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Mustela lutreola.

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Mustela lutreola (Linnaeus, 1761)

European Mink

Viverra lutreola Linnaeus, 1761:5. Type locality restricted to southwest Finland by Matschie, 1912:347.

Mustela lutreola Linnaeus, 1766:66. First use of current name combination.

Lutra minor Erxleben, 1777:451, a renaming of *lutreola* Linnaeus.

Lutreola europeae von Homeyer, 1879:184, substitute name for *lutreola* Linnaeus.

CONTEXT AND CONTENT. Order Carnivora, Family Mustelidae, Genus *Mustela*, Subgenus *Lutreola*. The genus *Mustela* includes 16 extant species (Honacki et al., 1982). Heptner (1967) recognized five subspecies of *Mustela lutreola*, but these were not accepted by Ognev (1931) or Youngman (1982).

DIAGNOSIS. *Mustela lutreola* often is confused with the forest polecat (*Mustela putorius*) and American mink (*Mustela vison*). In *M. lutreola*, guard hairs and underfur are brown while in *M. putorius* the guard hairs are blackish and the underfur is light grey to light buff. In *M. lutreola*, the depth of the rostrum at the anterior edge of the fourth upper premolar is barely equal to the distance from the fourth upper premolar to the anterior margin of the premaxillary, instead of considerably greater as in *M. putorius* In *M. lutreola*, the breadth across the postorbital processes is about the same as the greatest width of the occipital condyles, while in *M. putorius* the breadth across the postorbital processes is considerably larger than the width of the occipital condyles. In *M. lutreola*, the postpalatal length is much larger than the mastoidal breadth, while in *M. putorius* it is approximately the same. In *M. lutreola*, the angle between the lingual and buccal arms of the fourth upper premolar is approximately 90°, while in *M. putorius* the angle is greater causing the junction to be broadly U-shaped. *M. lutreola* differs from *M. vison* in having both upper and lower lips white, whereas *M. vison* usually has only the lower lip white. The bullae of *M. lutreola* are narrow and almond-shaped, and anteriorly overhang the surrounding bone, whereas the bullae of *M. vison* are broad and triangular in palatal view. Their anterior margins are straight and do not overhang the surrounding bone. The second upper premolar is single-rooted in *M. lutreola*, but usually double-rooted in *M. vison*. In *M. lutreola* the lingual arm of the fourth upper premolar is about equal in length to the buccal arm, while in *M. vison* the lingual arm is the longer (Youngman, 1982).

GENERAL CHARACTERS. A medium-sized mustelid with a long body, short legs, and a relatively short tail. Feet with interdigital membranes as in other members of the genus. Hair covering of body and tail relatively uniform in length. Soles of feet sparsely haired. The coloration of the European mink is a dark reddish-brown with a white margin around the mouth. Occasionally there are white throat, paw, and chest markings. Winter pelage is longer and denser than that of summer (Heptner, 1967; Novikov, 1939).

Averages and standard deviations of external measurements (in mm) and mass of seven males from France are: total length, 377.8 ± 14.39; length of tail, 163.5 ± 12.82; mass, 870.7 ± 152.68 g (range, 650–1,005 g). Measurements (in mm) of two females from France are: total length, 315, 310; length of tail, 120, 120; mass, 580 g, 505 g. Averages and standard deviations of cranial measurements (in mm) of 11 males and seven females, respectively, are condylobasal length, 63.53 ± 1.97 and 58.17 ± 1.93; palatal length, 28.54 ± 1.11 and 25.83 ± 0.97; zygomatic breadth, 36.13 ± 1.64 and 32.20 ± 0.78; mastoidal breadth, 30.90 ± 0.97 and 28.51 ± 0.57.

The skull (Fig. 1) is narrow and dorsoventrally flattened. The dorsal outline is only slightly curved. The distance from the palation to the condylion is considerably greater than the mastoidal breadth (Youngman, 1982).

DISTRIBUTION. The historic distribution of the European mink (Fig. 2) was from the Basque region of northern Spain in the west, to the Ob River basin in the east (Ternovskii, 1977), and from near Archangel in the north to the Caucasus in the south (Youngman, 1982). Novikov (1939) reported an extensive range extension (900 km) of *M. lutreola* through the Urals from 1871 to 1932. Youngman (1982) proposed that *M. lutreola* first migrated to France in the early 19th century, reaching Bordeaux by 1942 and Dax by 1950, and that recent (1950–1960) reports of the European mink in Spain were a continuation of this range expansion. The present distribution of the species is much reduced, poorly known, and diminishing (Tumanov and Zverev, 1986; Youngman, 1982).

FOSSIL RECORD. The ancestry of *M. lutreola* is unknown. A specimen from 4,100 to 4,300 years old is known from Vlaardingen, Netherlands (van Bree, 1961; Youngman, 1982) and there is a specimen of unknown geological age from the Moscow District, USSR. Other finds attributed to *M. lutreola* have been reidentified as *M. putorius* (Youngman, 1982).

FORM AND FUNCTION. The minks (*M. lutreola* and *M. vison*) occupy an intermediate position in body shape between the otter (*Lutra lutra*) and the terrestrial mustelids. However, various authorities have observed that the European mink is not as efficient in the water as the American mink (Ternovskii, 1977).

As young European mink develop from 5 to 25 days, their rectal temperatures rise from 32.5 to 35.3°C with a pulse of 210–300 beats/min. Adults have a body temperature from 36.2 to 38.4°C with a pulse of 210–300 beats/min. Between 1 month and 1 year of age the respiration rate decreases from 90–120 to 40–65 breaths/min (Danilov and Tumanov, 1976).

In the Karelian Autonomous Soviet Socialist Republic (Karalian ASSR) the molt from juvenile to adult pelage takes place in June. The autumn molt begins in the second half of August and ends in November. The spring molt begins at the end of March and ends in May (Danilov and Tumanov, 1976).

ONTOGENY AND REPRODUCTION. At birth, males average 73.9 mm in total length and 8.4 g and females 71.9 mm and 7.6 g. The external auditory meati open from 23 to 27 days and eyes open from 30 to 36 days. Teeth appear earlier (15–17 days) than in the American mink (18–21 days), with complete replacement at approximately the same age (60–67 and 62–72 days, respectively). The tracking, capturing, and eating of prey begins at 52–62 days. The breakup of the litter is from 2.5 to 4 months (Ternovskii, 1977). Females become sexually mature from 9 to 10 months and are polyestrous (Danilov and Tumanov, 1975). Active differentiation of spermatids into mature sperm occurs in February and April in the northwestern USSR (Danilov and Tumanov, 1972).

Estrus begins between 20 March and 1 June. In mink collected in Karelia, but raised in pens in Astrakhan, proestrous began at the end of March or in the first half of April and usually did not last >6 days. Estrus began in most animals in the second half of April, the earliest onset being 20 March and the latest termination being 30 June. Most effective matings occurred during the last 10 days of April. Estrus usually lasted 3–6 days. The first estrus was the longest. The duration of metestrus varied from 1 to 32 days (average, 10 days). In four instances the duration of diestrus was 3, 6, 18, and 41 days (Moshonkin, 1983).

At mating time, the pudendum of the European mink enlarges considerably and becomes pinkish-lilac in color (in contrast with that of the American mink, which does not change; Moshonkin, 1983;

FIG. 1. Dorsal, ventral, and lateral views of the cranium and lateral view of the mandible of adult male *Mustela lutreola* (National Museums of Canada 7534). Condylobasal length is 63.9 mm.

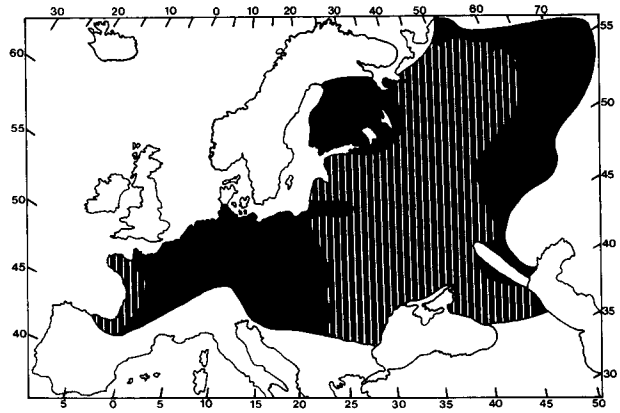

FIG. 2. Estimates of the historic (black) and current (white lines) distribution of *Mustela lutreola*.

Ternovskii, 1977). Coitus lasts from 40 min to 3 h (Ternovskii, 1977).

Gestation is from 40 to 43 days. From two to seven young are born. The sex ratio of 17 litters at birth was 32 males to 28 females (Ternovskii, 1977).

ECOLOGY. The European mink primarily occurs along small forest streams that are not likely to completely freeze during winter. European mink occur infrequently on large rivers; they select the months of small tributaries. They are rarely found on lake shores (Danilov and Tumanov, 1976; Heptner, 1967; Novikov, 1939, 1970).

In the southwestern part of the Leningrad Region of the USSR, the density in some places reaches 2–3 animals/10 km of shoreline. The overall population of the Karalian ASSR was estimated at 4,200–6,800. In the Pskov Region, the density reached 7–12 animals/10 km of shoreline or 7,500–9,300 individuals (Danilov and Tumanov, 1976). The total population of the European mink in the USSR is between 40,000 and 45,000 (Tumanov and Zverev, 1986). The age composition of a sample from the Leningrad Region (n = 35) was 36.6% <1 year, 30.8% yearlings and 2-year-olds, 17.2% 3-year-olds, and 15.4% >3 years (Danilov and Tumanov, 1976).

Both males and females occupy territories. In the Karalian ASSR those of males average 32 ha, while those of females average 26 ha. Of eight territories, the largest comprised 3 km of riverbank and the smallest 1 km (average, 2.4 km; Danilov and Tumanov, 1976).

Nests and shelters, well protected from the weather and predators, are located under the roots of trees and stumps, in rock piles, under collapsed buildings, along stream banks, in deadfalls, in hollows of fallen trees, and in muskrat (*Ondatra zibethicus*) houses and burrows (Danilov and Tumanov, 1976; Novikov, 1939). Each animal has on its own territory one to three burrows that it visits regularly for rest during the day. The hemispherical chamber is lined with dry grass, leaves, feathers, or rodent fur. The internal diameter is 20–35 cm and the wall is 7–10 cm thick (Danilov and Tumanov, 1976).

Mustela lutreola ingests a broad range of food, mostly aquatic. In the northwestern USSR (Karalia, Leningrad, and Pskov regions), examination of stomachs and scats showed the following food items in snowy and snowless periods, respectively (percent occurrence): mammals (muskrats, voles, shrews, moles) 33, 18; birds, 4.8, 20.3; frogs, 25.4, 72.9; fishes, 6.7, 26.4; insects 14.1, 61.3; vegetation, 1.9, 6.4 (Danilov and Tumanov, 1976). Individuals hoard small amounts of food (Danilov and Tumanov, 1976; Novikov, 1939). The dens of three females with young contained respectively: 23 frogs, 8 frogs, and 2 burbots (*Lota lota*); and 12 frogs and a mallard duckling (*Anas platyrhynchos*; Danilov and Tumanov, 1976).

Chief predators of the European mink may be man, the forest polecat (*M. putorius*), American mink (*M. vison*), golden eagle (*Aquila chrysaetos*), and large owls (Novikov, 1939). Heptner (1967), without specific identification, recorded 14 trematodes, 2 cestodes, and 11 nematodes from *M. lutreola*. The frontal sinuses often are infested with the nematode *Skrjabingylus* sp. (Hansson, 1970). In the Leningrad and Pskov regions, USSR, a study of 33 European mink showed that 77.1% were infested with *Skrjabingylus* sp. and filaria (Danilov and Tumanov, 1976). Didier and Rode (1935) reported the ticks *Ixodes hexagonus* and *I. cookei*.

The European mink has long been trapped and hunted for its valuable pelt (Etoc, 1910; Shaw, 1800). Gesner (1620) reported that thousands of furs were sold in Frankfurt, Germany. Heer (1965) reported a usual harvest of 2,000 mink in Romania. During the 1942–1943 season, the take rose to 10,000 skins. Novikov (1939) reported that an average of 49,850 pelts were taken yearly from 1922 to 1924 in the USSR.

In the USSR, *M. lutreola* formerly was captured primarily with dogs and traps. In autumn or early winter, one or two persons, accompanied by one or more dogs, clubbed, netted, or speared minks flushed from hiding places along stream banks. In winter, deadfalls, snares, and live traps were set for mink (Novikov, 1939).

European mink became extinct in middle Germany by the end of the 18th century, but survived in Hartz and Holstein in the middle of the 19th century. It was rare in Hannover, Mecklenburg, Pomerania, and Brandenburg by the late 19th century. There are no 20th century records from Germany. In Poland, the last specimen was collected in 1915. In Hungary a specimen was collected in 1952. Romania still has a viable population in the Danube Delta. In Finland, mink numbers decreased in the 1930s, becoming nearly

extinct by 1946 (Youngman, 1982). In the USSR, the European mink population is steadily decreasing in distribution and numbers. Neither the forest polecat nor the American mink are implicated in these reductions (Tumanov and Zverev, 1986). *M. lutreola* is rare in France. It disappeared from the Massif Central in the 19th century and from the Paris Basin early in the 20th century. During the past 10 years, most records have come from Loire Atlantique, Vendée, and Charante Maritime. American mink are spreading to localities formerly occupied by the European mink (Youngman, 1982).

The reasons for the disappearance of the European mink over much of its former range are not clear. Decreased populations, perhaps caused initially by natural climatic change, such as the Little Ice Age, have been aggravated by the clearing of forests, draining of swamps, and pollution of waterways. There is no evidence that the American mink has caused the disappearance of the European mink since reductions in numbers of the latter generally were not synchronous with the introductions and escapes of the American mink (Tumanov and Zverev, 1986; Youngman, 1982).

BEHAVIOR. Soon after the eyes of captive neonates open they closely follow moving objects such as their parents, wheeled toys, balls, and humans. By 53–54 days this "following reflex" becomes weak (Ternovskii, 1977).

The principal periods of activity are at dusk (1600–2200 h) and before daybreak (0500–1000 h). *M. lutreola* is more sedentary than *M. vison*. In extremely cold weather, European mink do not leave their shelters. When swimming, they paddle with front and hind limbs simultaneously (Danilov and Tumanov, 1976).

GENETICS. The karyotype contains a diploid number of 58 chromosomes, and it is identical in morphology, size, G-band pattern, and number to that of *M. sibirica* (Graphodatskii et al., 1976). Occasionally *M. luteola* and *M. putorius* hybridize, but there is no evidence of introgression (Youngman, 1982). When *M. lutreola* mates with *M. vison* or *M. sibirica*, the embryos are resorbed (Ternovskii, 1977).

REMARKS. The taxonomic relationship of *M. lutreola* to *M. vison*, *M. putorius*, and *M. sibirica* has been controversial (Heptner, 1967; Novikov, 1939; Ognev, 1931; Zimmermann, 1955). Youngman (1982) studied 15 species of *Mustela* using linear discriminant analysis of tooth and cranial measurements. He recognized five subgenera: assigning *M. lutreola* to *Lutreola* along with *M. sibirica*, *M. nudipes*, and perhaps *M. strigidorsa*; and assigned *M. vison* to *Vison*. The placement of *M. lutreola* and *M. vison* in different subgenera is supported by the immunological studies of Belyaev et al. (1984) and the karyological studies of Graphodatskii et al. (1976).

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