Mammal Study 47: 155–164 (2022) DOI: 10.3106/ms2021-0044

Original paper

The European mink (*Mustela lutreola*) on Kunashir Island: confirmed survival 40 years after introduction

Aleksandr A. Kisleyko[1], Vladimir Dinets[2,3,*], Mikhail Y. Grishchenko[1,4,5], Evgenyi E. Kozlovskiy[6] and Lyudmila A. Khlyap[7]

[1] *State Nature Reserve "Kurilsky", Russia*
[2] *Okinawa Institute of Science and Technology, Onna-son, Okinawa, Japan*
[3] *Psychology Department, University of Tennessee, Knoxville, United States of America*
[4] *Lomonosov Moscow State University, Faculty of Geography, Russia*
[5] *HSE University, Faculty of Geography and Geoinformatics, Russia*
[6] *Russian Forest Protection Center, Kaliningrad regional office, Russia*
[7] *A.N. Severtsov Institute of Ecology and Evolution RAS, Russia*

Abstract. In the early 1980s, the European mink (*Mustela lutreola*) was introduced on Kunashir [Kunashiri] Island in the Kuril [Chishima] Islands in order to preserve it in a region where its main competitor, the American mink (*Neovison vison*), is absent. We present records of the European mink on Kunashir in 2014–2021. In 23 cases, mink footprints were recorded on the snow or on sandbanks; in other nine cases, the animals were recorded visually or using camera traps. Camera trap photos reliably confirm the existence of a European mink population far from its severely contracted native range. The data were used to compose the dataset "Database of the European mink [*Mustela lutreola* (Linnaeus, 1761)] occurrence on Kunashir Island" that was transferred to the open international repository GBIF.

Key words: camera trap, Carnivora, conservation introduction, Critically Endangered species, distribution.

The distribution range and numbers of the European mink [*Mustela lutreola* (Linnaeus, 1761)] are catastrophically and steadily declining. Once a common and widespread species in much of Central and Eastern Europe, the Urals, Western Siberia, and the Caucasus (even with some expansion into Western Europe and southwestern Siberia in the 19th and 20th centuries), it started declining in many parts of its range around the 1970s (Tumanov and Zverev 1986; Ternovskiy and Ternovskaya 1994; Maran 1999). In the 1980s European mink still occurred in Western Siberia (Kassal 2018); in the early 1990s in the vicinity of Moscow (Dinets 1995), but by the 2020s European mink was extinct in much of its historic range. Isolated populations persisted in northern Spain, southwestern France, one or two small areas in Romania and adjacent Ukraine, a few regions in the European part of Russia, including Urals, and small areas in the Caucasus (Maran et al. 2016b). At that time, the European mink was still considered common in border areas of a few northern regions of the European part of Russia, but its ongoing decline was evident (Skumatov 2005; Skumatov and Saveljev 2006; Tumanov 2009). The remaining populations are still declining at the rate suggesting imminent extinction (Maran et al. 2016b).

According to the IUCN, the species was assessed in 1988 and 1990 as Vulnerable, in 1994, 1996, and 2008 as Endangered, and in 2011 as Critically Endangered (Maran et al. 2016b). In the Russian Federation only the Caucasian subspecies is listed in Red Data Book (Ministry of Natural Resources and Environment of the Russian Federation 2020). In the materials for the Red Data Book of the Russian Federation, prepared by leading experts, the European mink is included in the list of animals of special concern (Ilyashenko et al. 2018). The European mink is also listed in 46 regional Red Data Books in parts of Russia (Lissovsky et al. 2019).

*To whom correspondence should be addressed. E-mail: dinets@gmail.com

The decline of European mink populations first aroused concern among Russian scientists in the 1970s (Tumanov and Ternovskiy 1972, 1975; Ternovskiy and Tumanov 1973). In conservation practice, the release of wild or captive-bred animals into localities where they had disappeared (reintroduction) often produces good results for the preservation of endangered species in the wild (IUCN/SSC 1998, 2013; Seddon et al. 2007; Batson et al. 2015). In 1981, 1982, and 1986, wild-caught European mink were released on Valaam Island in Lake Ladoga, northwestern Russia (Tumanov and Rozhnov 1985, 1990) and were present there for up to ten years (Tumanov 2009). Estonian zoologists have regularly introduced captive-born European mink to Hiiumaa Island in the Baltic Sea. This project started in 2000, and by 2016, 578 animals had been released (Maran et al. 2016a). A small breeding population of fewer than 100 individuals exists on Hiiumaa Island at present (Maran et al. 2016b). In Germany, European mink were reintroduced in Saarland in the southwest (since 2006) and in Steinhuder Meer in the Lower Saxony (since 2010) (Peters et al. 2009; Maran et al. 2016b).

Another attempt to save the European mink was made in the 1980s. Ternovskiy (1975, 1980) came to the conclusion that one of the significant factors in the accelerating decline of the European mink was its competition with the American mink (*Neovison vison*), widely introduced and invasive in Eurasia (Dgebuadze et al. 2018). He believed that the only chance for long-term conservation of the European mink in the wild was to introduce it to areas free of the American mink and inaccessible for its invasion, and supported the unpublished proposal by V. G. and G. A. Voronov (cited in Ternovskiy 1980) to try such an introduction in the Kuril [Chishima] Islands (Ternovskiy 1980). This project was first implemented on Kunashir [Kunashiri] Island, the second largest island in the southern Kurils (Ternovskiy et al. 1982; Tikhonov et al. 1985). The European mink was deliberately introduced thousands of kilometers away from its native range. Despite the prevailing negative attitude towards introduction of species outside their native ranges, in rare cases, such actions (conservation introductions) are considered permissible (Seddon et al. 2014).

Four groups of the European mink were brought to Kunashir and released onto riverbanks in the northern part of the island (Fig. 1, Table 1). In three batches, all animals were from the breeding facility of the Biological Institute of the Siberian Branch of the Russian Academy of Sciences. In September 1981, nine males and 16 females were released on the Tyatina River [Onnebetsugawa], 1.5 km above the mouth; in October 1984, 33 males and 19 females were released on the Bannyi stream, 2 km above the mouth; in September 1985, 30 males and 20 females were released on Filatova River [Ruyabetsugawa], 2 km above the mouth. Additionally, in October 1985, four males and three females captured in the wild (Tver and Yaroslavl Regions) were released on Bolysheva River (a tributary of Filatova) (Ternovskiy and Ternovskaya 1994).

In 1986–1989, 254 European mink were introduced to Iturup [Etorofu] Island, the largest of the Kuril Islands, located ~20 km north of Kunashir (Voronov 1990); in its southwestern part, the coniferous forests are similar to those of northern Kunashir, while the rest of the island is dominated by larch (*Larix gmelinii* var. *japonica*), shrub alder (*Alnus hirsuta*), and dwarf bamboo (*Sasa kurilensis*) (Barkalov 2009). There are no recent documented records of the European mink on Iturup, but sightings are occasionally reported by local residents (V. V. Shkurov in preparation).

In 1983 the European mink population on Kunashir occupied 60–70 km^2 (20–40 individuals); by the early 1985, it expanded to nearly 250 km^2 (150–200 individuals) (Shvarts and Vaisfeld 1995, based on Voronov's unpublished reports). Shvarts and Vaisfeld (1993, 1995) conducted further fieldwork in August–September 1990 (180 km of routes) and in March 1991 (50 km). They found signs of mink activity on only six of the 12 rivers and streams near introduction sites and concluded that the number of the European mink on Kunashir was low (Shvarts and Vaisfeld 1993, 1995).

Subsequent scientific publications contained no reliable information on the status of the European mink on Kunashir. In an overview of the status of rare carnivoran mammals in Russia, Tumanov (2009) reported that, according to the survey data, the European mink was not recorded in the north of the island after 1994, although in the south (down to the village of Golovnino on the southern coast) single animals were found at the beginning of the 21st century. As a result, Tumanov (2009) believed that all these data "do not allow us to be completely sure that the European mink on the Kuril Islands has indeed survived to the present day" (p. 386). In the IUCN Red List, the introduction of the European mink to Kunashir is described as follows: "This introduction was unsuccessful; no stable populations were established in these islands (A. V. Abramov personal communication 2014)" (Maran et al. 2016b).

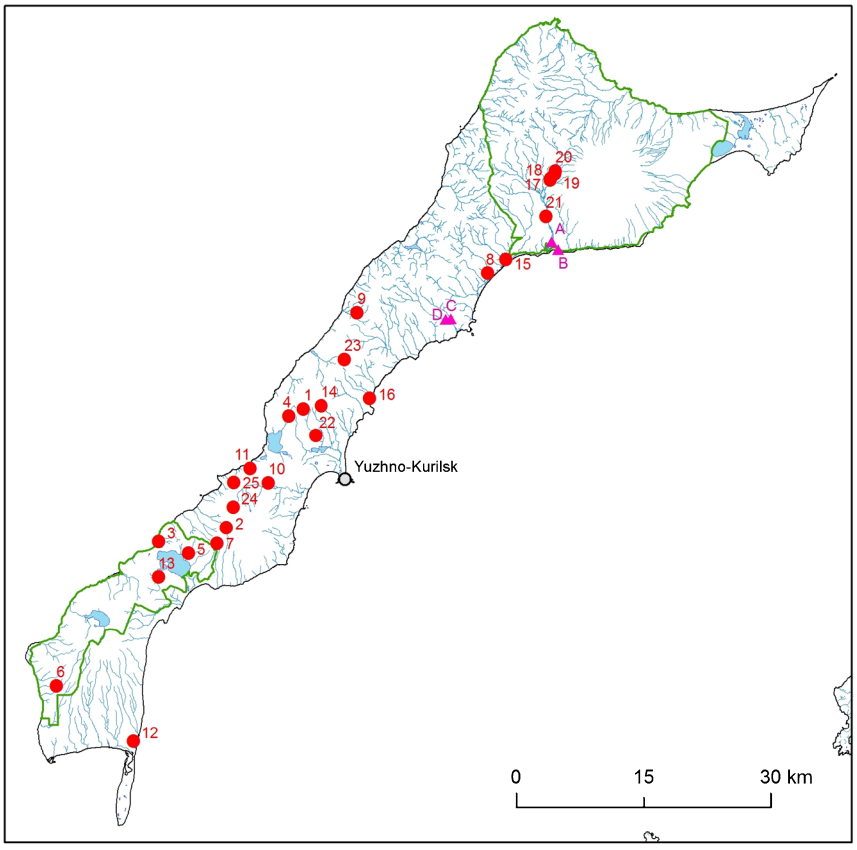

Fig. 1. European mink (*Mustela lutreola*) release sites (triangles marked with alphabetical letters) and 2014–2021 records (numbered circles) on Kunashir [Kunashiri] Island. For more information on the sites, see Tables 1 and 2. The green line shows the borders of two sections of State Nature Reserve "Kurilsky".

Table 1. European mink (*Mustela lutreola*) release sites on Kunashir [Kunashiri] Island (from Ternovskiy and Ternovskaya 1994)

No.	Date	Location	Number of animals
A	24 Sep. 1981	Tyatina River [Onnebetsu-gawa], 1.5 km above the mouth	25
B	9 Oct. 1984	Banny stream, 2 km above the mouth	52
C	28 Sep. 1985	Filatova River [Ruyabetsu-gawa], 2 km above the mouth	50
D	6 Oct. 1985	Bolysheva stream (tributary of Filatova River)	7

Numbers refer to the map (Fig. 1).

However, the personnel of the State Nature Reserve "Kurilsky" (hereafter Kurilsky Reserve), two sections of which are located on Kunashir Island, annually records tracks of the European mink on the island, and sometimes observes the animals directly. Records of the European mink on Kunashir in 2015–2018 have never been logged by the Nature Reserve in its chronicle but never published and remain virtually unknown. Our goal was to create a complete list of modern (2014–2021) records of the European mink on Kunashir Island and make this information publicly available.

Materials and methods

Study site

Kunashir is a rugged volcanic island, the southernmost in the Greater Kurils island chain, separated from the nearest land (Hokkaido Island) by a straight 16 km wide at the narrowest point. It stretches from southwest to northeast for 123 km. The width is mostly 8–11 km, up to 30 km in the northern part. The island has temperate maritime monsoon climate. Winters are relatively warm; the coldest month is February (average temperature –4.6°C).

Summers are cool and humid; the warmest month is August (average temperature 15.7°C). Below-freezing temperatures are usually recorded from mid-December to late March. Average annual precipitation is 1251 mm. Despite the fact that in winter there is little precipitation (109 mm), more than 1 m of snow accumulates in river valleys, ravines, and other depressions. Stable snow cover persists for 117 days per year on average (Barkalov and Eremenko 2003).

Abundant precipitation has created a dense network of rivers and streams. Floods occur a few times per year. On the Lesnaya River [Shojin-gawa], minimum water levels of ~85 cm are observed in January and July, while the maximum level (slightly above 160 cm) usually occurs in early November, with a secondary maximum (associated with winter thaws) in mid-December. Spring flood (up to 120 cm) lasts from mid-March to late May. Several small rises in water level due to monsoon rains occur in August. The water temperature in this river is above freezing all year round, the minimum (1.8°C) was recorded in January and February. Other rivers of the island also do not freeze completely, thanks in part to their groundwater supply (Alekseeva et al. 1992; Kotlyakov et al. 2009). Rivers of Kunashir typically have clear water with fast flow. The longest river is Tyatina (18 km), located in the northern part and draining into the Pacific Ocean. The first European mink were released to the island in its lower reaches. Of the other large watercourses, only the Bystry stream [Sarukamappu-gawa] (8 km) has recent records of the European mink. Kunashir has many lakes. The largest lake, Peschanoe [Toufutsu-ko] (7.87 km^2, average depth 4.2 m) and most others have lagoon origin and freeze in winter. Caldera lakes Goryacheye [Ichibishinai-ko] and Kipyashcheye [Pontoh] do not freeze but are unsuitable habitats for the European mink due to lack of aquatic fauna and coastal vegetation caused by volcanic activity.

Kunashir has remarkably diverse flora and fauna for a non-tropical island of its size (Newell 2004). It is more than 70% forested; the uplands are mostly covered with coniferous forests, but on the western (Sea of Okhotsk-facing) side, the forests are dominated by broadleaf trees (Barkalov 2009). On the shores of lakes and rivers, there are grows of willows (mostly *Salix udensis*) and alder (*Alnus hirsuta*), as well as tallgrass meadows with grasses and herbs up to 3 m tall (Barkalov and Eremenko 2003; Barkalov 2009).

Known European mink prey items on Kunashir include the Hokkaido brown frog (*Rana pirica*), the Dolly Varden trout (*Salvelinus malma*), and the grey red-backed vole (*Craseomys rufocanus*), while on Iturup, where frogs do not occur, the brown rat (*Rattus norvegicus*) plays an important role (Voronov 1990). Many rivers on both Kunashir and Iturup have spawning populations of Pacific salmon (*Onchorhynchus* spp.) and chars (*Salvelinus* spp.); in total there are over 20 freshwater fish species, as well as populations of crayfish (*Cambaroides* spp.), more than 60 species of freshwater mollusks, and other large aquatic invertebrates (Prozorova et al. 2002; Sidorov and Pichugin 2005). The island's coastline has high abundance and diversity of marine invertebrates in the intertidal zone (Solovyov 1945).

Small carnivores occurring on Kunashir are the red fox (*Vulpes vulpes*), the sable (*Martes zibellina*), and the least weasel (*M. nivalis*) (Voronov 1990). Unlike on some nearby islands, there are no records of non-native Japanese weasel (*M. itatsi*) or American mink (*N. vison*).

Human population of Kunashir was 6680 people as of 2010 (Federal Service of State Statistics 2010). Almost half of the island (the northern and the southwestern parts) is protected within two sections of Kurilsky Reserve.

Survey methods

In 2015–2018, the staff of Kurilsky Reserve carried out a tracking survey of the European mink on Kunashir, in the two sections of the reserve and in the adjacent territory. Banks of rivers, streams, and lakes were examined; the total length of routes was ~250 km.

We supplemented the survey results with observations made in 2014–2021. During this period, mink tracks were annually recorded during winter route counts; the surveyors were particularly attentive if the route crossed a watercourse. Identification of tracks was straightforward as no other animal on Kunashir has footprints of similar size and shape; specifically, mink tracks are ~33 mm long, while those of the red fox and sable are more than 60 mm long, and those of the least weasel smaller than 22 mm; the distance between footprints also differs between those species (Dinets and Rotshild 1998). Presence of escaped ferrets (*M. furo*), or of American mink, an abundant invasive animal on nearby Hokkaido (Ohdachi et al. 2015) is theoretically possible, but the species identity for the European mink was confirmed by camera traps (see below); besides, ferrets' tracks normally have longer claw marks, occur in upland habitats and do not enter the water or emerge from it (Dinets and Rotshild 1998).

The routes covered both sections of Kurilsky Reserve:

457.7 km of routes in the Tyatinsky (northern) section and 607.4 km in the Alekhinsky (southern) section, 1065.1 km in total. Only small parts of these routes crossed riparian habitats inhabited by the European mink.

Camera traps were set up in places where European mink presence had been detected if they were sufficiently accessible. Two such places were chosen. A Scout Guard 2060-k camera trap was used on Pervukhina stream (Fig. 1, #4), and operated for 51 days (from 20 December, 2015 to 9 February, 2016). On the left tributary of the Lesnaya River (Fig. 1, #10), we used one Reconyx HC600 and one Bushnell camera traps. Reconyx HC600 camera trap worked for two periods: from 15 April to 25 May, 2017 (40 days) and from 8 to 31 December 2020 (23 days). Bushnell camera trap worked from 12 to 23 May 2019 (12 days; unlike the other cameras, it recorded videos rather than photos). Small fish obtained from grocery stores was sometimes used as bait.

Dataset creation

All collected records of the European mink (both the animals and their tracks), except May 2019 records, were combined in the dataset "Database of the European mink (*Mustela lutreola* L., 1761) on Kunashir Island" and transferred to the open international repository GBIF (Kisleyko et al. 2021, https://www.gbif.org/dataset/22914bef-d1f8-410b-86ba-eabe44773988, Accessed 22 January 2022). The dataset includes the records of the European mink on Kunashir in 2014–2021 and the sites of introductions to the island in the 1980s.

In most cases, the coordinates were determined using a portable GNSS receiver. The coordinates of release locations and some of the places where European minks were recorded were determined using Google Earth web mapping service. Good knowledge of the terrain and working conditions allowed us to determine these coordinates with an accuracy of 0.00001°. The records are formatted to the Darwin Core specifications. A map of release locations and recent records of the European mink on Kunashir was compiled using ArcGIS 10.5 software. For its compilation, the materials of Kurilsky Reserve GIS (Grishchenko and Ashkatov 2019) were used.

Results

From the early 2014 to mid-2021, 32 occurrences of the European mink were recorded on Kunashir Island (Fig. 1, Table 2). During this period, the European mink was found throughout the island. The southernmost record was at the lake near the Belozerskaya River [Shiromanbetsu-gawa], the westernmost near an unnamed stream near the Bystry stream, the northernmost and easternmost record in the upper reaches of Tyatina River.

From 2014 to 2021, the European mink was recorded at 19 watercourses and two lakes (Fig. 1, Table 2). Most records were near small streams and in the upper reaches of rivers. The highest density of records was in the central part of the island: at Pervukhina (4), Luchevoy (14), and Asin (7) streams, on an unnamed tributary of Lesnaya River (10), and on Lake Peschanoye (3); the numbers correspond to Fig. 1 and Table 2. In the southern part of the island, European mink tracks were recorded only twice. The northern part of the island is difficult to access; the survey there is now being conducted. In 2014–2019, traces of the European mink were not found anywhere in the northern part of Kunashir, including the places of release, and the northernmost records during this period were on Vilka River [Seoi-gawa]. However, on 29 February, 2020, fresh tracks of the European mink were found in the upper reaches of Tyatina River and on its unnamed tributary.

In 23 cases, the tracks were recorded on the snow or on sandbanks. Other records: one direct observation of an animal, one trapping by a poacher, and seven records by camera traps (Table 2).

Most often, the tracks were found in February–March. On Kunashir, rivers do not freeze in winter, so one can see short trackways leaving the water and returning to it, or left on rocks and other objects protruding above the water.

Following European mink tracks in the upper reaches of the Lesnaya River on 20 March, 2021 showed that the animal emerged from the water, ran ~3 km over land, moving as far as 500–600 m from the river, and returned to it.

With the camera traps, we managed to get 180 photos and 10 videos of the European mink (Table 3), among which were good photographs of the animal showing the white ring around the lips characteristic of the European mink but not of the American mink (Fig. 2). The only other recorded carnivore was a sable (Fig. 2); camera traps also recorded numerous mice, voles, and rats.

On Pervukhina stream, where a camera was set for 51 days (from 20 December, 2015 to 9 February, 2016), photos of the European mink were taken on 5 and 28 January, 2016.

On the left tributary of Lesnaya River, where cameras were set for 40 days in 2017 (from 15 April to 25 May),

Table 2. Recent (2014–2021) records of European mink (*Mustela lutreola*) on Kunashir [Kunashiri] Island

Location number	Date	Location	Kind of record
1	16 Mar. 2014	upper tributary of Treugolny stream	tracks
2	25 Mar. 2014	upper reaches of Tyurina River	trapped by poacher
3	27 Mar. 2015	NW shore of Peschanoye Lake [Toufutsu-ko]	tracks
4	8 Mar. 2016	Pervukhina stream, 2 km above the mouth	tracks
4	5 and 28 Jan. 2016	same as above	camera trap
5	3 Feb. 2016	NE shore of Peschanoye Lake	tracks
6	13 Feb. 2016	tributary of Bystry stream [Sarukamappu-gawa]	tracks
7	17 Feb. 2016	Asin stream	tracks
8	20 Feb. 2016	Rogachyovka River [Kuraoi-gawa]	tracks
9	20 Apr. 2016	right tributary of Tropinka River	tracks
10	1 Feb. 2017	left tributary of Lesnaya River [Shojin-gawa]	tracks
10	3, 13, 23–25 May 2017	same as above	camera trap
10*	13 and 22 May 2019	same as above	camera trap
11	1 Mar. 2017	left tributary of Pesochny stream	tracks
12	19 Aug. 2017	lakes at Belozyorskaya River [Shiromanbetsu-gawa]	tracks
13	1 Oct. 2017	Ryborazvodny stream	sighting of animal
14	17 Feb. 2018	Luchevoy stream	tracks
15	21 Mar. 2018	Vilka River [Seoi-gawa]	tracks
16	13 Mar. 2019	1st Vodopadny stream, traces	tracks
17	29 Feb. 2020	upper reaches of Tyatina River [Onnebetsu-gawa]	tracks
18	29 Feb. 2020	upper reaches of Tyatina River	tracks
19	29 Feb. 2020	upper reaches of Tyatina River	tracks
20	29 Feb. 2020	upper reaches of Tyatina River	tracks
21	29 Feb. 2020	tributary of Tyatina River	tracks
22	3 Jan. 2021	middle reaches of Treugolny stream	tracks
23	12 March 2021	source of Ilyinsky stream	tracks
24	20 March 2021	upper reaches of Lesnaya River	tracks
25	20 March 2021	upper reaches of an unnamed stream	tracks

Numbers refer to the map (Fig. 1). See Table 3 for details of camera trap recordings. *Not included in the Dataset published in GBIF.

for 12 days in 2019 (from 12 to 23 May), and for 12 days and for 23 days in 2020 (from 8 to 31 December), the European mink was recorded only in 2017 and 2019. 44 photos were taken on 3 May, 2017, ten photos on 13 May, 2017, 120 photos on 23–24 May, and six photos on 25 May. More photos were obtained when fish bait was placed in front of the camera. On 23 May, 21 photos were taken in less than one minute (16:49), and eight minutes later, 57 more photos were taken in four minutes. All that time, the animal was apparently dragging the fish to a secluded place. A different camera set at that location for 12 days (13–23 May) in 2019 recorded six videos on 13 May and four videos on 22 May. The footage shows the animal exploring the bank of the stream and swimming across the stream with a fish in its teeth.

In January all records were made during daytime, while in May the activity was distributed almost evenly (six days with daytime records vs. five days with nighttime records).

Discussion

The collected data confirmed the presence of the European mink on Kunashir, 40 years since its first introduction to the island. No other introduced or reintroduced population of the European mink is known to have survived that long. The second longest survival time (20 years) was recorded on Hiiumaa Island in Estonia, where new animals were released every year for at least 15 years since the first introduction, while only four groups of the European mink were released on Kunashir (in 1981, 1984, and 1985). On both islands, the numbers of animals

Table 3. Photo and video records of European mink (*Mustela lutreola*) obtained by camera traps on Kunashir [Kunashiri] Island

Date	Time	Records	Bait
Pervukhina Stream (location #4, Fig. 1)			
5 Jan. 2016	09:12	2 photos	fish
5 Jan. 2016	12:41	2 photos	fish
5 Jan. 2016	14:33	2 photos	fish
28 Jan. 2016	07:50	3 photos	fish
Left tributary of Lesnaya River (location #10, Fig. 1)			
3 May 2017	00:00	7 photos	fish
3 May 2017	00:06–00:08	31 photo	fish
3 May 2017	03:32	3 photos	fish
3 May 2017	08:12	2 photos	none
3 May 2017	15:03	1 photo	none
13 May 2017	12:01	10 photos	none
23 May 2017	04:43	9 photos	fish
23 May 2017	04:49	21 photos	fish
23 May 2017	16:58–17:02	57 photos	fish
23 May 2017	19:52	3 photos	fish
23 May 2017	20:02	6 photos	fish
24 May 2017	01:05	6 photos	none
24 May 2017	19:53	6 photos	none
24 May 2017	21:53–21:54	9 photos	none
25 May 2017	03:45	3 photos	none
25 May 2017	06:28	3 photos	none
13 May 2019	14:52–15:45	6 videos	fish
22 May 2019	23:52–23:57	4 videos	fish

Numbers correspond to the map (Fig. 1).

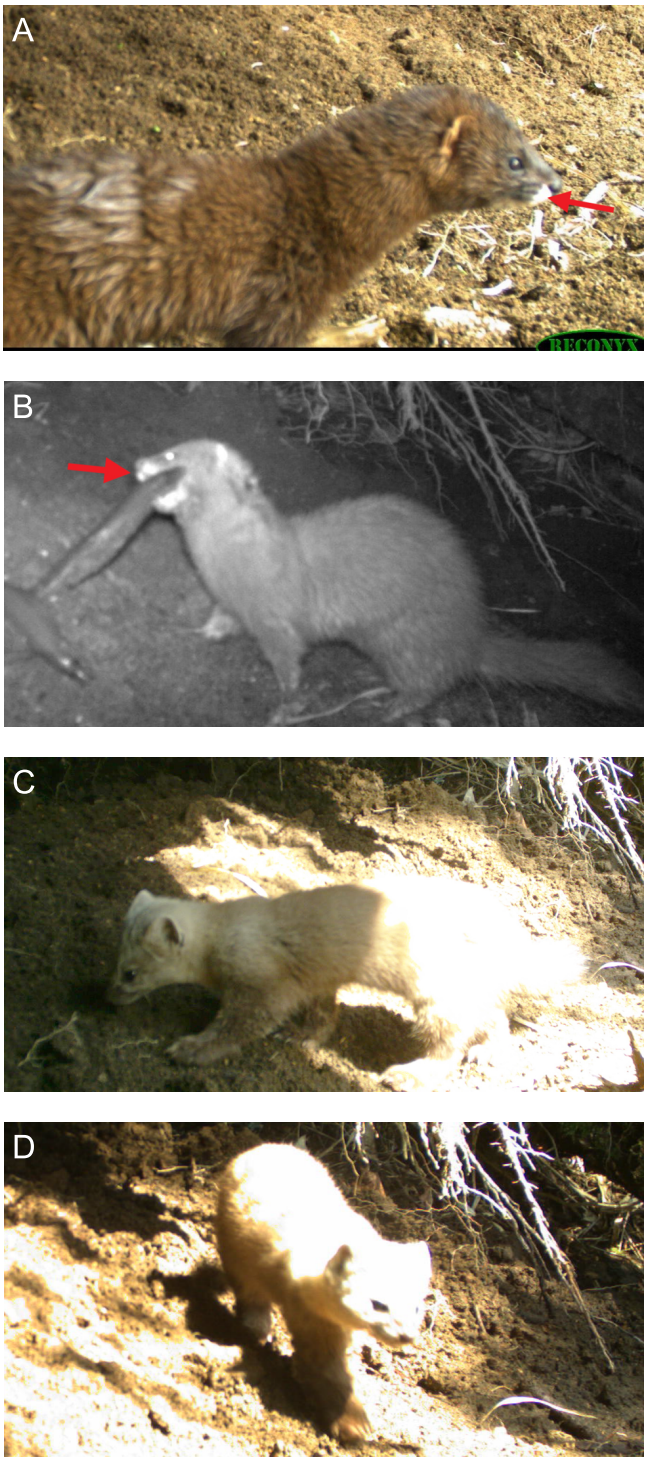

Fig. 2. A, B: European mink (*Mustela lutreola*) photographed by a camera trap on Kunashir [Kunashiri] Island, on a tributary of Lesnaya River [Shojin-gawa] (A: 13 May 2017, 12:01, B: 03 May 2017, 06:54). Arrows point to white markings on the muzzle rather than on the chin and throat, a diagnostic feature for distinguishing European mink from American mink (*Neovison vison*) (Dinets and Rotshild 1998). C, D: sable (*Martes zibellina*), the only other carnivore recorded by camera traps during the study.

appear to have stabilized at low levels, without population explosions observed elsewhere in other introduced semi-aquatic mammals, such as the muskrat (*Ondatra zibethica*) (Chesnokov 1976) or the European beaver (*Castor fiber*) (Petrosyan et al. 2016). The reasons for such difference are not known. The prediction by Voronov (1990) that European mink population on the Kuril Islands could reach 7000 was clearly an overestimate: it would mean a population density of more than one animal per kilometer of streams, which is obviously inconsistent with the small number of records in this study.

The population growth can be limited by the natural history of the European mink (Rozhnov 1993) and by habitat parameters of the Kuril Islands. Among the most likely factors limiting European mink numbers on Kunashir are late-spring and summer floods, possibly

lethal to the young in nests. In early July 1987, the Filatova River rose by more than 50 cm following heavy rain, and the current carried away a mink cub which has the size of a rat (A. Kisleyko personal observation). That time the cub was rescued by the observer. Litter mortality due to flooding events in late spring and early summer has been reported in Spain (Palomares et al. 2017). In most parts of the native range of the European mink, flooding normally occurs in early spring, before the pupping season (Ternovskiy and Ternovskaya 1994).

River estuaries in the northern part of Kunashir, such as Saratovskaya and Tyatina, have wide floodplains that are often flooded. This might explain why European mink released into such rivers moved to other parts of the island, and are now found mostly along small rivers and streams. Shvarts and Vaisfeld (1993, 1995) surveyed the northern part of the island for the European mink, but recorded very few signs of its presence.

Japanese weasels (*M. itatsi*) and small Indian mongooses (*Urva auropunctata*), carnivores similar to the European mink in size, have caused catastrophic declines of numerous native prey species on many islands where they had been introduced (Ohdachi et al. 2015). However, there is no reported evidence of negative effect of the European mink on the native fauna of the Kurils, probably because its population remains low.

Determining the optimal time of year for European mink censuses is not a simple problem (Ternovskiy and Ternovskaya 1994). European mink presence is very difficult to detect during snow-free season. Tracks are easier to detect during the mating season, when the animals move a lot along and between rivers and streams. European mink on Kunashir appear to mate from the end of March until the end of April (A. Kisleyko unpublished data). At that time, nightly refreezing of the melting snow turns it into firn covered by ice crust, making tracks invisible except during thaws or shortly after snowfalls, which do not happen often. Further research is required to estimate the current number of European minks on the island.

The long survival, lack of competition with the American mink, and the protection provided by Kurilsky Reserve suggest that the European mink population on Kunashir might remain stable. However, its future survival there is far from guaranteed. It can be threatened by poaching (see above), overfishing of salmonids (Dronova and Spiridonov 2008), development such as gold mining and road construction in river valleys (Pushkov 2012), and/or climate change. An invasion of Kunashir by the American mink from Hokkaido is also possible, as demonstrated by the fact that sika deer (*Cervus nippon*) have reached Kunashir from Hokkaido multiple times in recent years, likely by swimming or walking on sea ice, and appear to have become established (Kozlovskiy et al. 2020). European mink monitoring on the Kuril Islands (including Iturup) should be expanded, ideally as a dedicated program. Overall protection of the fragile, unique, and spectacular ecosystems of the Kuril Islands is of utmost importance.

Acknowledgments: The authors thank the employees of State Nature Reserve “Kurilsky” (Russia) Sokov D. V., Sundukov Y. N., and Tikhonov A. N. for conducting tracking surveys; local resident Teplov V. I. for reporting a mink sighting; and Shkurov V. V. for allowing us to quote his unpublished data on European mink occurrence on Iturup. The study was supported by the Russian Science Foundation, Project # 21-14-00123.

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Received 21 September 2021. Accepted 10 January 2022.
Published online 20 April 2022.
Editor was Yuya Watari.