hill, J.E. 1992. *Mammals of the Indo-Malayan Region: a Systematic Review*. Oxford University Press, Oxford, UK.

Cortes 1998; Cortes Y., Fernandez-Salvador R., Garcia F.J., Llorente M. 1998. Changes in otter *Lutra lutra* distribution in Central Spain in the 1964 - 1995 period. Biol. Conserv. 86(2): 179-183.

de Silva, P.K. 1996. Food and feeding habits of the Eurasian *Otter lutra lutra* L. (Carnivora, Mustelidae) in Sri Lanka. *Journal of South Asian Natural History* 2(1): 81-90.

de Silva, P.K. 1997. Seasonal variation of the food and feeding habits of the Eurasian otter *Lutra lutra* L. (Carnivora, Mustelidae) in Sri Lanka. *Journal of South Asian Natural History* 2(2): 205-216.

Dubinin, E.A. (2002). River otter (Lutra lutra L.) in north-eastern Siberia: the distribution andabundance. Russian J. Ecology. 3: 237-240. [in Russian with English summary]

Dulamtseren, S. 1970. *Guide Book of the Mammals in Mongolia*. Publishing House of the Mongolian Academy of Science, Ulaanbaatar.

Elmeros M., Hammershøj M., Madsen A.B., Sogaard B. 2006. Recovery of the otter Lutra lutra in Denmark monitored by field surveys and collection of carcasses. Hystrix 17: 17-28.

Erlinge, S. 1969. Food habits of the otter (*Lutra lutra* L) and the mink (*Mustela vison* Schreber) in a trout water in southern Sweden. *Oikos* 20: 1-7.

Erlinge S. 1967. Home range of the otter *Lutra lutra* in Southern Sweden. Oikos, 18: 186-209

Freitas D., Gomes J., Sales Luis T., Madruga L., Marques C., Baptista G., Rosalino L. M., Antunes P., Santos R.,Santos-Reis M. 2007. Otters and fish farms in the Sado estuary: ecological and socio-economic basis of a conflict. Hydrobiologia, 587:51–62

Georgiev, D. G. 2005. Habitats of the Otter (*Lutra lutra* L.) in some Regions of Southern Bulgaria. IUCN Otter Spec. Group Bull. 18(1): 6 - 13

Giovacchini S., Marrese M., Loy A. 2018. Good news from the south: filling the gap between two otter populations in Italy. IUCN OTTER Spec. Group Bull. 35(4): 212 - 221Green, J. and Green, R. 1983. Territoriality and home range in Scotland. Paper presented at the III International Otter Colloquium, held in Strasbourg, France, November 1983.

Gomez. L., Bouhuys J. 2018. Illegal otter trade in Southeast Asia. TRAFFIC, Petaling Jaya, Selangor, Malaysia.on trade and conflicts

Green, J., Green, R. and Jefferies, D.J. 1984. A radio-tracking survey of otters *Lutra lutra* on a Perthshire river system. *Lutra* 27: 85-145.

Harris, S., Morris, P., Wray, S. and Yalden, D. 1995. A review of British mammals: population estimates and conservation status of British mammals other than cetaceans. Joint Nature Conservation Committee, Peterborough, UK.

Hauer, S., Ansorge, H. e Zinke, O. (2000) A long-term analysis of the age structure of otters (Lutra lutra) from eastern Germany», Zeitschrift fur Saugetierkunde.

Hauer S., Ansorge H., Zinke O. (2002) Mortality patterns of otters (*Lutra lutra*) from eastern Germany. Journal of Zoology, 256: 361-368

Hobbs G., Chadwick E., Slater F., Bruford M. 2006. Landscape genetics applied to a recovering otter (*Lutra lutra*) ppopulation in the UK: preliminary results and potential methodologies. Hystrix, the Italian Journal of Mammalogy, 17(1).

Hong S. 2016. Re-establishment of the Eurasian otter (*Lutra lutra*) in South Korea from 1987 to 2010: the contributions of environmental improvement and conservation policy. In 13th International Otter Congress, Singapore.

Hong, S., Do, Y., Kim, J. Y., Cowan, P., & Joo, G. J. 2017. Conservation activities for the Eurasian otter (*Lutra lutra*) in South Korea traced from newspapers during 1962–2010. Biological conservation, 210, 157-162.

Hong S., Gim J. S., Kim H. G., Cowan P. E., Joo G. J. 2019. A molecular approach to identifying the relationship between resource use and availability in Eurasian otters (*Lutra lutra*). Canadian Journal of Zoology, 97(9), 797-804.

Hong S., Di Febbraro M., Loy A., Cowan P., Joo G. J. 2020. Large scale faecal (spraint) counts indicate the population status of endangered Eurasian otters (*Lutra lutra*). Ecological Indicators, 109, 105844.

Hung C.M. Li S.H., Lee L. 2004. Faecal DNA typing to determine the abundance and spatial organisation of otters (*Lutra lutra*) along two stream systems in Kinmen. Anim. Conserv., 7: 301-311.

Hung, N. and Law, C. J. 2016. *Lutra lutra* (Carnivora: Mustelidae). *Mammalian Species* 48 (940): 109–122.

Hussain, S.A. 1999. Species profile: Mustelids, Viverrids and Herpestids of India. *ENVIS Bulletin on Wildlife & Protected Areas* 2(2): 1-38.

Hussain, S.A. 2000. Status of otter conservation in India. *ENVIS Bulletin on Wildlife and Protected Areas* 2(2): 92-97.

Jansman H. A. H., Chanin P. R. F., Dallas J. F. 2001. Monitoring otter populations by DNA typing of spraints. IUCN Otter Specialist Group Bulletin 18: 12-19.

Jansman H. A. H., Perez-Haro M., Lammertsma D., Niewold F., Loek K., Koelewijn H. (2002) Monitoring the reintroduction of otters in the Netherlands using non-invasive genetics and telemetry. Proc. of the European Otter Workshop, Padula (SA), Italy, 38ppJansman et al., 2002;

Janssens X., Fontaine M.I.C, Michaux J.R., Libois R., Kermabon J., Defourny P., Baret P.V. 2008. Genetic pattern of the recent recovery of European otters in southern France, Ecography, 31: 176-186.

Jefferies, D. J. 1988. Postscript: The demise of the otter population of the Rivers Glaven and Stiffkey and adjacent coastal marshes. In: The Otter, 2nd edition. (Weir, V.). The Vincent Wildlife Trust, London.

JNCC (Joint Nature Conservation Committee). 2007. European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC).

Joshi, AS, Tumsare, VM, Nagar, AK, Mishra, AK and Pariwakam, MP 2016. Photographic Records of Eurasian Otter *Lutra lutra* from the Central Indian Landscape. IUCN Otter Spec. Group Bull. 33 (1): 73 – 78

Karami M., Mirzaei R., Hamzehpour M. 2006. Status of Eurasian Otter (Lutra lutra) in Iran IUCN Otter Spec. Group Bull, 23(1): 27-33.

Koelewijn, H. P., Pérez-Haro, M., Jansman, H. A. H., Boerwinkel, M. C., Bovenschen, J., Lammertsma, D. R., Niewold F. J. J., Kuiters, A. T. 2010. The reintroduction of the Eurasian otter (*Lutra lutra*) into the Netherlands: hidden life revealed by noninvasive genetic monitoring. Conservation Genetics, 11(2), 601-614.

Kranz, A. 1995. On the ecology of otters in central Europe. Doctoral dissertation, University of Agriculture, Vienna.

Kranz A., Toman A. 2000 Otters recovering in man-made habitats in central Europe. Griffiths I. (Ed.), Mustelids in a Modern World, Bachhuys Publishers, Leiden, Netherlands, pp. 163-184

Krawczyk, A. J., Bogdziewicz, M., Majkowska, K., Glazaczow, A. 2016. Diet composition of the Eurasian otter *Lutra lutra* in different freshwater habitats of temperate Europe: a review and meta–analysis. Mammal Review, 46(2), 106-113.

Kruuk H. 2006. Otters ecology, behaviour and conservation. Oxford University Press, 280 pp

Kruuk, H., Kanchanasaka, B., O'Sullivian, S. and Wanghongsa, S. 1994. Niche separation in three sympatric otters *Lutra perspicillata, Lutra lutra* and *Aonyx cinerea* in Huai Kha Khaeng, Thailand. *Biological Conservation* 69: 115-210.

Kruuk, H., Moorhouse, A., Conroy, J.W.H., Durbin, L. and Freares, S. 1989. An estimate of numbers and habitat preferences of otters *Lutra lutra* in Shetland, U.K. *Biological Conservation* 49: 241-254.

Kuhn R., Jacques H. 2011. The French Action Plan for The Eurasian Otter. Proceedings of XIth International Otter Colloquium, IUCN Otter Spec. Group Bull. 28B: 91 – 100.

Lanszki J., Sallai Z. 2006. Comparison of the feeding habits of Eurasian otters on a fast-flowing river and its backwater habitats. Mammalian Biology 71(6): 336-346.

Lekagul, B. and McNeely, J.A. 1977. *Mammals of Thailand*. Association for the Conservation of Wildlife, Bangkok, Thailand.

Li F., Zheng X., Zhang H., Yang J., Chan1 B. P. L. 2017. The current status and conservation of otters on the coastal islands of Zhuhai, Guangdong Province, China. Biodiversity Science [in Chinese with English summary]

Loy A., Bucci L., Carranza M.L., De Castro G., Di Marzio P., Reggiani G. 2004. Survey and habitat evaluation for a peripheral population of the Eurasian otter in Italy. IUCN Otter Spec. Group Bull. 21A: 1-9

Loy A. 2018. Eurasia. Eurasian otter. In: Duplaix N., Savage M the Global Otter Conservation Strategy. IUCN/SSC Otter Specialist Group, Salem, Oregon, USA pp 46-56.

Loy A., Cianfrani C. 2018. How will Climate Change affect otters? In: Duplaix N., Savage M. 2018. The Global Otter Conservation Strategy. IUCN/SSC Otter Specialist Group, Salem, Oregon, USA pp: 125-136.

Loy A., Diamente S., Di Febbraro M. 2019. Population Viability Analysis of the Italian otter population. 8th European Mammal Congress. Borowski Z. (Ed) 2019 Book of Abstract: 175.

Mallon, D.P. 1985. The mammals of the Mongolian People's Republic. *Mammal Review* 15(2): 71-102.

Mason, C. F. 1992. Do otter releases make sense? – The experience in Great Britain. In: C. Reuther (ed.), *Otter Schutz in Deutschland. Habitat No. 7.*, pp. 157-161. Hankensbuettel, Germany.

Mason, C.F. and Macdonald, S.M. 1986. *Otters: Ecology and Conservation.* Cambridge University Press, Cambridge, UK.

Masseti, M. 2009. Carnivores of Syria. ZooKeys 31: 229.

Mirzaei R., Karami M., Danehkar, A., Abdoli A. 2009. Habitat selection of the Eurasian Otter, *Lutra lutra*, in Jajrood river, Iran: (Mammalia: Carnivora). Zoology in the Middle East, 47(1): 13-19.

Mirzaei R., Conroy J., Yoxon P. 2010. Otters in the Hawr al Azim wetland, Iran. Hystrix-the Italian Journal of Mammalogy, 21(1):

Михеев А. В. 2017. The diet range of the otter (*Lutra lutra*, Carnivora, Mustelidae) in the southeast of Ukraine (the Dnepropetrovsk region taken as an example). Zoologicheskii Zhurnal 96(9): 1090-1097 [in Russian].

Morell V. 2008. Into the wild: reintroduced animals face daunting odds. Science, 320(5877): 742-743.

Nakanishi N. and Izawa M. 2019. Rediscovery of Otters on the Tsushima Islands, Japan by Trail Cameras. Mammal Study 44(3), 215-220.

Oleynikov, A.Y. and A.P. Saveljev. 2015. Current distribution, population and population density of the Eurasian Otter (Lutra lutra) in Russia and some adjacent countries – a review. Proceedings European Otter Workshop, 8 - 11 June 2015, Stockholm, Sweden. IUCN Otter Specialist Group Bulletin. 33(A): 21-30.

Pacifici, M., Santini, L., Di Marco, M., Baisero, D., Francucci, L., Grottolo Marasini, G., Visconti, P. and Rondinini, C. 2013. Generation length for mammals. *Nature Conservation* 5: 87–94.

Pavanello M., Lapini L., Kranz A., Iordan F. 2015. Rediscovering the Eurasian Otter (*Lutra Lutra* L.) in Friuli Venezia Giulia and Notes on its Possible Expansion in Northern Italy. IUCN Otter Spec. Group Bull. 32 (1): 12 – 20.

Pedroso N. M., Sales-Luís T., Santos-Reis M. 2014. The Eurasian otter Lutra lutra (Linnaeus, 1758) in Portugal. Munibe Monogr. Nat. Ser. 3: 132-144.

Pocock, R.I. 1941. *The Fauna of British India, including Ceylon and Burma*. Taylor & Francis, Ltd., London, UK.

Prater, S. 1971. *The Book of Indian Animals*. Bombay Natural History Society, Bombay, India.

Prigioni C., Remonti L Balestrieri A., Sgrosso S., Priore G. 2006a. How many otters are there in Italy? Hystrix, It. J. Mamm., 17(1) 29-36

Prigioni C., Remonti L., Balestrieri A., Sgrosso S., Priore G., Mucci N., Randi E. 2006b. Estimation of otter (*Lutra lutra*) population size by fecal DNA typing in Southern Italy. Journal of Mammalogy, 87(5): 855–858

Prigioni C., Balestrieri A., Remonti L. 2007. Decline and recovery in otter *Lutra lutra* populations in Italy Mammal Rev. 37: 71-79.

Quaglietta L., V.C. Fonseca, A. Mira, L. Boitani. 2014. Sociospatial organization of a solitary carnivore, the Eurasian otter (*Lutra lutra*). J. Mammal. 95: 140–150.

Quaglietta L., Fonseca V. C., Hájková P., Mira A., Boitani L. 2013. Fine-scale population genetic structure and short-range sex-biased dispersal in a solitary carnivore, *Lutra lutra*. Journal of Mammalogy, 94(3), 561-571.

Quaglietta, L., P. Hájková, A. Mira and L. Boitani. 2015. Eurasian otter (*Lutra lutra*) density estimate based on radio tracking and other data sources. Mamm. Res. 60: 127–137.

Remonti, L., Prigioni C., Balestrieri A., Sgrosso, S., Priore G. 2008Trophic flexibility of the otter (*Lutra lutra*) in southern Italy. Mammalian Biology, 73(4), 293-302.

Reuther, C. 1991. Otters in captivity - A review with special reference to *Lutra lutra*.

Reuther, C. 1999. Development in weight and length of cubs of the Eurasian otter (*Lutra lutra*). *IUCN Otter Specialist Group Bulletin* 16(1): 11-25.

Reuther, C., Rifai, L., Qarcas, M., Abu Baker, M. & Amr, Z.S. 2001. Results of an Initial Field Survey for Otters (*Lutra lutra*) in Jordan. IUCN Otter Spec. Group Bull. 17(2): 75 - 79

Reuther, C. and Hilton-Taylor, C. 2004. *Lutra lutra*. 2007 IUCN Red List of Threatened Species. IUCN 2007.

Rosoux, R. 1995. Cycle journalier d'activities et utilisation des domaines vitaux chez la loutre d'Europe (*Lutra lutra* L.) dans le Marais Potevin (France). *Cahiers d'Ethologie* 15(2-4): 283-306.

Ruiz-Olmo, J. and Gosalbez, J. 1997. Observations on the sprainting behaviour of the otter *Lutra lutra* in the NE Spain. *Acta Theriologica* 42(3): 259-270.

Ruiz-Olmo, J. and Palazon, S. 1997. The diet of the European otter (*Lutra lutra* L., 1758) in Mediterranean freshwater habitats. *Journal of Wildlife Research* 2(2): 171-181.

Ruiz-Olmo J., Lopez-Martin J.M., Palazon S. 2001. The influence of fish abundance on the otter (*Lutra lutra*) populations in Iberian Mediterranean habitats. Journal of Zoology, 254: 325-336

Saavedra B. 2002. Reintroduction of the Eurasian otter (Lutra lutra) in Muga and Fluvià basins (north-eastern Spain): viability, development, monitoring and trends of the new population. PhD Thesis. University of Girona, Spain. http://www.tesisenxarxa.net/TESIS_UdG/AVAILABLE/TDX-0319104-124146//tdsb.pdf

Saavedra, D., & Sargatal, J. (1998). Reintroduction of the otter (Lutra lutra) in northeast Spain (Girona province). Galemys, 10, 191-199.

Sales-Luís T., Pedroso N. M., Santos-Reis M. 2007. Prey availability and diet of the Eurasian otter (*Lutra lutra*) on a large reservoir and associated tributaries. Canadian Journal of Zoology, 85(11): 1125-1135.

Seignobosc, M., Hemerik, L., Koelewijn, H. P. 2011. A demo-genetic analysis of a small reintroduced carnivore population: the otter (Lutra lutra) in the Netherlands. International Journal of Ecology, 2011. 870853. doi.org/10.1155/2011/870853

Shagdarsuren, O., Jigi, S., Tsendjav, D., Dulamtseren, S., Bold, A., Munkhbayar, Kh., Dulmaa, A., Erdenejav, G., Olziihutag, N., Ligaa, U. and Sanchir, Ch. 1987. *Mongolian Red Book*. Publishing House of the Mongolian Academy of Sciences, Ulaanbaatar, Mongolia.

Shar, S, Samiya, R, Boldgiv, B and Savage, M. 2018. A National Survey of the Eurasian Otter (Lutra lutra L., 1758) in Mongolia. IUCN Otter Spec. Group Bull. 35 (1): 22 – 30

Sidorovich V.E. (2000) Distribution and population density of the otter Lutra lutra and pollution of acquatic ecosystems in Belarus. In: Proc. 1st Otter Toxicology Conference Conroy, J.W.H., Yoxon P., Gutleb A.C. (Eds), Broadford, Isle of Skye, IV49 9AQ, Scotland

Skaren, U. 1993. Food of *Lutra lutra* in central Finland. *IUCN Otter Special Group Bulletin* 8: 31-34.

Sokolov, V. E. and Orlov, V. N. 1980. *Guide to the Mammals of Mongolia*. Pensoft, Moscow, Russia.

Strachan, R. 2007. National survey of otter *Lutra lutra* distribution in Ireland - Mammals dataset. Irish otter dataset; BTO/JNCC/RSPB.

Suzuki, T., Yuasa, H. and Machida, Y. 1996. Phylogenetic position of the Japanese river otter *Lutra nippon* inferred from the nucleotide sequence of 224 bp of the mitochondrial cytochrome b gene. *Zoological science* 13: 621–626.

Toyran K., Albayrak İ. 2019. Distribution and ecology of *Lutra lutra* (Linnaeus, 1758) in Kizilirmak River (Turkey). JAPS: Journal of Animal & Plant Sciences, 29(3).

Trowbridge, B. J. 1983. Olfactory communication in the European otter (*Lutra l. lutra*). Thesis, University of Aberdeen.

Tsagaan, S. 1975. Distribution of Otters (*Lutra lutra* l.) in Mongolia. *Studia Museologica* 2: 95-107.

Tsagaan, S. 1977. Biological Study of Otters in Mongolia. *Studia Museologica* 9: 73-89.

Tsendjav, D. 2005. A new geographic record of otters in Mongolia. *Proceedings of the Institute of Biology of the Mongolian Academy of Sciences* 25: 333.

Tsendjav, D. 2005. The Otter Has Been Found in a New Location. *Proceedings of the Institute of General and Experimental Biology of the Mongolian Academy of Sciences* 25: 333.

Ulevičius A., Balčiauskas L. 1996. Otter population density in Lituania. Report of the Seminar on the Conservation of the European Otter (Lutra lutra). Leeuwarden, The Netherlands, 7-11 Jun 1994. Council of Europe Eds, 84-86 pp

Webb, J.B. 1975. Food of the otter (*Lutra lutra* L.) on the Somerset Levels. *Journal of Zoology (London)* 177: 486-491.

Weber J. M. 2011. Food habits of escaped Eurasian otters (*Lutra lutra*) in a suburban environment in Switzerland. Revue Suisse de Zoologie, 118(3): 485-489.

Wilson, D.E. and Reeder, D.M. 1993. *Mammal Species of the World. A Taxonomic and Geographic Reference*. Smithsonian Institution Press, Washington, DC, USA.

Wilson, D.E. and Reeder, D.M. 2005. *Mammal Species of the World*. Johns Hopkins University Press, Baltimore, MD, USA.

Wozencraft, W.C. 2005. Order Carnivora. In: D.E. Wilson and D.M. Reeder (eds), *Mammal Species of the World: A Taxonomic and Geographic Reference. Third Edition*, pp. 532-628. Johns Hopkins University Press, Baltimore.

Zhang, R., Yang, L., Laguardia, A., Jiang, Z., Huang, M., Lv, J., Ren, Y., Zhang, W., Luan, X. 2016. Historical distribution of the otter (Lutra lutra) in north–east China according to historical records (1950–2014). Aquatic Conservation: Marine and Freshwater Ecosystems, 26(3), 602-606.