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Mustela lutreola, European Mink

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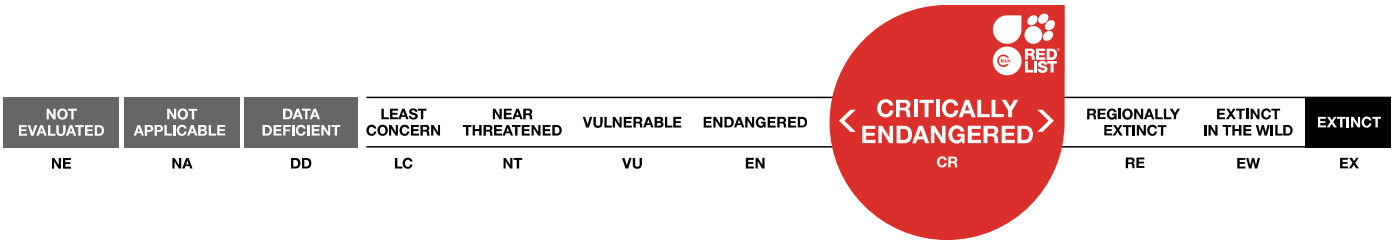

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Mustelidae

Scientific Name: *Mustela lutreola* (Linnaeus, 1761)

Synonym(s):

- *Viverra lutreola* Linnaeus, 1761

Regional Assessments:

- Global
- Mediterranean

Common Name(s):

- English: European Mink
- French: Vison d'Europe
- Spanish; Castilian: Visón Europeo
- Basque: Bisoi Europar
- Catalan; Valencian: Visó Europeu
- Estonian: Euroopa naarits
- German: Europäischer Nerz
- Romanian: Nurca Europeană
- Russian: Evropeyskaya norka, Европейская норка

Taxonomic Source(s):

ASM. 2024. Mammal Diversity Database (Version 1.12, released 5 January 2024). American Society of Mammalogists (ASM). Available at: www.mammaldiversity.org. (Accessed: 9 January 2024).

Taxonomic Notes:

On the basis of museum collections of the former Soviet Union, Novikov (1939) identified six subspecies: *Mustela lutreola lutreola* (Linnaeus 1761), *Mustela lutreola borealis* (Novikov 1939; synonym *M. l. novikovi*, Ellerman and Morrison-Scott 1951), *Mustela lutreola caucasica* (Novikov 1939; synonym *M. l. binominata*, Ellerman and Morrison-Scott 1951), *Mustela lutreola cylipena* (Matschie 1912), *Mustela lutreola hungarica* (Éhik 1932; synonym *M. l. transsylvanica*, Éhik 1932) and *Mustela lutreola biedermani* (Matschie 1912). Synonyms are given as listed in Wilson and Reeder (2005), who also list a seventh subspecies: *Mustela lutreola turovi*, attributed to Kuznetsov in Novikov (1939). Heptner *et al.* (1967) analysed largely the same materials and drew up a somewhat different list of subspecies, including slightly different range borders. However, these authors consider it likely that the distinguished subspecies do not exist in reality. Youngman (1982) states that the different forms identified as subspecies by earlier authors are, in fact, associated with clinal variability of characteristics within a continuous range and thus concludes that there are no valid subspecies. More recent genetic studies (e.g. Cabria *et al.* 2015) also do not support the existence of subspecies.

Hybridization with Western Polecat *Mustela putorius* (and Domestic Ferret *M. putorius furo*) may occur (Ternovsky and Ternovskaya 1994). Hybridization is asymmetric: polecat males mate with European mink females but there is no evidence of a reciprocal cross. Hybrid females appear to be fertile, and there is

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some evidence of backcrossing (from mating between a female F1 hybrid and a polecat male; Ternovsky and Ternovskaya 1994, Cabria *et al.* 2011); it is not known whether or not male hybrids are also fertile. Hybrids appear to be larger than European Mink in body size and intermediate between the two species in ecological and behavioural traits, and in skin colour and facial markings (although they appear visually more similar to European mink than to polecats or ferrets, Ternovsky and Ternovskaya 1994, Sidorovich 2001, Tumanov and Abramov 2002, Cabria *et al.* 2011, M. Põdra and A. Gómez, pers. obs.).
Genetic diversity (as evidenced by the number of identified haplotypes, nucleotide diversity, and haplotype diversity) is lower in the southeastern European population (inhabiting the Danube Delta in Romania) than in the population in the northeast (in the European part of Russia) and is lowest in the western population (inhabiting the southwestern part of France, and the northern and western parts of Spain) (Skorupski 2020). Individuals in the western populations (France/Spain) exhibit a single unique mitochondrial DNA haplotype that is closely related to those in eastern populations, but not currently found there (Michaux *et al.* 2004, 2005; Cabria *et al.* 2015, Nummert *et al.* unpub. data). In contrast, 10 different mtDNA haplotypes have been identified in the northeastern population in European Russia (Michaux *et al.* 2004, 2005, Cabria *et al.* 2015). Cabria *et al.* (2015) attribute the high genetic homogeneity of populations in France and Spain to founder effects and genetic drift as a result of recent population isolation and reduction.

Assessment Information

Red List Category & Criteria: Critically Endangered A3ce ver 3.1

Year Published: 2025

Date Assessed: July 13, 2024

Justification:

European regional assessment: Critically Endangered (CR)
EU 27 regional assessment: Critically Endangered (CR)

This species is listed as Critically Endangered (A3ce) for both Europe and for the EU27 Member States because of an ongoing population reduction, the cause of which (predominantly competition with the introduced invasive American Mink *Neogale vison*, coupled with widespread habitat loss and degradation) is still present. The European Mink is currently estimated to persist in less than 3% of its historic range. The decline has occurred over the last century and been ongoing over the last several decades, with the loss of some populations (e.g. in Estonia and Belarus) and a reduction in others (e.g. in France and Spain), resulting in the current situation of a few small, isolated extant populations across Europe and Russia. In the last ten years (a period exceeding three generations) it is likely that there has been continued decline - for example, amongst the American Mink skins caught by trappers in Russia, there are only a few isolated records of European Mink skins (although trappers use non-target traps) - but a widespread absence of up-to-date data (particularly across Russia and in the Danube Delta where the largest remaining population is thought to persist) means that quantifying the rate of decline over this period is not possible. However, given the ongoing increase and spread of the invasive American Mink population across Europe and Russia (and the associated risk of colonisation of areas occupied by European Mink), we predict that population reduction of European Mink is likely to exceed 80% in the next 10 years.

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This prediction is supported by evidence from a number of different studies across several different countries. For example, in the Lovat river valley in Belarus, European Mink density declined from about seven individuals per 10 km prior to the arrival of American Mink (prior to 1988), to less than two per 10 km three years later (1991), and within four years of its arrival, American Mink occupied all aquatic habitats at a higher density than European Mink (1992; Sidorovich and Macdonald 2001). European Mink initially persisted in sub-optimal habitats and survived for approximately ten years because of American Mink control carried out there, but disappeared in the early 2000s. In other areas in the north of the country, European Mink disappeared in the mid-1990s and the species is now considered extinct in Belarus (Sidorovich 2011). In Estonia, a small population of European Mink persisted in the northern and eastern parts of the country until the late 1980s but disappeared during the next few years (the last specimen was recorded in 1996; Maran 1991, 2003). Thus, studies in Belarus and Estonia demonstrate that small populations of European Mink disappear in the wild within 10 years or less when American Mink colonises the area.

In Spain, surveys carried out since the early 2000s show a similar pattern to that of Belarus and Estonia: the population currently persists due only to ongoing intensive American Mink removal. However, even in Spain, population decline and local level extinction has been observed in some rivers in the north of the Basque country following the rapid expansion of American Mink there (Zuberogoitia and Pérez de Ana 2014; this population response was accurately predicted by simulation models, Zabala and Zuberogoitia 2007). Colonisation by American Mink of areas occupied by European Mink can be extremely rapid: almost 400 km of watercourses in the Ebro river basin in Spain were colonised between 2009/2010 and 2014, leading the European Mink almost to the brink of extinction there (Põdra and Gómez unpubl. data). Despite some success in the local-level eradication of American Mink, colonisation pressure is ongoing, and so the European Mink population in Spain remains at high risk. Although the population in the Danube Delta is considered “safe” from American Mink, American Mink have been recorded in central Romania and in the Carpathians (Hegyeli and Kecskés 2014), which means that the possibility of colonisation of the Danube Delta cannot be excluded and remains a potential threat to the European Mink there.

In summary, a precise assessment of the status of European Mink, and recent trends in extant populations, is confounded by a lack of empirical data across most of its range. Systematic range-wide and coordinated monitoring is urgently needed to improve the scientific basis for this assessment. The species may have survived to a very limited extent in Russia: the European Mink has been registered in the European part of the country in 32 cases during the period 2014-2024 (https://rusmam.ru/atlas/map). However, in the countries where European Mink status is well documented, severe decline (Spain, France), or population extinction (Belarus, Estonia), has been recorded in a period of less than 10 years. Accepting uncertainty in the current distribution and size of the overall European Mink population, there is sufficient evidence regarding the status, ongoing increase, and impact of American Mink to support the existence of a serious and potentially increasing threat to the viability of extant European Mink populations across their entire range over the next 10 years. There is also sufficient evidence to support a prediction of local-level impacts that would potentially result in the loss of remaining populations, in the event that American Mink colonises areas occupied by European Mink or ongoing removal trapping of American Mink fails in areas where it has already colonised. These known threats are compounded by ongoing habitat degradation across the species’ range, and other potential local-level threats (e.g. risks of non-target fur trapping in Russia, roadkill, etc.). Collectively, the loss of one or more of the few remaining populations, and/or reduction in

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others, could feasibly result in an overall population reduction exceeding 80%. Consequently, currently, a Critically Endangered status is warranted.

Previously Published Red List Assessments

2012 – Critically Endangered (CR)

2007 – Endangered (EN)

Geographic Range

Range Description:

It was commonly found in many European countries and was distributed over a large part of European Russia except the tundra and Kalmyk steppe (Heptner *et al.* 1967, Ternovskii and Ternovskaya 1994). There is some uncertainty regarding the history of the species distribution east of the Urals and whether or not the European Mink was initially a purely European endemic species is unclear (Anon. 1875, Kassal 2018, Harrington and Maran in print). There are no records of European Mink in the United Kingdom, Ireland, Sweden, Norway, Portugal, Belgium, or many of the Balkan countries, although they are known to have occurred in Italy, Albania and the former republic of Yugoslavia (reviewed in Maran 2007).

The relatively recent discovery of European Mink in France (1839) and in northern Spain (1951) suggests late expansion of the species to the west (Youngman 1982, 1990; Michaux *et al.* 2005; the mechanism of expansion is debated but most likely the result of natural migration from Central Europe, reviewed in Zuberogoitia *et al.* 2016, Maran *et al.* 2017, and Harrington and Maran in print). However, over the last 150 years, the area occupied by European Mink has severely declined (Maran 2007, Maran *et al.* 2017). It is estimated that the current range of the European Mink is less than 3% of its former historical range (Harrington *et al.* 2018). The European Mink is now considered extinct in: Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, mainland Estonia, Finland, Georgia, Germany, Hungary, Italy, Kazakhstan, Latvia, Lithuania, Moldova, Montenegro, the Netherlands, Poland, Serbia, Slovakia, Slovenia, Switzerland and in Austria (although there is debate regarding the historical presence of the species in the latter) (Maran *et al.* 2016). East of the Ural Mountains, European Mink was last seen in the Omsk Oblast in 1984 and they are considered regionally extinct there (currently they are listed on the regional Red List under the category “species that have become extinct from the territory of Omsk oblast and their natural occurrence has not been confirmed for over 30 years”, Omsk Red Book 2015, cited in Kassal 2018). The current status of European Mink in the Cis-Urals and Western Siberia, and whether or not they are present beyond the Omsk region, is unknown (Harrington and Maran in press) but they are assumed to be absent there (Kassal 2018).

The currently occupied range in Europe (as defined by the terrestrial limits set in past European Red List assessments) consists of a few isolated fragments which make up most of the species range in the wild: the species is present in northern Spain and south-western France, the Danube Delta in Romania and Ukraine, in isolated patches in Russia (Maran *et al.* 2017) and on Hiiumaa Island in Estonia (Põdra 2021). The size and geographical extent of remnant European Mink populations is uncertain but there is no evidence of a large population surviving in the wild. Also, out of the Pan-European region, small introduced populations exist on Kunashir Island in the Kuril Archipelago in Russia (Kisleyko *et al.* 2022) and probably, a small population is left in the Caucasus region of Russia (Skumatov 2017, Kiseleva 2018).

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What is known of the geographical extent of each of the remaining populations is detailed below:
In Spain, European Mink appear to be mainly restricted to the Ebro river basin in Navarre, La Rioja and the Basque Country (mostly in the province of Álava) in the north of the country; low numbers are also present in eastern Castile and León (provinces of Burgos and Soria) and in Aragon (province of Zaragoza) (Gómez *et al.* 2011, Balmori *et al.* 2015, Põdra and Gómez 2018). The species has disappeared from the northern part of the Basque country and the Cantabric river basin in Navarre (approximately a quarter to a third of its original Spanish range); a few dispersing individuals have been detected there since the last IUCN Red List assessment was conducted in 2016, but no regular presence (Tragsatec 2019, I. Zuberogoitia, unpubl. data).

In France, the European Mink was present in around forty departments at the end of the nineteenth century and the beginning of the twentieth century (DIREN Aquitaine and Mission Vison d'Europe 2003, de Bellefroid and Rosoux 1998). Since then, French populations have declined drastically. In the 1950s, the European Mink was only present on the Atlantic coast, the Cher and the Loir-et-Cher. By the end of the 1980s, it was present in just over a tenth of the country, and by the end of the 1990s was only observed in 7 departments (Aquitaine and Charentes) (Maizeret *et al.* 1998, Maizeret *et al.* 2002). Thus, in just 20 years, the species has lost half of its range (DIREN Aquitaine and Mission Vison d'Europe 2003). Currently, the European Mink is present on the Charente watershed (in the Charente-Maritime and Charente departments), on the Tude in the Charente department and in the Lizonne in the Dordogne department (Dordogne watershed) and on the Adour watershed in the Pyrénées-Atlantiques department (near the city of Bayonne) (DREAL 2021). The known range covers approximately 6,500 km^2 although the actual area of distribution may be wider as the species is particularly difficult to detect, especially in areas where it is present in low densities (updating knowledge of the species' distribution in France is currently underway).

In Romania and Ukraine, the presence of European Mnk in the Danube and Dniester Deltas was re-confirmed relatively recently, based on the identification of skins in nearby villages, bycatch of Muskrat Ondatra zibethicus trappers, and preliminary sign surveys and live trapping (Gotea and Kranz 1999, Kranz *et al.* 2004, de Jongh *et al.* 2007). Live-trapping surveys between 2003 and 2011, 2012 and 2014, and from 2021 to 2024 (Marinov *et al.* 2012, M. Marinov unpub. data) confirm the presence of European Mink throughout the Romanian side of the Danube Delta and in the south of the Danube Delta Biosphere Reserve in the lagoon complex. The capture of a single male in 2022 suggests that European Mink may be found further west in the floodplain of the Danube between Grindu and Isaccea, Tulcea County (Cristescu et al. 2023). A small population was also present in Ukraine in the Dniester Delta between 2009-2014 and the American Mink was not spotted there (Rozhenko 2015), which suggests that European Mink may still persist there. Outside of the Danube and Dniester Deltas, the most recent published record of European Mink in Romania is from Transylvania, dated 1993 (Hegyeli and Kecskés 2014); these authors refer to recent unconfirmed sightings of European Mink in the mountain regions but note that there is a possibility of confusion with American Mink and Western Polecat, and suggest that European Mink might already have been rare in the region by the time of the arrival of American Mink (presumed to have arrived in the area in the mid-late 1980s). Areas where it is considered likely that European Mink might persist in Romania outside of the Danube Delta include Balta Mică a Brăilei, Prut River, Romanian Danube and some areas in the Carpathians - currently however, this remains unconfirmed (Maran *et al.* 2014, Marinov 2022). Live-trapping and camera trap surveys in Balta Mică a Brăilei, the Mureș Gorge and tributaries, and the Mureș Upper Valley in the Carpathians, and live-trapping in the lower reaches of the Prut Valley in 2024 failed to detect European

Mink or American Mink (A. Bulacu, A. Duma, A. Hăgătiș, unpub. data 2024). A pelt of European Mink, supposedly captured by illegal trappers during winter 2020/2021, was recovered in the Ukrainian side of the Carpathians, in the locality of Bystrets, Ivano-Frankivsk region (data reported by M. Rusin, 2023). Also, the species was recorded during camera trapping in summer 2021 in the Carpathian National Nature Park, in the upper reaches of Prut River, in the vicinity of Vorokhta, also in the Ivano-Frankvisk region (data reported by A. Mishta, 2024). These two independent records in the same region suggest the recent/current existence of a population in this part of the Carpathians. The localities are 20-30 km from the Romanian border and therefore, the presence of the species in the north of Romania is also possible.

In Russia, European Mink might still be present in the following 12 federal regions (within the Pan Europe boundaries established by the IUCN for past Red List assessments): Arhangelsk, Vologda, Komi, Ivanovo, Kostroma, Tver, Jaroslav, Perm, Saratov, Volgograd, Rostov, Stavropol (Skumatov 2017). However, this is based on data obtained at least 10 years ago, and it is likely that the species has now disappeared from some of these regions: it has been registered only in nine regions in the last 10 years (Komi, Perm, Kostroma, Jaroslav, Ivanovo, Novgorod, Tver, Moscow and Volgograd) (https://rusmam.ru/atlas/map). Information obtained from hunters suggests that the species may also still be present in Samara, Kaluga, Belgorod and Baskhorostan regions (data reported by N. Kiseleva, 2024).

In Estonia, the European Mink is present on the island of Hiiumaa (from captive-bred animals released between 2000-2016) where it can be found in most small rivers and streams, in an area of approximately 1,000 km^2 (M. Põdra, S. Pitsal and T. Maran, unpubl. data 2023).

The historical range of the European Mink extended from south/central Finland to the Caucasian Mountains and Black Sea, and from east of the Ural Mountains, to northern Spain (Novikov 1939, Heptner *et al.* 1967, Youngman 1990, Maran 2007).

Country Occurrence:

Native, Extant (resident): France (France (mainland)); Romania; Spain (Spain (mainland)); Ukraine

Native, Possibly Extant (resident): Russian Federation (Central European Russia, East European Russia, Kaliningrad, North European Russia, Northwest European Russia, South European Russia)

Native, Extinct: Austria; Belarus; Bulgaria; Croatia; Czechia; Estonia; Finland; Germany; Hungary; Latvia; Lithuania; Moldova; Montenegro; Netherlands; Poland; Serbia; Slovakia; Switzerland

Distribution Map

Legend

- EXTANT (RESIDENT)
- POSSIBLY EXTANT (RESIDENT)

Compiled by:

European Red List; IUCN & EC 2023

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

The remaining European Mink populations are small and fragmented and most are declining. In most regions, the data available do not permit an accurate assessment of population size and trend. Monitoring data (carried out over the last decade) are available only for the southwestern population (France and Spain); these data confirm the unfavourable status of the population.

Spain: the remaining population is located predominantly in the Ebro river basin. Monitoring carried out in some regions within this distribution area suggests that the population is relatively stable in the Ebro and its tributaries in areas free of American Mink. For example, in the province of La Rioja, with constant live-trapping effort of nine sites (10x10 UMT squares) per year for 5-years (2019-2023), 13-19 individuals were trapped every year with no apparent trend over time. However, annual trapping of American Mink in some parts of the Ebro basin evidencing their constant invasion, means that this stability cannot be assured in the future (A. Gómez and M. Põdra, unpubl. data). In 2022, hair-traps were used to detect European Mink throughout the main Ebro River basin distribution area, and DNA analysis of hair samples was carried out with the aim of evaluating population size. As a result, 87 individuals were identified and population size, using spatially explicit capture-recapture methods, was estimated to be 130 - 157 individuals (MITECO 2024). In eastern Castile and León and in Aragon low numbers are trapped annually; it is not possible to estimate numbers present on this basis but it is assumed that they do not add significantly to the overall population size. The estimated overall population size is significantly lower than the previous expert estimate of 500-1,000 individuals (Maran *et al.* 2016). This difference in estimates might reflect methodological differences (previous expert opinion may have overestimated the population size), and also a population decline.

France: The French population of European Mink has been estimated by experts (DREAL 2021) at fewer than 250 individuals since 2017. Two main nuclei have been identified, both in the Charente watershed. These are: downstream, in the Rochefort backwater marshes and in the Marais Poitevin area, and upstream, around and north of the city of Angoulême, each occupying tens of kilometres (Life Vison project 2017-2023). A few individuals have been detected since 2016 on the Adour watershed in the Pyrénées-Atlantiques department (near the city of Bayonne), which indicates that a small nucleus may also be present there. Recent point data on the Tude (Charente department) and Lizonne (Dordogne department) also suggest the potential presence of relict nuclei that might have gone unnoticed for several years.

Romania and Ukraine: In the Danube Delta, following an apparent population decrease between 1956 and 1980 (when a 98% decline in trap return was reported by hunters, Marinov *et al.* 2012), current population size was estimated to be between 1,470 and 2,320 individuals (M. Marinov, “Revizuirea planului de management și a regulamentului RBDD”, code SMIS 2014+ 123,322, reporting under Article 17 of the Habitats Direct, Marinov 2022). This is higher than an earlier estimation of 1,000 - 1,500 individuals (based on the length of canal bank and lagoon coast, Maran *et al.* 2014). Both estimates are based on expert opinion using known numbers trapped and assessments of habitat availability; there are currently no published robust estimates of population size that account for imperfect detection and/or estimate the unsampled fraction of the population (using e.g. capture-mark-recapture or occupancy methods). At present, the Danube delta population is the largest known population remaining in the wild (although considerable uncertainty remains as to its actual size). Data are not available to estimate population size or trends in other parts of Romania or Ukraine (Carpathians). In

Ukraine, American Mink are widespread in the forest and forest-steppe zone (Hegyeli and Kecskés 2014) and likely now throughout all regions (data reported by M. Rusin, 2023) and therefore, if still present in the Carpathians, European Mink would not now be abundant. In the Lower Dniester National Park, the population size was estimated at 40-70 individuals between 2009 and 2014 (Rozhenko 2015). Elsewhere in Ukraine, American Mink are widespread in the forest and forest-steppe zone (Hegyeli and Kecskés 2014) and likely now throughout almost all regions (data reported by M. Rusin, 2023); therefore, where they still persist in the Carpathians, European Mink are unlikely to be abundant.

Russia: the lack of recent data complicates evaluation of the current status of European Mink in Russia (https://rusmam.ru/atlas/map). Nevertheless, information available throughout the original range of the species indicates that the species is probably present locally, at low numbers, and that the American Mink is widely distributed in all districts. Small, fragmented populations of European Mink may remain scattered across western Russia in the northern and central part of the country, but the size and status of these populations is also largely unknown and may comprise a few hundred or a few thousand individuals following Skumatov (2017). In the 'Mammals in Russia' portal, the species has been registered only in 32 cases in the European part of Russia during the last 10 years (2014-2024) (https://rusmam.ru/atlas/map). The information available by region is presented below:

In the north-west of the Perm territory European Mink might still exist, although most available data are at least 10 years old: skins of trapped animals stored in the Zoological Museum of Kirov since the year 2000. A European Mink skin was also confiscated from a poacher in the Kosinsky district, and a few skins from trapping in this region in 2011-2012 were reported by fur farmers (Skumatov 2017). The 'Mammals in Russia' portal includes data on the presence in the western part of the Perm region, close to the Kirov region (https://rusmam.ru/atlas/map).

In the Kostroma region, the species was known to be present between 2011 and 2016 (https://rusmam.ru/atlas/map; Skumatov 2017). Presence was also confirmed by trail cameras in 2019 (D. Skumatov, pers. com. 2021). The European Mink is probably present in the central and eastern part of this region, in the river basins of Nemda, Neya, Vetluga, and Unzha, although the situation may change due to the confirmed presence of the American Mink. For example, in the east of the Kostroma region, European Mink were present in the upper reaches of the river Vokhma in the early 2000s, but after 5-7 years, the American Mink was mostly found there instead (Skumatov 2017).

In the Vologda region, between 2010 and 2015, the species almost disappeared, and was found only in the extreme north-west and east of the region by 2015. The American Mink is now present in all former habitats of the European Mink in this region (Poddubnaja *et al.* 2016).

In the southern part of the Volgograd region, European Mink were photographed in 2013 and 2014 in the Volga river basin, at the locality of Kirova (https://www.inaturalist.org/observations/38505995), indicating that a small population or its fragments could persist in this area. A few datapoints in 'Mammals in Russia' from 2016 support the view that the species is (or was until recently) present in the region (https://rusmam.ru/atlas/map).

In South-West Vologda, in the centre of Ivanovo region, and in the northwest of the Kirov region, American Mink are now present everywhere, and European Mink are extremely rare, or have disappeared altogether (Skumatov, 2017).

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In the Arkhangelsk region, the species is possibly present (Skumatov 2017). According to the Red Book of Arkhangelsk (2020), it was found in the southern part of the region at the beginning of the 21st century, but is now probably extinct there; the species is possibly still present in the Timan basin.

In the Komi region, according to the Red Book data (2019) it is possible to find the species in the Syktyvdinsky and Kortkerossky districts (data from 2011–2017), and in the basins of Vashka, Mezen, Tsilma, upper Vym, Izhma and Kozhva. There are no data on the current population size. According to expert estimates, the regional grouping can, at most, be made up of 100–150 individuals. However, the actual number is likely to be lower as American Mink have now populated the entire region. In 'Mammals in Russia' (https://rusmam.ru/atlas/map), a few datapoints between 2015-2019 are recorded in the Pizhma River basin.

In addition to the areas shown on the map where the species is possibly extant, there have been a number of unconfirmed observations of European Mink reported. These include three reported observations of the European Mink in the Novgorod region, two from 2016 and one from 2018 (https://rusmam.ru/atlas/map). However, in the last assessment (Maran *et al.* 2016, and also according to Skumatov 2017), the species was already considered extinct there. Therefore, the possibility that a European Mink population persists there is very low, especially given that American Mink have been present in the area since before 2010 (Khlyap 2011, https://rusmam.ru/atlas/map). Observations of European Mink were also reported in the Belgorod, Kaluga and Baskhorostan regions in 2018 (data reported by N. Kiseleva, 2024), where they had not been previously reported. (Maran *et al.* 2016, Skumatov 2017). Skumatov (2017) also reports the presence of European Mink in the Saratov region although no more recent data from the area are available (https://rusmam.ru/atlas/map).

With limited recent data available it is difficult to evaluate population status in Russia. In addition to the lack of data, the similarity between the two Mink species is a problem, and, without expert confirmation, erroneous identification of European Mink might occur (Skumatov 2017). Due to the rapid colonisation of the area by American Mink, the status of the small and fragmented populations of European Mink in Russia is considered to be unfavourable, and extinction of the species in Russia in the coming years is considered to be very likely. Hunting pressure may have slowed down the spread of American Mink in the past, but currently, it is not considered to be a factor constraining the distribution of this species due to the low cost of skins on the market and the greater profitability of farmed fur production (Kiseleva 2018).

Estonia: the population established on the island of Hiiumaa has survived since 2016 without additional releases. Annual monitoring, based on live-trapping and searching of footprints, is carried out. The current population size is estimated to be between approximately 50 and 100 individuals (Põdra 2021, T. Maran, M. Põdra and S. Pitsal, unpubl. data). 23 individuals have also been released on the island of Saaremaa since 2022 but a population is not yet established there (M. Silts and T. Maran, unpubl. data).

Germany: European Mink were released in Saarland and Lower Saxony (Steinhuder Meer). In Saarland, 162 captive-born Mink were released between 2006 and 2013. In Steinhunder Meer, 219 individuals were released between 2010 and 2020. Reproduction in the wild has been recorded in both areas but there is no data on population size and the successful establishment of wild populations is not confirmed. Currently, the release operation has been stopped in Saarland (Põdra 2021 and references

therein).

Taken together, the overwhelming majority of the remaining, already-small populations of European Mink appear to be in decline, except the population established on the island of Hiiumaa in Estonia. Current population trends in the Danube Delta are unknown. The species is not abundant in any region.

The lack of quantitative information available for wild populations mean that it is difficult to estimate the size of the global population. For example, in Russia, the European Mink population was previously estimated to be in the region of 22,000 (Maran *et al.* 2016) but more recent estimates (Skumatov 2017) suggest it is only a few hundred or a few thousand at most, and following 'Mammals in Russia' only 32 datapoints have been registered during the last 10-years period. In the Danube Delta, the population size was estimated to be 1470-2320 individuals (Marinov 2022), and in southwestern Europe (Spain, France) fewer than 500 individuals (DREAL 2021, MITECO 2024). The population established on the island of Hiiumaa in Estonia is formed by fewer than 100 individuals and therefore does not contribute greatly to the overall population. Also, the populations in the Carpathians in Ukraine (and possibly Romania) cannot be large due to the limited area remaining free of the American Mink, and only 40-70 individuals were estimated to inhabit the core area of Dniester Delta. Summing current country estimates, there may be no more than 5,000 European Mink left in the wild. This number may even be significantly lower taking into account that some of the data available are more than 10 years old (e.g. for most of Russia). Further, the results of a recent study in Spain show that the estimated population size was nearly three times smaller there compared to earlier expert-opinion-based estimations. This is likely to happen in other countries too.

Based on estimated historical range reduction, and historical hunting bag data (40,000-60,000 individuals hunted in Russia in the first decades of 20th century; Maran *et al.* 1998b), it is likely that the overall number of Mink has declined more than 95% (concomitant with their decline in occupied range) since the beginning of the 20th century (note that the majority of this decline occurred before the A1/A2 Red List assessment window). This decline is highly likely to continue in the coming years, given the small size of remaining populations, the ongoing invasion of American Mink and limited efforts to stop this and other causes of decline.

Current Population Trend: Decreasing

Habitat and Ecology **(see Appendix for additional information)**

European Mink are semi-aquatic, inhabiting densely vegetated banks of rivers, streams, lakes, marshes, and lagoons (Sidorovich *et al.* 1998; Maran *et al.* 1998a; Garin *et al.* 2002; Palazon *et al.* 2004, 2008; Palomares *et al.* 2017; Fournier *et al.* 2007) where they use both terrestrial and aquatic habitats. According to Sidorovich and Macdonald (2001), the highest density of European Mink was observed in small rivers (10-100 km long) where up to 10 individuals were found per 10 km of river in Belarus. In Spain, similar to Belarus, small and medium-size rivers provide optimal habitat for the species, especially the lower courses of rivers (up to 800 m altitude in the Ebro river basin; A. Gómez and M. Põdra, unpubl. data). Elsewhere European Mink sightings have been reported up to 1,120 m above sea level (Palazón *et al.* 2003), but they have not been recorded on the sea coast.

Typically, European Mink are restricted to habitats within 200 metres of freshwater but some exceptions have been noted (Danilov and Tumanov 1976). Sometimes they cross land to move between streams

and rivers and they have been recorded visiting chicken farms some distance away from rivers (Zuberogoitia and Zabala 2003). Monitoring results on the island of Hiiumaa, and in France in the Landes de Gascogne region, show that European Mink sometimes moves from one river to another, especially males during the mating season when they search for females (P. Fournier and C. Chambrillon-Fournier per.s obs.; M. Põdra and S. Pitsal, pers. obs.). European Mink are also known to move away from watercourses (into forests and fields – habitats that are otherwise rarely visited) in response to aggression or direct attacks from American Mink (Sidorovich *et al.* 2000). Dispersing individuals are sometimes killed on roads far from aquatic habitats (Zuberogoitia and Zabala 2003; these authors suggest that animals found in these areas are probably transient non-territory holders, but little is known about them or their movements). Dens and resting sites are provided by tree roots, log cavities, heaps of stones, and vegetation (e.g. brambles, or reeds); in the south, or in summer, resting sites may be under bushes above ground like Rubus sp. (Palomares *et al.* 2017; Harrington and Maran in print, and references therein). Beaver activity, especially in watercourses transformed by human activity (canals), also offer shelter opportunities (burrows, lodges, dams etc.) (Sidorovich 1997). The European Mink is an opportunistic generalist carnivore that hunts both terrestrial and aquatic prey. Prey items include amphibians, crustaceans (crayfish), fish, small mammals, insects, and reptiles (Sidorovich *et al.* 1998; Maran *et al.* 1998a; Palazón *et al.* 2004, 2008; Põdra *et al.* 2013; reviewed in Harrington and Maran in print). Its diet varies according to habitat and season (Libois *et al.* 1998, Sidorovich *et al.* 2001, Põdra *et al.* 2012).

The European Mink is a seasonal breeder, mating only once a year, and has a polygynous/promiscuous mating system in which one male mates with several females and females may also mate with several males (Dunstone 1993). Males' female-seeking behaviour begins early in winter, while female oestrus peaks in April (Kiik *et al.* 2017). Oestrus lasts on average 5 days and the females are polyoestrous, returning to heat up to three times if fertilisation fails (Moshonkin 1983). Gestation lasts normally 43 days, resulting in births in May-July (Kiik *et al.* 2017). Unlike some other mustelids (e.g. American Mink) they do not appear to have delayed implantation (Nagl *et al.* 2015). Both males and females become sexually mature at 9-10 months old (Youngman 1990, T. Maran unpub. data). Average litter size in captivity is between three and five (Ternovsky and Ternovskaya 1994, Amstislavsky *et al.* 2008, Põdra unpubl. data). Kiik *et al.* (2017) reported an average of 4.42 (±1.48 SD). In the Spanish breeding program, the average litter size is markedly lower: 2.96 (±1.04 SD) young per female (80 litters analysed between 2005 and 2020; Põdra, unpubl. data). Reported litter sizes in the wild are usually slightly lower than in captivity: Sidorovich (1997) reported an average of 3.8 young per female (range 2 - 6) for wild European Mink less than one month old in Belarus, and 2.4 young per female (range 1-5) more than 1 month old. Fournier-Chambrillon *et al.* (2010) reported an average of 3.4 (range 2-5) embryos in France and Spain. Litter sizes in captivity have been found to depend on female body condition and age, and the sex ratio at birth did not differ from 1:1 (Kiik *et al.* 2017). There are no data on pregnancy rates in the wild but an ongoing study in Spain suggests pregnancy rates can be above 90% (Põdra *et al.* unpub. data). Of more than 1,000 European Mink born at Tallinn Zoo, 85 (7.3%) died before reaching their first breeding season; most (93%) of the deaths occurred during the litter period (Kiik *et al.* 2017). There are few data on juvenile or adult survival in the wild, but wild populations tend to be dominated by young of the year and yearlings: for example, in Belarus 39% of 32 males and 25% of 18 females were aged < 1 year, and 33% and 25%, respectively, aged 1-2 years, while 6% and 12%, respectively, were over 4 years old (Sidorovich 1997). A similar age structure is reported by Danilov and Tumanov (1976) for a Russian population. In Spain, a high proportion of young animals was detected in the wild population (n=54): individuals prior to their first breeding season (class 0+) represented approximately half of all animals

during the post-reproductive period (Mañas *et al.* 2016), and very similar results were obtained in France (Fournier-Chambrillon *et al.* 2022). At the same time, a high mortality rate of 0+ age class (50%) was calculated during the dispersal-winter period (Mañas *et al.* 2016).

Systems: Terrestrial, Freshwater (=Inland waters)

Use and Trade

The European Mink was hunted for the fur trade during the first half of the 20th century (e.g. Maran *et al.* 2017). There are no data on present trade but the higher quality of farmed American Mink fur makes it highly unlikely that this trade would become an issue in European Mink conservation. However, European Mink individuals are still caught incidentally in small numbers in Russia (where hunting is still legal; data from N. Kiseleva 2023) by trappers hunting for American Mink (e.g. Skumatov and Saveljev 2006).

Threats (see Appendix for additional information)

European Mink populations have been in decline since the early nineteenth century. A number of factors have played a role in their historical decline, including over-exploitation in Russia, and large-scale habitat destruction due to wetland drainage and channelling of rivers for agricultural purposes in Central Europe (Maran and Henttonen 1995). The pattern of decline is complex and causative factors likely varied in time and across regions (Maran 2007; Maran *et al.* 2016, 2017). Currently, the main threat to the European Mink is the presence of the non-native American Mink.

American Mink individuals are slightly larger than European Mink and outcompete European Mink by direct interspecific aggression (Sidorovich *et al.* 1999, Põdra *et al.* 2013). The two species are similar in appearance, behaviour, and ecology, although the European Mink is not as closely related to American Mink as it is to other similar mustelids (e.g. Western Polecat *Mustela putorius*) and the American Mink is now placed in a separate genus *Neogale* (formerly *Neovison*) distinct from the *Mustela* species (Koepfli *et al.* 2017, Patterson *et al.* 2021). American Mink tend to be more adaptable in terms of habitat use than European Mink (Zabala *et al.* 2006, 2007; Zuberogoitia *et al.* 2006; Maran *et al.* 2017), and evidence from captive experiments and radio-tracking studies of wild populations suggest that they dominate in direct contact interactions (Maran *et al.* 1998, Sidorovich 2000, Sidorovich and Macdonald 2001). American Mink also produce litters that are larger than those of European Mink (Sidorovich 1997), with American Mink females carrying double the number of embryos of European Mink females (Fournier-Chambrillon *et al.* 2010), and the largest number of embryos per female recorded in an expanding population that had recently dispersed into a new area, or populations under hunting pressure (Sidorovich 1993), and thus, along with other reproductive differences (e.g. earlier oestrous in American Mink), theoretically have the capacity to quickly outnumber and outperform the European species (Maran *et al.* 2017, Harrington and Maran in print). Following colonisation of an area by American Mink, European Mink appear to be progressively excluded from their preferred habitats (Sidorovich 2000; Sidorovich *et al.* 1999, 2010; Sidorovich and Macdonald 2001), adult (live trapped) sex ratios have been observed to become increasingly male-biased (suggesting reduced survivorship of females or inability of females to persist in sub-optimal habitats, Sidorovich 2000), and body size of surviving male and female European Mink appears to increase (suggesting reduced survivorship of smaller individuals; Sidorovich *et al.* 1999). Population level impacts are evidenced by observations of the local extinction of European Mink coinciding with colonisation by American Mink in Estonia, the Tver

region in central Russia, parts of northern Spain, and the Lovat River Valley in Belarus (Maran *et al.* 2016 and references therein, Maran *et al.* 2017). Elsewhere, there are no records of long-term coexistence of the two mink species, and, whilst there are numerous accounts of local replacement of the European Mink with the American Mink, there is none in which the opposite has occurred (Maran *et al.* 2016). This situation presents an extreme and imminent threat to all extant wild populations of European Mink, given that American Mink are now established across much of mainland Europe (Vada *et al.* 2023, Harrington *et al.* 2023), including European (Western) Russia (through the Caspian-Baltic watersheds, Vada *et al.* 2023) and the Russian Federation as a whole from the west to the Far East (except in some of the northern regions; Khlyap *et al.* 2011). Crucially, American Mink now occupy most of the remaining range of the European Mink with the main exception of the Danube delta (although there have been isolated records of individual mink in the vicinity of the delta; Hegyeli and Kecskés 2014, Marinov *et al.* 2012, Harrington *et al.* 2023) and very limited areas in some countries like Spain, France (where they are subject to on-going removal trapping, see Conservation below). Areas confirmed to be free of American Mink across Europe are scarce and small (Harrington *et al.* 2023) and a recent review of the distribution of American Mink in Europe suggests that they are continuing to spread in many of the countries currently occupied (e.g. Germany, Vada *et al.* 2023) - this means that as well as presenting a constant threat to extant populations, opportunities for conservation translocations of European Mink are currently limited. Even very low numbers of American Mink pose a threat to newly released European Mink: in Spain, during an experimental release of captive-bred European Mink, and despite the abundance of American Mink being reduced by selective trapping, 30% of recorded European Mink mortality was likely caused by American Mink (Põdra *et al.* 2013).

Habitat loss and degradation is still a serious threat especially in the western population, both in France and in Spain. European Mink are negatively impacted by habitat destruction (particularly that associated with urbanisation and river canalisation; Zabala *et al.* 2006), and pollution. Canalised rivers are less suitable for European Mink due to modification of watersheds and banks, and removal of riparian vegetation, which cause a deficit of prey species and availability of shelters. In Belarus, the European Mink was present in canals at lower densities (up to 2 ind/10 km) than in rivers (up to 10 ind/10 km) (Sidorovich 1997). Modified habitats may also act as barriers for dispersion (Zabala *et al.* 2006, Zuberogoitia *et al.* 2013). For example, concrete or rubble riverbanks and drainage pipes on rivers and streams not only reduce the habitat available for mink but also create movement barriers forcing mink onto roads (Zuberogoitia *et al.* 2013), as do roads intersecting rivers (Palazón *et al.* 2012). Between 1990–2008, 145 roadkills were registered in Spain (Palazón *et al.* 2012), and in France, between 1987-2008, 54% of European Mink corpses found dead were due to collisions (unpublished data, Fournier-Chambrillon *et al.* 2013). While not the primary cause of decline, roadkills still may increase the mortality rate and significantly impact small populations at local scales. There is little published information on direct effects of pollutants (Harrington and Maran in print). However, mink tend to avoid highly polluted river courses and their populations tend to be more fragmented in areas with high levels of organic matter, phosphorous, pesticides, micropollutants, and heavy metals (Lodé *et al.* 2001, Lodé 2002).

Little is currently known of the likely impact of climate change on the European Mink but their dependence on aquatic habitats and especially small rivers and streams suggests that they are likely to be vulnerable to drying landscapes (Harrington and Maran in print) and it is, therefore, likely to become a more important threat in the near future, particularly for island populations (due to their small river catchment areas) and populations in the southern part of their range (due to higher likelihood of

draughts). One study in Russia suggested that distributional changes at the eastern limit of their range were associated (weakly) with abiotic factors, primarily, solar activity and, to a lesser degree, moisture, and the water level in water bodies (Kassal 2018). Changes in both distribution area and population density are weakly correlated with the timing of spring and fall onset, the amount of precipitation, and the extent of snow cover in winter (Kassal 2018).

In terms of disease susceptibility, a recent study in Spain (Villanueva-Saz *et al.* 2022) evaluated the presence of SARS-CoV-2 in European and American Mink in the wild. From 2020 to 2022, a total of 162 animals (127 European Mink and 35 American Mink) were included in the study and no evidence of SARS-CoV-2 infection was detected. With these results, it can be considered that the probability that the virus is circulating in wild mink is low, but not impossible. This remains a potential concern given the susceptibility to the disease of American Mink and Domestic Ferrets (M. putorius furo) (Delahay *et al.* 2021), and the potential for the spread of disease from fur farms (Harrington *et al.* 2021), particularly for conservation breeding actions. Other diseases, such as canine distemper (CD), avian flu or Aleutian disease (AD), are potentially dangerous - currently, there is no evidence of population-level impacts (AD: Mañas *et al.* 2016) but some diseases might be locally important. For example, the regular re-emergence of CD in some wild populations (e.g. Navarre, Fournier-Chambrillon *et al.* 2022) poses a real threat to European Mink conservation in those areas.

Hybridisation with Western Polecat (*Mustela putorio*s) has also been suggested to pose a threat to European Mink (Cabria *et al.* 2011, Fournier-Chambrillon *et al.* 2024). However, under normal circumstances, hybridization appears to be a rare event (Tumanov and Zverev 1986, Lodé *et al.* 2005, Amstislavsky *et al.* 2009, Cabria *et al.* 2011): Cabria *et al.* (2011) report a hybridization rate of up to 3% based on a sample of 400 individuals of European Mink, polecats, and hybrids, from across Europe. More recent studies suggest that the hybridization rate may be lower than 3%: for example, during the Life Lutreola Spain project (2014-2019), 103 European Mink individuals were live-trapped but no hybrids were detected (A. Gómez and M. Põdra, unpubl. data). Various sources of evidence suggest that hybridization is more frequent when European Mink numbers are low (Sidorovich 2001, Lodé *et al.* 2005, Maran 2007). Being an uncommon event, it is not likely that hybridisation will threaten the remaining populations of European Mink globally, although it could still play a role locally (see below).

In addition to the main factors behind the decline of European Mink populations, the small size of the remaining populations renders them particularly vulnerable to a number of other factors that may pose a local threat, such as non-natural accidental mortality (e.g. dog predation at farms, by-catch of hunting and illegal fishing with nets/traps, secondary poisoning, etc.), loss of genetic diversity and/or hybridization and inbreeding (Korablev *et al.* 2014), and environmental and demographic stochastic events.

Conservation Actions **(see Appendix for additional information)**

The European Mink is listed in Annex II to the Bern Convention on the Conservation of European Wildlife and Natural Habitats, and Annexes II and IV (a priority species of Community Interest) of the EU Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora). The European Mink has recently been listed as Critically Endangered at a national level in France (DREAL 2021) and is included on the Spanish National Catalogue of Endangered Species (CNEA) in "Critical situation". In Estonia, it is listed as 'I category' (i.e. granted the highest level of protection). In Romania, it is listed as Endangered in the Red Book of Vertebrates (Botnariuc *et al.* 2005). The Red Book

of the Russian Federation (2024 https://redbookrf.ru/ accessed 02.04.24) lists a purported subspecies of European Mink: the Caucasian European Mink, *Mustela lutreola turovi* (Novikov 1939) as Endangered.

The following conservation actions have been carried out between 2016 and 2023, with some still on-going:

1. Captive breeding: the European Mink has been bred in captivity in Russia since the 1970s (Ternovsky and Ternovskaya 1994) and in Estonia since the 1980s (Maran 2006). In the framework of the EEP, dedicated breeding facilities have also been established in Germany (Festl *et al.* 2004) and France (DIREN 2021), with other European zoos occasionally also contributing to breeding and/or increasing awareness for the species. In Spain, a national breeding program was initiated in 2004 (MMARM 2008). Currently, the EEP and the Spanish breeding programme are managed separately - experimental breeding between the EEP and Spanish population was carried out between 2018-2020 but discontinued at present (Põdra *et al.* unpubl. data). The EEP program is composed of >200 individuals (founders from north of Europe) and the Spanish programme 50-60 individuals (founders from Spanish wild population) (K. Nemvalts and C. Aranda, pers. com. 2024). A small captive population is also maintained in the Breeding Center of Ilmen Nature Reserve in Russia (Kiseleva 2018). There are no individuals from the southern population (Danube Delta) involved in breeding programs at the moment (reported by T. Maran 2024).

2.Conservation translocations: reintroduction and reinforcement projects are ongoing in Spain, Germany, and the Estonian islands of Hiiumaa and Saaremaa. Similar actions are planned for France from 2025 onwards. Between 2000 and 2016, 580 mink were released onto Hiiumaa Island (an island of ca. 1,000 km^2); since 2016 a stable population of fewer than 100 wild-born individuals has been estimated (reviewed in Maran *et al.* 2017). A similar release on the larger (2,400 km^2) neighbouring island of Saaremaa Island was started in 2022 (Maran, T. and Silts, M., unpubl. data). In Spain, a reinforcement action has been ongoing in the Ebro basin in Álava and La Rioja (with more than 100 European Mink released there between 2018 and 2023), and experimental releases in different regions (Gipuzkoa: population reinforcement; Aragón: assisted colonisation; unpubl. data). A concerted effort is underway aiming to restore European Mink to the Carpathian Mountains of Romania, but this is currently at the feasibility stage.

3. Monitoring of European Mink: in Estonia, the island population in Hiiumaa is regularly monitored (annual live-trapping combined with searching for footprints). In Spain, monitoring of European Mink is carried out by regional governments where the species is present. Traditionally, live-trapping has been used to this effect, and recently also hair-trapping and camera-trapping have been used (Croose *et al.* 2023). In addition, information about the presence of the species is collected alongside the control/eradication of American Mink (see below). In 2022, a field study was carried out across the known distribution area in Spain, and DNA analyses of hair samples were carried out with the aim of evaluating the distribution area and population size in the whole country (MITECO 2024). In France, from 2016, the European Mink range is continuously updated as part of the 3rd National Action Plan (NAP; DREAL 2021). Similarly to the monitoring in Spain, different methods (live-trapping, hair-trapping, camera-trapping, etc.) are used to detect the species' presence, prioritising areas with confirmed recent species presence data (DREAL 2021). In Romania, regular monitoring has been conducted in the Danube Delta since 2001, primarily using live-trapping (since 2003) and opportunistic sightings and direct observations. Surveys using live-trapping, camera traps, eDNA and faecal DNA are ongoing in the Mureș

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Basin since autumn 2023.

4. American Mink control/eradication: programs to control American Mink within and around the European Mink range are ongoing in Spain and in France. Both countries primarily use mink rafts (with clay tracking pads and live traps) as a method to trap and kill American Mink. In Spain, a number of local and regional attempts to remove American Mink within the European Mink distribution area and its surroundings have been underway since the late 1990s - early 2000s (Põdra and Gómez 2018). However, due to the incompatibility of both species sharing the same ecological niche (see above), there is a continual risk of colonization of the area where the European Mink still survives. Within the framework of the Life Lutreola Spain project (2014-2019), the American Mink population was eradicated in the Ebro river basin in Álava and La Rioja, and in several Cantabric rivers in the north of the Basque Country (Tragsatec 2019). Since 2019, low numbers of American Mink individuals have been captured there annually (having dispersed into the area from neighbouring populations), meaning that European Mink only survive due to ongoing American Mink removal efforts. In France, continuous work is carried out to limit the impact of American Mink on areas with known presence of European Mink, as part of the 3rd DREAL, with positive outcomes (i.e. significant decreases in the number of captures and rafts visited in some areas, unpubl. data). The Life Visón project strengthened this action significantly between 2017-2023 to preserve the Charente basin, which is still free of American Mink (https://lifevison.fr/).

5. Habitat restoration: several actions have been carried out to improve habitat quality in the southwestern range of the population. In Spain, Arga and Aragon river restoration was carried out within the framework of the Life Territorio Visón project (2010-2016) (https://territoriovison.eu/). Also, as a part of the Life Lutreola Spain project (2014-2019), a local-scale habitat restoration was carried out in the Basque Country, in the province of Álava (Ebro river) (Tragsatec, 2019). In France, within the framework of the Life Visón project (2017-2023), different restoration works were implemented to improve habitat quality, such as the creation of fish spawning grounds and ponds, restoration of wet meadows and riparian woodlands in the Charente basin, and reduction of road collisions by adapting passages for the European Mink and other mammals (https://lifevison.fr/). In Romania, in 2019, a project was launched for the restoration of some areas in the Danube Delta: including the construction of artificial platforms, and the construction of interconnected channels with platforms to facilitate territory connectivity. The construction of these platforms is aimed at minimising the negative effect that delayed floods (by approximately two months) can have for reproductive success at that time of the year; they also compensate for bank erosion caused by engine boats as a result of the very high increase in tourism traffic (Marinov 2022). Another project started in 2019 aiming to assess conservation status and propose conservation measures for all habitats and animals of community interest, including European Mink.

6. Research: studies have been undertaken to determine the European Mink's ecological requirements, to analyse the causes of its decline, and to assess the genetic variability, and the survival of released captive-born European Mink (reviewed in Maran *et al.* 2016, 2017). New studies have been launched to study reproductive behaviour and physiology, impact of captive conditions on behavioural development and welfare, options for artificial insemination, microbiome and genomics, and effects of individual differences (personality) in mink for improving both conservation breeding and reintroduction and reinforcement actions. For example, studies on reproductive behaviour and physiology of the species in captivity are currently ongoing in both Estonia and in Spain with the aim of understanding the reasons behind the lower mating success rate of captive-born individuals (Kiik *et al.* 2013), including individual

differences (i.e. personality, Nemvalts *et al.* 2018) and welfare-relevant factors (Díez-León *et al.* 2020, Marin-Sierra *et al.* 2024, Kiik *et al.* 2024, Nemvalts *et al.* 2024). Assisted reproduction techniques have also been piloted in this species in France and in Spain (Santucci 2019, C. Aranda pers. comm.), blood reference values described (Villanueva-Saz *et al.* 2024), and a study of captive and wild morbidity and mortality analysis is underway (e.g. Ruano Feo at al. 2020, Giner *et al.* 2022). In addition, experimental breeding between the individuals of EEP and Spanish breeding program, as well as a genetic study of both captive populations, was undertaken within the framework of the Life Lutreola Spain (2014-2019), with the aim of evaluating the joint management of captive populations of European Mink (Tragsatec 2019, Nummert *et al.* unpublished data). Genetic studies have also evaluated differences between the established Hiiumaa population and the EEP population (Nummert *et al.* 2023), sequenced the species' genome (Mouton *et al.* 2022, Skorupski *et al.* 2023), and analysed gut microbiome differences between European and American Mink (van Leeuwen *et al.* 2023). Field studies have included assessment of methods for population assessment (Croose *et al.* 2023, MITECO 2024), and studies of reproduction in the wild are being carried out in Estonia (island of Hiiumaa, M. Díez-León and T. Maran, unpubl. data), Spain (A. Gómez and M. Põdra, unpubl. data) and in France (https://lifevison.fr/). Also, studies on survival and adaptation of the species in reintroduction programs are underway in Spain and in Estonia, which include studies on how captive conditions affect behaviour that leads to successful adaptation in released individuals (e.g. Marin-Sierra *et al.* 2022), as well as behavioural studies of wild European Mink (M. Põdra and M. Díez-León unpubl. data).

The impact of American Mink and the preservation of intact habitats are likely to remain the main challenges for the preservation of the European Mink in terms of both management and research. Efficient strategies for large-scale removal of American Mink, and detection and prevention of further American Mink invasion (or re-invasion) into new areas are needed. The use of mink rafts in different countries (Spain, France) for American Mink control/eradication is effective and local efforts to date have been sufficient to avoid colonisation of American Mink within the range of native European Mink. Nevertheless, the American Mink's constant expansion into new areas means that additional and more efficient effort and strategy are needed to remove American Mink from rivers in adjacent areas, to ensure the survival of European Mink.

Possibilities for European Mink recovery are limited in most of Europe, mostly due to a lack of suitable habitat that is free of American Mink and other threats. Therefore, there is an urgent need to assess the possibilities to (re)introduce even small populations across Europe, in areas with suitable habitats available, free of American Mink and with low risk of colonisation. To provide capacity for future reintroductions, the habitat requirements of possible future European Mink populations need to be incorporated into current management protocols for recipient rivers and streams, and there is a need for cost-effective restoration methods for running-water ecosystems, especially small streams and watercourses modified by human-activity.

The critical status of the species in the wild means that ex situ species management is also necessary. The conservation breeding efforts of the species requires collaboration among countries and coordination across Europe. Currently, the captive-breeding programmes are barely meeting the goal of maintaining genetic diversity due to the limited resources available, and the small number of individuals in the population: there are just over 200 individuals in all the centres that are currently part of the EEP, and 50-60 in Spanish centres. Such small populations will lose genetic diversity fast when kept separately, and new founders are not available. Therefore, joint management is needed. Although experimental breeding between individuals in the EEP and in the Spanish breeding programme gave

positive genetic results (Tragsatec 2019, Nummert *et al.* in print), the Spanish breeding program has not joined the EEP at the time of writing. Recent whole genome studies for the species (Mouton *et al.* 2022, Skorupski *et al.* 2023) might open new avenues to inform coordinated management of wild and captive populations. However, improved capacity for conservation breeding of European Mink will also require a better understanding of its reproductive biology, especially of the factors limiting successful mating (see ongoing research above).

For extant populations and to improve confidence in the assessment of the global conservation status of the species, further information is urgently needed on the current status of the European Mink in Romania, Ukraine and elsewhere in eastern parts of Europe, as well as updated information on the status of American Mink in other areas.

In addition, to comprehensively and actively protect this species, it is important to continue efforts to raise awareness and educate the general public and local stakeholders about the species so that any conservation management actions undertaken locally and regionally (be these habitat protection, American Mink control, conservation translocations, etc.) have the highest chances of success.

Currently, the remaining small isolated populations of European Mink exist in different countries under different regulatory systems. A single coordinated “one-plan” approach encompassing management of all extant population fragments, strategic planning for the restoration and/or establishment of new populations, in the areas where the known threats are not present, supported by coordinated ex situ populations, and appropriate policy or management tools to support collaboration between governments and other stakeholders, is urgently needed to ensure the survival of the species.

Credits

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Disclaimer

External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.1. Forest - Boreal	Resident	Suitable	Yes
1. Forest -> 1.2. Forest - Subarctic	Resident	Suitable	Yes
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	Yes
3. Shrubland -> 3.3. Shrubland - Boreal	Resident	Marginal	-
3. Shrubland -> 3.4. Shrubland - Temperate	Resident	Marginal	-
3. Shrubland -> 3.8. Shrubland - Mediterranean-type Shrubby Vegetation	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.2. Wetlands (inland) - Seasonal/Intermittent/Irregular Rivers/Streams/Creeks	Resident	Marginal	-
5. Wetlands (inland) -> 5.3. Wetlands (inland) - Shrub Dominated Wetlands	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.4. Wetlands (inland) - Bogs, Marshes, Swamps, Fens, Peatlands	Resident	Marginal	-
5. Wetlands (inland) -> 5.5. Wetlands (inland) - Permanent Freshwater Lakes (over 8ha)	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.6. Wetlands (inland) - Seasonal/Intermittent Freshwater Lakes (over 8ha)	Resident	Marginal	-
5. Wetlands (inland) -> 5.7. Wetlands (inland) - Permanent Freshwater Marshes/Pools (under 8ha)	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.8. Wetlands (inland) - Seasonal/Intermittent Freshwater Marshes/Pools (under 8ha)	Resident	Marginal	-
5. Wetlands (inland) -> 5.9. Wetlands (inland) - Freshwater Springs and Oases	Resident	Marginal	-
5. Wetlands (inland) -> 5.13. Wetlands (inland) - Permanent Inland Deltas	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.14. Wetlands (inland) - Permanent Saline, Brackish or Alkaline Lakes	Resident	Marginal	-
5. Wetlands (inland) -> 5.15. Wetlands (inland) - Seasonal/Intermittent Saline, Brackish or Alkaline Lakes and Flats	Resident	Marginal	-
5. Wetlands (inland) -> 5.16. Wetlands (inland) - Permanent Saline, Brackish or Alkaline Marshes/Pools	Resident	Marginal	-
5. Wetlands (inland) -> 5.17. Wetlands (inland) - Seasonal/Intermittent Saline, Brackish or Alkaline Marshes/Pools	Resident	Marginal	-

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Habitat	Season	Suitability	Major Importance?
15. Artificial/Aquatic & Marine -> 15.2. Artificial/Aquatic - Ponds (below 8ha)	Resident	Marginal	-
15. Artificial/Aquatic & Marine -> 15.3. Artificial/Aquatic - Aquaculture Ponds	Resident	Marginal	-
15. Artificial/Aquatic & Marine -> 15.7. Artificial/Aquatic - Irrigated Land (includes irrigation channels)	Resident	Marginal	-
15. Artificial/Aquatic & Marine -> 15.8. Artificial/Aquatic - Seasonally Flooded Agricultural Land	Resident	Marginal	-
15. Artificial/Aquatic & Marine -> 15.9. Artificial/Aquatic - Canals and Drainage Channels, Ditches	Resident	Suitable	Yes

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
10. Wearing apparel, accessories	Yes	Yes	No

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity
1. Residential & commercial development -> 1.1. Housing & urban areas	Unknown	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.2. Species disturbance		
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Unknown	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.2. Species disturbance		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Unknown	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Minority (<50%)	Slow, significant declines

	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition -> 2.3.7. Reduced reproductive success	
2. Agriculture & aquaculture -> 2.2. Wood & pulp plantations -> 2.2.2. Agro-industry plantations	Ongoing	Unknown	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition -> 2.3.7. Reduced reproductive success	
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Unknown	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition -> 2.3.7. Reduced reproductive success	
2. Agriculture & aquaculture -> 2.4. Marine & freshwater aquaculture -> 2.4.3. Scale Unknown/Unrecorded	Unknown	Unknown	Unknown
	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 -> 2.2. Species disturbance	
3. Energy production & mining -> 3.2. Mining & quarrying	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance	
3. Energy production & mining -> 3.3. Renewable energy	Ongoing	Minority (<50%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success	
4. Transportation & service corridors -> 4.1. Roads & railroads	Ongoing	Minority (<50%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.2. Species disturbance	
4. Transportation & service corridors -> 4.3. Shipping lanes	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance	

5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.1. Intentional use (species is the target)	Past, unlikely to return	Majority (50-90%)	Rapid declines
Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.2. Unintentional effects (species is not the target)	Ongoing	Minority (<50%)	Unknown
Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Unknown	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Unknown	Causing/could cause fluctuations
Stresses:	2. Species Stresses -> 2.1. Species mortality		
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
6. Human intrusions & disturbance -> 6.2. War, civil unrest & military exercises	Ongoing	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.2. Abstraction of surface water (commercial use)	Ongoing	Unknown	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.3. Abstraction of surface water (agricultural use)	Ongoing	Unknown	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		

7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.6. Abstraction of ground water (commercial use)	Ongoing	Unknown	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.7. Abstraction of ground water (agricultural use)	Ongoing	Unknown	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.10. Large dams	Ongoing	Minority (<50%)	Unknown
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 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 -> 2.3.7. Reduced reproductive success		
7. Natural system modifications -> 7.3. Other ecosystem modifications	Ongoing	Unknown	Rapid declines
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition -> 2.3.7. Reduced reproductive success -> 2.3.8. Other		
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (Neogale vison)	Ongoing	Whole (>90%)	Very rapid declines
Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition		
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.3. Type Unknown/Unrecorded	Ongoing	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.1. Nutrient loads	Ongoing	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.2. Soil erosion, sedimentation	Ongoing	Unknown	Unknown
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects		

				2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success
9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.3. Herbicides and pesticides		Ongoing	Unknown	Unknown
	Stresses:			1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success
9. Pollution -> 9.6. Excess energy -> 9.6.3. Noise pollution		Ongoing	Unknown	Unknown
	Stresses:			2. Species Stresses -> 2.2. Species disturbance
11. Climate change & severe weather -> 11.2. Droughts		Ongoing	Unknown	Unknown
	Stresses:			1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success -> 2.3.8. Other
11. Climate change & severe weather -> 11.3. Temperature extremes		Ongoing	Unknown	Unknown
	Stresses:			1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success -> 2.3.8. Other

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over entire range
Occurs in at least one protected area: Yes
In-place species management
Successfully reintroduced or introduced benignly: Yes
In-place education
Included in international legislation: Yes
Subject to any international management / trade controls: Unknown

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed	Notes
1. Land/water protection -> 1.1. Site/area protection	-
1. Land/water protection -> 1.2. Resource & habitat protection	-
2. Land/water management -> 2.1. Site/area management	-

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Conservation Action Needed	Notes
2. Land/water management -> 2.2. Invasive/problematic species control	-
2. Land/water management -> 2.3. Habitat & natural process restoration	-
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management	-
3. Species management -> 3.2. Species recovery	-
3. Species management -> 3.3. Species re-introduction -> 3.3.1. Reintroduction	-
3. Species management -> 3.3. Species re-introduction -> 3.3.2. Benign introduction	-
3. Species management -> 3.4. Ex-situ conservation -> 3.4.1. Captive breeding/artificial propagation	-
3. Species management -> 3.4. Ex-situ conservation -> 3.4.2. Genome resource bank	-
4. Education & awareness -> 4.1. Formal education	-
4. Education & awareness -> 4.2. Training	-
4. Education & awareness -> 4.3. Awareness & communications	-
5. Law & policy -> 5.1. Legislation -> 5.1.1. International level	-
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level	-
5. Law & policy -> 5.1. Legislation -> 5.1.3. Sub-national level	-
5. Law & policy -> 5.1. Legislation -> 5.1.4. Scale unspecified	-
5. Law & policy -> 5.2. Policies and regulations	-
5. Law & policy -> 5.3. Private sector standards & codes	-
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.1. International level	-
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level	-
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level	-
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.4. Scale unspecified	-
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives	-
6. Livelihood, economic & other incentives -> 6.2. Substitution	-
6. Livelihood, economic & other incentives -> 6.4. Conservation payments	-
6. Livelihood, economic & other incentives -> 6.5. Non-monetary values	-

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

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Research Needed	Notes
1. Research -> 1.2. Population size, distribution & trends	-
1. Research -> 1.3. Life history & ecology	-
1. Research -> 1.5. Threats	-
1. Research -> 1.6. Actions	-
2. Conservation Planning -> 2.1. Species Action/Recovery Plan	-
2. Conservation Planning -> 2.2. Area-based Management Plan	-
3. Monitoring -> 3.1. Population trends	-
3. Monitoring -> 3.2. Harvest level trends	-
3. Monitoring -> 3.4. Habitat trends	-

Additional Data Fields

Distribution
Continuing decline in area of occupancy (AOO): Yes
Continuing decline in extent of occurrence (EOO): Yes
Continuing decline in number of locations: Yes
Lower elevation limit (m): 0
Upper elevation limit (m): 1,120
Population
Continuing decline of mature individuals: Yes
Population severely fragmented: Yes
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 2

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The IUCN Red List Partnership

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