

Rattus norvegicus



Taxon	Family / Order / Class / Phylum
<i>Rattus norvegicus</i> (Berkenhout, 1769)	Muridae / Rodentia / Mammalia / Vertebrata

COMMON NAMES (English only)

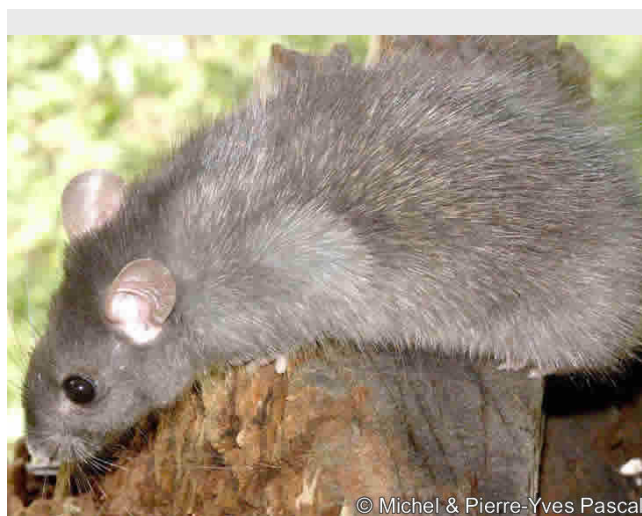
Norway rat
Brown rat

SYNONYMS

Mus norvegicus Berkenhout, 1769
Mus decumanus Pallas, 1778
Mus hibernicus Thompson, 1837
Epimys norvegicus Miller, 1912

SHORT DESCRIPTION

The Norway rat is an omnivorous and opportunistic terrestrial rodent. Mostly grey or brown, adults may weigh more than 500 g (230-550) with a body length of 190-265 mm and a tail length of 160-205 mm. Its albino form is used in laboratories and bred as a pet.



© Michel & Pierre-Yves Pascal

***Rattus norvegicus* is an omnivorous and opportunistic terrestrial rodent.**

Photo: Michel & Pierre-Yves Pascal

BIOLOGY/ECOLOGY

Dispersal mechanisms

When introduced, natural spread is terrestrial, following paths and roads, rivers, lake banks and the seashore.

Reproduction

In Europe reproduction in natural habitats takes place during spring, summer and autumn, but it is observed all year round in human dwellings. Sexual maturity occurs when the animal is 50-60 days old. The average number of embryos per litter is 7 to 8; pregnancy lasts 21 days and breeding lasts 22 days. Post-partum fertilisation is frequent.

Known predators

In Europe major predators are carnivorous mammals, - i.e. fox (*Vulpes vulpes*), wild and feral cat (*Felis sivestris*), western polecat (*Mustela putorius*), and birds of prey such as the barn owl (*Tyto alba*).

Resistant stages (seeds, spores etc.)

None

HABITAT

Native (EUNIS code)

I: Regularly or recently cultivated agricultural, horticultural and domestic habitats, J: Constructed, industrial and other artificial habitats, B: Coastal habitats, C: Inland surface water habitats, D: Mire, bog and fen habitats, E: Grassland and tall forb habitats, F: Heathland, scrub and tundra habitats, G: Woodland and forest habitats and other wooded land, H: Inland unvegetated or sparsely vegetated habitats.

Habitat occupied in invaded range (EUNIS code)

J: Constructed, industrial and other artificial habitats, I: Regularly or recently cultivated agricultural, horticultural and domestic habitats, D: Mire, bog and fen habitats.

Habitat requirements

Where introduced, the Norway rat occupies many types of habitats except high mountains, but seems to need some fresh water. Nevertheless, some populations persist in islands totally deprived of fresh water.

DISTRIBUTION

Native Range

The Norway rat is likely to be native to the South East of Siberia, North of China and Hondo region (Japan).

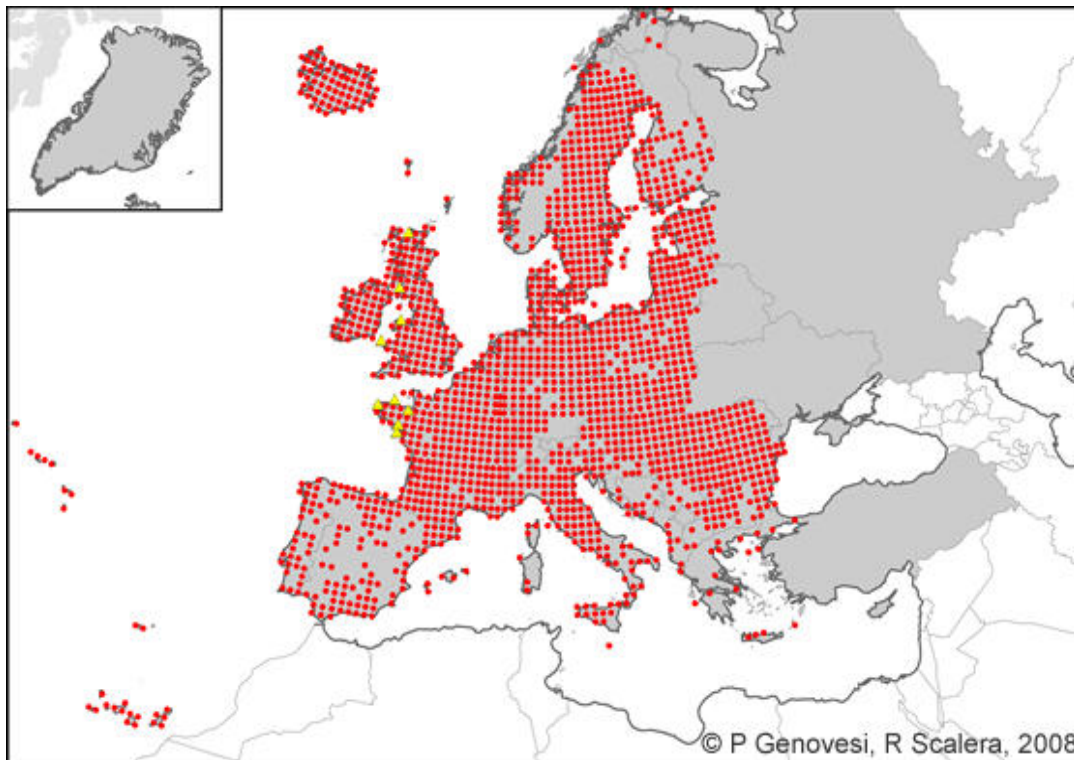
Known Introduced Range

During the beginning of the XVIII century, this synanthropic species was simultaneously introduced by humans in all the continents except Antarctica and since then, the species has been introduced in a large number of islands all around the globe by maritime traffic.







Trend

It is increasing its distribution area by non-deliberate introductions in islands.

MAP (European distribution)



Legend

	Known in country		Known in CGRS square		Known in sea
	Eradicated		Eradicated		Extinct

INTRODUCTION PATHWAY

Mainly maritime and terrestrial traffic (i.e. by stowing away on vessels and trucks).

IMPACT

Ecosystem Impact

When present on islands, it induces declines in small mammal populations (shrews - i.e. *Crocidura suaveolens* & *C. russula*), marine and land bird populations (i.e. *Anthus petrosus*, *Troglodytes troglodytes*, *Prunella modularis*) and reptiles (i.e. *Anguis fragilis*). It has contributed to the disappearance of several insular marine bird populations (i.e. *Hydrobates pelagicus*).

Human Health and Social Impact

Norway rat serves as a reservoir and vector of *Leptospira interrogans* and as a reservoir of the Hepatitis E virus.

Economic Impact

The cost of Norway rat population control in towns and warehouses is very high.

MANAGEMENT

Prevention

Since it is difficult to eradicate rats, it is better to prevent their colonisation, particularly on islands, where the presence of rats can be detected successfully using different trapping methods and several activity signs.

Mechanical

Rats can be captured effectively through live-traps and snap-traps.

Chemical

In Europe, Norway rat populations in human dwellings, towns and warehouses are controlled with toxic baits. Recent attempts to eradicate several European insular populations using successively trapping and toxic baiting were successful and consequences of these operations on native species were positive.

Over the last fifteen years, eradication of rats (*R. rattus*, *R. norvegicus* and *R. exulans*) have been carried out successfully using chemical poisons on increasingly larger offshore islands, i.e. Langara Island (British Columbia, Canada, 3100 ha), Raoul Island (2938 ha) and Little Barrier Island (3083 ha) (New Zealand). Rats, as with many rodents, are susceptible to anticoagulant poisons such as chlorofacinone, bromadiolone, difethialone and brodifacoum (although the latter can acquire persistent residues in non-target wildlife). Diphacinone, coumatetralyl and warfarin should also be evaluated in field studies as alternative rodenticides.

Biological

Contraceptive methods of control are currently experimental, but if the potential for effective control using such methods is promising, these methods must solve potential collateral effects. National Wildlife Research Center (USA) scientists are working on several possible formulations that may make effective oral immunisation possible.

REFERENCES

- Atkinson, I. A. E. 1985. The spread of commensal species of *Rattus* to oceanic islands and their effects on island avifaunas. In: Moors PJ (ed) Conservation of island birds: case studies for the management of threatened island species. International Council for Bird Preservation No. 3, Cambridge. pp 35-81
- Lorvelec O, Pascal M (2005) French attempts to eradicate non-indigenous mammals and their consequences for native biota. *Biological Invasions* 7:135-140
- Pascal M, Siorat F, Lorvelec O, Yésou P, Simberloff D (2005) A pleasing Norway rat eradication consequence: two shrew species recover. *Diversity and Distribution* 11:193-198

OTHER REFERENCES

- Abdelkrim J, Pascal M, Calmet C, Samadi S (2005) Importance of Assessing Population Genetic Structure before Eradication of Invasive Species: Examples from insular Norway Rat Populations. *Conservation Biology* 19(5):1509-1518
- Amengual JF, Aguilar JS (1998) The impact of the Black rat *Rattus rattus* on the reproduction of Cory's shearwater *Calonectris diomedea* in the Cabrera national park, Balearic Islands, Spain. In *Écologie des oiseaux marins et gestion intégrée du littoral en Méditerranée*. 4^{ème} Symposium méditerranéen des oiseaux marins, Hammamet, 11-16 avril 1995, Arcs Editions, Tunis. pp 94-121
- Atkinson IAE, Atkinson TJ (2000) Land vertebrates as invasive species on islands served by the South Pacific Regional Environment Programme. In: *Invasive Species in the Pacific: A Technical Review and Draft Regional Strategy*. South Pacific Regional Environment Programme, Samoa: 19-84
- Atkinson IAE (2001) Introduced mammals and models for restoration. *Biological Conservation* 99:81-96
- Bell BD (1978) The Big South Cape Islands rat irruption In: Dingwall PR, Atkinson IAE, Hay C (eds) *The ecology and control of rodents in New Zealand nature reserves*. Department of Land and Survey, Wellington. pp.33-45
- Bell BD (2002) The eradication of alien mammals from five offshore islands, Mauritius, Indian Ocean. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 40-45
- Bertram DF, Nagorsen DW (1995) Introduced rats on Queen Charlotte Island: Implications for seabird conservation. *Canadian Field-Naturalist* 109: 6-10
- Bertram DF (1995) The role of introduced rats and commercial fishing in the decline of Ancient Murrelets on Langara Island, British Columbia. *Conservation Biology* 9:865 - 872
- Bishop JA, Hartley DJ, Partridge GG (1977) The population dynamics of genetically determined resistance to warfarine in *Rattus norvegicus* from MidWalles. *Heredity* 39:389-398
- Calmet C, Pascal M, Samadi S (2001) Is it worth eradicating the invasive pest *Rattus norvegicus* from Molène archipelago? Genetic structure measures as a decision-making tool. *Biodiversity and Conservation* 10(6):911-928
- Chapuis J-L, Barnaud G, Bioret F, Lebouvier M, Pascal M (1995) L'éradication des espèces introduites, un préalable à la restauration des milieux insulaires. Cas des îles françaises. *Natures Sciences et Sociétés*, Hors série 3, 51-65
- Courchamp F, Chapuis J-L, Pascal M (2002) Mammal invaders on islands: impact, control and control impact. *Biological Reviews* 78:347-383

- Daycard L, Thibault J-C (1990) Gestion de la colonie de Puffin cendré (*Calonectris diomedea*) de l'île Lavezzi (Corse): une expérience de dératisation. Travaux Scientifiques du Parc National and Réserves Naturelles de Corse, Ajaccio 28:55-71
- Cromarty PL, Broome KG, Cox A, Empson RA, Hutchinson WM, McFadden I (2002) Eradication planning for invasive alien animal species on islands- the approach developed by the New Zealand Department of Conservation. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 85-91
- Doty RE (1945) Rat control on Hawaiian sugar cane plantations. Hawaiian Planters Record 49(2):71-241
- Drever MC, Harestad A (1998) Diets of Norway rats (*Rattus norvegicus*) on Langara Island, Queen Charlotte Islands, British Columbia: Implications for conservation of breeding seabirds. Canadian Field-Naturalist 112:676 - 683
- Empson RA, Miskelly CM (1999) The risks, costs and benefits of using brodifacoum to eradicate rats from Kapiti Island, New Zealand. New Zealand Journal of Ecology 23:241-254
- Galván J-P, Tershy B, Howald G, Samaniego A, Keitt B, Browne M, Russell J, Pascal M, Parkes J (2005) A Review of Commensal Rodent Eradication on Islands. *Pacific Seabird Group Conference*, Portland, U.S.A., January 2005. Data set: <http://www.islandconservation.org/eradicationdb.html>
- Greaves JH (1971) Resistance to anticoagulant in rodents. Pesticides Sciences 2:276-279
- Greaves JH (1994) Resistance to anticoagulant rodenticides. In: Buckle AP, Smith RH (eds) Rodent pests and their control. Cab. International, Oxon G.B. pp 197-217
- Greaves JH, Redfern R, Ayres PB, Gill JE (1977) Warfarine resistance: a balanced polymorphism in the Norway rat. Genet. Res. Camb. 30:257-263
- Jackson WB, Brooks JE, Bowerman AM, Kaukeinen DE (1975) Anticoagulant resistance in the Norway rat. Pest Control, April, 12-16
- Kaiser GW, Taylor RH, Buck PD, Elliott JE, Howald GR, Drever MC (1997) The Langara Island Seabird Habitat Recovery Project: Eradication of Norway Rats – 1993–1997. Technical Report Series No. 304, Canadian Wildlife Service, Pacific and Yukon Region, British Columbia
- Kerbiriou C, Pascal M, Le Viol I, Garoche J (2004) Conséquences sur l'avifaune terrestre de l'île de Trielen (Réserve Naturelle d'Iroise, Bretagne) de l'éradication du rat surmulot (*Rattus norvegicus*). *Revue d'Écologie (Terre & Vie)* 59 (1/2):319-329
- Lund M. (1964) Resistance to the warfarine in the common rat. Nature 15:778
- Lund M (1984) Resistance to the second-generation anticoagulant rodenticides. In: Clark DO (ed) 11th Vertebrate Pest Conference, University of California, Davis, U.S.A. pp 89-94
- Lattanzio RM, Chapman JA (1980) Reproductive and physiological cycles in an island population of Norway rats. Bulletin of the Chicago Academy of Sciences 12:1-68
- Lovegrove TG, Zeiler CH, Greene BS, Green BW, Gaastra R, MacArthur AD (2002) Alien plant and animal control and aspects of ecological restoration in a small 'mainland island': Wenderholm Regional Park, New Zealand. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. Pp. 155-163
- Martin J-L, Thibault J-C, Bretagnolle V (2000) Black rats, island characteristics and colonial nesting birds in the Mediterranean: current consequences of an ancient introduction. Conservation Biology 14:1452-1466
- McClelland PJ (2002) Preparation for the eradication of Norway rats (*Rattus norvegicus*) from Campbell Island, New Zealand. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 406 - 414
- Merton D, Climo G, Laboudallon V, Robert S, Mander C (2002) Alien mammal eradication and quarantine on inhabited islands in the Seychelles. In *Turning the tide: the eradication of invasive species*. Veitch, C.R. and Clout, M.N.(eds). IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 182-198
- Miskelly C, Robertson H (2002) Response of forest birds to rat eradication on Kapiti Island, New Zealand. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species* IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. Pp. 406 - 414
- Moors PM (1985) Norway Rats (*Rattus norvegicus*) on the Noises and Motukawao Islands, Hauraki Gulf, New Zealand. New Zealand Journal of Ecology 8:37 - 54
- Moors PJ (1990) Norway rat. In King CM (ed.) The Handbook of New Zealand Mammals. Oxford University Press, Auckland, pp192-206
- Moors PJ, Atkinson IAE, Sherley GH (1992) Reducing the rat threat to island birds. Bird Conservation International 2: 93–114

- Moses Kairo, Bibi Ali (2003) Invasive Species Threats in the Caribbean Region. Report to the Nature Conservancy. CAB International, Trinidad & Tobago
- Pascal M, Siorat F, Cosson J-F, Burin des Roziers H (1996) Éradication de populations insulaires de Surnulot (Archipel des Sept-Îles - Archipel de Cancale: Bretagne, France). *Vie et Milieu - Life and Environment* 46 (3/4):267-283
- Pascal M, Chapuis J-L (2000) Éradication de mammifères introduits en milieux insulaires: questions préalables et mise en application. *Revue d'Ecologie (La Terre et la Vie) Suppl.* 7:85-104
- Pascal M, Brithmer R, Lorvelec O, Vénunnière N (2003) Conséquences sur l'avifaune nicheuse de la réserve naturelle des Îlets de Sainte-Anne (Martinique) de la récente invasion du Rat noir (*Rattus rattus*), établies à l'issue d'une tentative d'éradication. *Revue d'Ecologie (La Terre et la Vie)* 59 (1/2):309-318
- Pye T, Bonner WN (1980) Feral brown rats, *Rattus norvegicus*, in South Georgia (South Atlantic Ocean). *Journal of Zoology, London* 192:237-255
- Sowls AL, Byrd GV (2002) Preventing rat introductions to the Pribilof Islands, Alaska, USA. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species* IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 406 – 414
- Taylor RH, Thomas BW (1989) Eradication of Norway rats (*Rattus norvegicus*) from Hawea island, Fjordland, using brodifacoum. *New Zealand Journal of Ecology* 12: 23 - 32
- Taylor RH, Thomas BW (1993) Rats eradicated from rugged Breaksea Island (170 ha), Fiordland, New Zealand. *Biological Conservation* 65:191-198
- Taylor RH, Kaiser GW, Drever MC (2000) Eradication of Norway rats for recovery of seabird habitat on Langara Island, British Columbia. *Restoration Ecology* 8: 151 - 160
- Tershy BR, Donlan CJ, Keitt BS, Croll DA, Sanchez JA, Wood B, Hermosillo MA, Howald GR, Biavaschi N (2002) Island conservation in north-west Mexico: a conservation model integrating research, education and exotic mammal eradication. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 293-300
- Thibault J-C (1995) Effect of predation by the Black rat *Rattus rattus* on the breeding success of Cory's shearwater *Calonectris diomedea* in Corsica. *Marine ornithology* 23:1-10
- Thomas BW, Taylor RH (2002) A history of ground-based techniques developed in New Zealand, 1959-1993. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 301-310
- Tompkins J (2001) Eradication of *Rattus norvegicus* from Seabird habitat in Canada. CWS, British Columbia, Canada
- Towns DR, Broome KG (2003) From small Maria to massive Campbell: forty years of rat eradications from New Zealand islands. *New Zealand Journal of Zoology* 30:377-398
- Veitch CR (2002a) Eradication of Norway rats (*Rattus norvegicus*) and house mouse (*Mus musculus*) from Motuihe Island, New Zealand In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 381-388
- Veitch CR (2002b) Eradication of Norway rats (*Rattus norvegicus*) and house mouse (*Mus musculus*) from Browns Island (Motukorea), Hauraki Gulf, New Zealand. In: Veitch CR, Clout MN (eds) *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK. pp 381-388

Author: Michel Pascal and Olivier Lorvelec

Date Last Modified: December 11th, 2006