GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Ondatra zibethicus***

Ondatra zibethicus **System:** Freshwater_terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Rodentia	Cricetidae

Common name

Synonym

Similar species

Summary

Muskrats are territorial rodents native to North America. Their range extends from Northern Canada to Northern Mexico, but they have been introduced to Argentina and multiple European countries. Secondary spread has led to an invasive range throughout Europe and as far as China and Japan. Similar to beavers, they are considered ecosystem engineers, and they can have severe impacts on infrastructure and habitats through grazing, burrowing and mound building. The most common method of control is continuous trapping to maintain populations low.

view this species on IUCN Red List

Species Description

Rodent roughly 50cm long, weighing 700 to over 1800g. Dense, generally brown fur, with a lighter ventral side. Fur can vary from white and silver through to brown. Large, blunt head with relatively small eyes. Short, rounded ears that are largely hidden by its fur. Black, scaly tail with a fringe of hair on the ventral keel. The tail is about as long as the head and body. Adaptations for aquatic lifestyle include broad, partially webbed hind feet, but with small forefeet, laterally flattened tail, and lips that close behind the incisors to allow gnawing underwater. They can stay submerged underwater for up to 20 minutes. (Willner et al., 1980) They are crepuscular, spending the day floating or in their burrows (Reinhardt et al., 2003). Their droppings are elongated measuring 10-12mm in length, brown or black, and are usually deposited in a pile (Triplet, 2009). Anterior margin of the cranium abruptly constricted, interorbital region with a median ridge. Palatal bridges absent, with a spine in the posterior margin of the palate. Incisors are rootless and without grooves. The upper incisors protrude slightly beyond the nasals. Long and narrow incisive foramina. First lower molar has six triangles, the first of which is not closed, and the anterior loop is bilobed. The third lower molar has three outer salient angles. The dental formula is: i 1/1, c 0/0, p 0/0, m 3/3, total 16. Both sexes have paired musk glands at the ventral base of the tail (Willner et al., 1980).

Notes
Primarily predated upon by Mink (Mustela vison). Racoons (Procyon lotor), Red Foxes (Vulpes vulpes), Polecats (Putorius putorius), Stoats (Mustela erminea), Wild dogs (Canis lupus familiaris), Wolves (Canis lupus) (Gable et al., 2018), Bald eagles (Haliaeetus leucocephalus), Great horned owls (Bubo virginianus), Ferruginous hawks (Buteo regalis), and other hawks can also prey on Muskrats. Mainly parasitized by mites and ticks, although sever infestations appear to be non-lethal (Willner et al., 1980). Also parasitized by 66 species of helminths, including Plagiorchis eutamiatis zibethica, Notocotylus quinqueserialis and Echinostoma armigerum. These represent potential introductions as the Muskrat spreads, such as the Laelaps multispinosus tick introduced to Lithuania from North America (Skyriene & Paulauskas, 2012). Frequent bycatch of brown rats in Dutch Muskrat trapping schemes has also presented a minor human health risk because of their potential to transmit Seoul orthohantavirus and Leptospira spp. (Friesema et al., 2018). Competitors include Nutria (Myocastor coypus), Norway rats (Rattus norvegicus), and Water voles (Arvicola terrestris) (Willner et al., 1980). The following are subspecies of Ondatra zibethicus: - Ondatra zibethicus albus - Ondatra zibethicus bernardi - Ondatra zibethicus cinnamominus - Ondatra zibethicus floridanus - Ondatra zibethicus macrodon - Ondatra zibethicus mergens - Ondatra zibethicus occipitalis - Ondatra zibethicus pallidus - Ondatra zibethicus spatulatus - Ondatra zibethicus zalophus (“Ondatra zibethicus in”, 2017).

Lifecycle Stages
Neonates are blind and hairless but can survive very low temperatures. Young become active within 14 days and are weaned after four weeks. Reproductive activity begins the spring after birth. Longevity is three to four years. (Willner et al., 1980)

Uses
Trapped for fur, although the interest has drastically decreased due to a reduction in the market for fur trading (Gorshkow, 2006). They have been proposed as indicators of pollution in aquatic environments due to the accumulation of heavy metals in their tissues (Willner et al., 1980). Trapped for fur, although the interest has drastically decreased due to a reduction in the market for fur trading (Gorshkow, 2006). They have been proposed as indicators of pollution in aquatic environments due to the accumulation of heavy metals in their tissues (Willner et al., 1980).

Habitat Description
Sub-tropical rivers, costal marshes, arctic tundra, deltas, brackish and fresh-water lakes and ponds (“Best Practice Guidleines”, 2013). They dig burrows into banks or make houses out of vegetation, such that they are above water level and can only be accesses through underwater tunnels. They build separate structures for nesting and feeding (Willner et al., 1980). The mounds are made in late summer and early autumn, and typically require rebuilding annually (Kadlec et al., 2007). While their home ranges are small, they can travel up to 160km/day by rafting and disperse with a rate of 0.9 to 25.4km/year (Bos, 2017; Reinhardt et al., 2003).

Reproduction
Breeding in Southern ranges occurs throughout the year, while northern ranges show reproductive activities during spring and summer. Musk glands are used at this time to deposit scent around defecation sites, houses, burrows and trails. The gestation period varies between 25 and 30 days, and litter size varies from four to eight pups (Willner et al., 1980). They can produce two to six litters per year, depending on latitude and habitat quality. Females exhibit parental care until weaning, after which males provide food and territory defense for the young (Prendergast & Jensen, 2012).

Nutrition
Primarily herbivorous, feeding on aquatic vegetation, with roots as the most important part of the diet. This includes cattail (Typha spp.), bulrush (Scirpus spp.), sedge (Carex spp.), arrowhead (Sagittaria spp.), water lily (Nymphaea spp.), sweet flag (Acorus calamus), and pondweed (Potamageton spp.) (Kadlec et al., 2007). They can also feed on crayfish, mussels, turtles, mice, birds, frogs and fish if food is scarce (Willner et al., 1980).

General Impacts
Listed as fourth worst alien species in Europe in a literature review by Nentwig et al., 2018, they can severely impact habitats by damaging river banks through burrowing and reducing aquatic vegetation through overconsumption and the construction of mounds, which can interfere with hydraulic systems and lead to road damage (Cassola, 2016). In it's native range, the Muskrat has become a big issue. Burrowing into banks and travel trails can cause hydraulic short-circuiting and collapse roads. Overuse of the vegetation for feeding and building mounds can lead to groundwater contamination, habitat degradation, reduction in primary productivity and the attracitno of waterfowl that can further impact ecosystems. Their burrowing can also aerate the soil and result in an increase in nitrogen mineralization, which puts nearby aquatic systems at a risk of eutrophication. Lastly, its overlap with beaver niches promotes competitive interaction in which muskrats exploit beavers' lodges. These changes are not only impactful to habitats and ecosystem services, but they are also deleterious for the aesthetic maintenance of areas, as residents show concerns about the changes seen as a result of muskrat activity. (Connors et al., 2000; Kadlec et al. 2007; Mott et al., 2013; Willner et al., 1980) Muskrats have been linked to human leptospirosis outbreaks, as they can be carriers of disease (Hurd et al., 2017). Some other carried species such as the dog tapeworm (Taenia hydatigena), cat tapeworm (Taenia taeniaformis) and dwarf tapeworm (Echinococcus multilocuralis) can infect humans. Cryptosporidium can also be transmitted to domestic animals and humans through infected water (Skyriene & Paulauskas, 2012).

Management Info
Because of their impact they are often treated as pests both in their native and invasive ranges. Trapping, hunting and poisoning are commonly used to control populations (Cassola, 2016). Early detection methods recommended include visual inspection for signs of presence, using bait or traps to enhance chances of detection. Trapping has been used for successful eradication before the species is established in areas up to 2800km2 in the UK and Ireland. The main method of control for established populations is long term trapping programs. Fortifying flood walls and banks can reduce damage and risks to public safety where they are established (Bos, 2017). For an extensive list on prevention, control and eradication techniques and advice see Kadlec et al., 2007 and Bos, 2017.

Pathway

Principal source: Bos, D. 2017. Information on measures and related costs in relation to species included on the Union list: Ondatra zibethicus. Technical note prepared by IUCN for the European Commission. Kadlec, R. H., Pries, J., & Mustard, H. (2007). Muskrats (Ondatra zibethicus) in treatment wetlands. Ecological Engineering, 29(2), 143-153. Reinhardt, F., Herle, M., Bastiansen, F., & Streit, B. (2003). Economic impact of the spread of alien species in Germany. Berlin, Germany: Federal Environmental Agency (Umweltbundesamt). Skyrienė, G., & Paulauskas, A. (2012). Distribution of invasive muskrats (Ondatra zibethicus) and impact on ecosystem. Ekologija, 58(3). Willner, G. R., Feldhamer, G. A., Zueker, E. E., & Chapman, J. A. (1980). Ondatra zibethicus. Mammalian species, (141), 1-8.

Compiler:

Review:

Pubblication date:

ALIEN RANGE

[1] ALBANIA
[1] AUSTRIA
[1] BELGIUM
[1] BULGARIA
[1] CHINA
[1] ARGENTINA
[1] BELARUS
[1] BRITISH ISLES
[1] CHILE
[1] CZECH REPUBLIC

[1] DENMARK
[1] EUROPEAN UNION (EU)
[1] FRANCE
[1] GIBRALTAR
[1] IRELAND
[1] JAPAN
[1] KOREA, REPUBLIC OF
[1] LATVIA
[1] MOLDOVA, REPUBLIC OF
[1] NETHERLANDS
[1] POLAND
[1] RUSSIAN FEDERATION
[1] SLOVENIA
[1] SWITZERLAND
[1] ESTONIA
[1] FINLAND
[1] GERMANY
[1] HUNGARY
[1] ITALY
[1] KAZAKHSTAN
[1] KYRGYZSTAN
[1] LITHUANIA
[1] MONGOLIA
[1] NORWAY
[1] ROMANIA
[1] SLOVAKIA
[1] SWEDEN
[1] UKRAINE

Red List assessed species 4: CR = 1; VU = 2; LC = 1;

Arvicola amphibius **LC**
Desmana moschata **VU**
Arvicola sapidus **VU**
Pacifastacus fortis **CR**

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