**Rattus rattus**

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**Common name**
Hausratte (German), European house rat (English), bush rat (English), blue rat (English), ship rat (English), roof rat (English), black rat (English)

**Synonym**
- *Mus rattus*, Linnaeus, 1758
- *Mus alexandrinus*, Geoffroy, 1803
- *Musculus frugivorus*, Rafinesque, 1814
- *Mus novaezelandiae*, Buller, 1870

**Similar species**
*Rattus norvegicus*

**Summary**
A native of the Indian sub-continent, the ship rat (*Rattus rattus*) has now spread throughout the world. It is widespread in forest and woodlands as well as being able to live in and around buildings. It will feed on and damage almost any edible thing. The ship rat is most frequently identified with catastrophic declines of birds on islands. It is very agile and often frequents tree tops searching for food and nesting there in bunches of leaves and twigs.

**Species Description**
A slender rat with large hairless ears, the ship rat (*Rattus rattus*) may be grey-brown on the back with either a similarly coloured or creamish-white belly, or it may be black all over. The uniformly-coloured tail is always longer than the head and body length combined. Its body weight is usually between 120 and 160 g but it can exceed 200 g.

The work of Yosida (1980) and his co-workers has shown that there are two forms of *R. rattus* that differ in chromosome number. The more widespread Oceanic form has 38 chromosomes and is the ship rat of Europe, the Mediterranean region, America, Australia and New Zealand. Present indications are that it is the Oceanic form that has reached islands in the South Pacific, but studies are needed to confirm this. The Asian form has probably reached some islands north of the equator, e.g. the Caroline Islands. On the basis of colour variation in rats on Ponape and Koror Islands, described by Johnson (1962) as *Rattus rattus mansorius*, we suspect that these rats may be the Asian form of *R. rattus* (SPREP, 2000).
Notes
Ship rats can be widespread, utilising most habitat types, but they show a preference for drier habitats. They generally avoid swimming.

Lifecycle Stages
*Rattus rattus*: gestation 20-22 days; weaning 21-28 days; sexual maturity 3-4 months; total life may not exceed two years.

Habitat Description
Ship rats can be widespread, utilising most habitat types, but they show a preference for drier habitats. They generally avoid swimming. Ship rats in a New Zealand study (Hooker and Innes, 1995; in Innes, 2001) were mostly arboreal, but were also frequently recorded on the ground. The mean range length for females was 103m, and 194m for males. Another study (Dowding and Murphy, 1994; in Innes, 2001) found that rats generally used 3-4 dens each throughout their range. In the Mediterranean region *R. rattus* is most common in forests and shrublands up to 1080m in elevation (Martin *et al.*, 2000).

Reproduction
A placental mammal with dependent young. Litter size 3-10 (average 5-8), with frequency of litters dependent on season and food supply. The interval between litters may be as little as 27 days.

Nutrition
Ship rats are omnivorous generalists, yet can be very selective feeders. They eat both plant and animal matter all year round.
A Japanese study showed that *R. rattus* is primarily herbivorous, but can change its food habits when it is thirsty, or when food is in short supply (Yabe, 2004).
General Impacts
The ship rat has directly caused or contributed to the extinction of many species of wildlife including birds, small mammals, reptiles, invertebrates, and plants, especially on islands. Ship rats are omnivorous and capable of eating a wide range of plant and animal foods. These include native snails, beetles, spiders, moths, stick insects and cicadas and the fruit of many different plants (Innes 1990). They also prey on the eggs and young of forest birds (Innes et al., 1999). In the recovery programme for the endangered Rarotonga flycatcher or kakerori (see Pomarea dimidiata in the IUCN Red List of Threatened Species), Robertson et al. (1994) identified ship rats as the most important predator affecting the breeding success of this bird. Several cases are known where predation on seabirds can be reliably attributed to ship rats. These include sooty terns (see Sterna fuscata in IUCN Red List of Threatened Species) in the Seychelles Islands (Feare, 1979), Bonin petrels (see Pterodroma hypoleuca in IUCN Red List of Threatened Species) in Hawai’i (Grant et al., 1981), Galapagos dark-rumped petrels (see Pterodroma phaeopygia in IUCN Red List of Threatened Species) in the Galapagos Islands (Harris, 1970), and white-tailed tropicbirds (see Phaethon lepturus in IUCN Red List of Threatened Species) in Bermuda (Gross, 1912).

The ship rat is most frequently identified with catastrophic declines of birds on islands. The best documented examples in the Pacific region are Midway Island in the Leeward Islands of Hawai’i (Johnson, 1945; Fisher and Baldwin, 1946), Lord Howe Island (Hindwood, 1940; Recher and Clark, 1974) and Big South Cape Island, New Zealand (Atkinson and Bell, 1973). Atkinson (1977) brought together circumstantial evidence suggesting that ship rats, rather than disease, were responsible for the decline of many species of Hawai’ian native birds during the 19th century. There are few indications of rat-induced declines in native birds on islands nearer the equator (latitude 15°N to 20°S). This zone coincides with the distribution of native land crabs, animals that also prey on birds and their eggs. The long co-existence between land crabs and some island birds may have resulted in the development of behaviours among the birds that gives them a degree of protection against rats. Atkinson (1985) suggested that this might be the reason why rat-induced catastrophes are less apparent within the equatorial zone, but this hypothesis has never been tested (SPREP, 2000).

Species of weight similar to or smaller than that of rats appear to be the most vulnerable to predation. Impacts also appear to be more severe on smaller islands, where rat densities tend to be higher and do not fluctuate. Constant predation pressure results in a reduction in colony size on these islands (Martin et al., 2000).

Both R. rattus and R. norvegicus transmit the plague bacterium (Yersinia pestis) via fleas in certain areas of the world. There have been a series of recent outbreaks in Madagascar in recent years (Boiser et al. 2002).
Management Info

Preventative measures: Research has shown that it can often be difficult to eradicate rats from islands in the early stages of invasion, hence it is better to prevent rodents arriving on islands in the first place. Eliminating a single invading rat can be disproportionately difficult because of atypical behaviour by the rat in the absence of conspecifics, and because bait can be less effective in the absence of competition for food (Russell et al., 2005). Weihong et al. (1999) provide useful information regarding the detection of rodent species using different trapping methods and bait.

Physical: The use of poison baits is the only proven way to remove rodents from large islands. Trapping generally fails to remove all individuals, as trap-shy animals can survive and repopulate the island (DOC, 2004).

Chemical: Rattus rattus can be eradicated from small areas or seasonally controlled using proprietary rat poison products in an appropriate manner. The largest island to date from which ship rats have been eradicated is Barrow Island (23 000 ha, Western Australia) (Morris, 2002). Second-generation anticoagulant poisons are used widely for ship rat control, but possible consequences of any ongoing control should always be considered. These consequences include primary or secondary poisoning of species we are aiming to protect or other non-target species, secondary poisoning of other vertebrate pests such as cats, and development of resistance to these poisons by ship rats. It is not known whether their tree-climbing habits will make eradication more difficult (SPREP, 2000).

Fisher et al. (2004) suggest that diphacinone especially, and also coumatetralyl and warfarin, should be evaluated in field studies as alternative rodenticides in New Zealand. Brodifacoum, the most widely used rodenticide in New Zealand currently, can acquire persistent residues in non-target wildlife. Mineau et al. (2004) presented a risk assessment of second generation rodenticides at the 2nd National Invasive Rodent Summit. O'Connor and Eason (2000) discusses the variety of baits which are available for use on offshore islands in New Zealand. An investigation Spurr et al. (2007) was carried out to assess the behavioural response of ship rats to four different bait station types. Yellow plastic pipe, wooden box (‘rat motel’), and wooden tunnel bait stations were found all suitable for surveillance of ship rats and the first two at least for Norway rats (all were readily entered and had a similar amount of bait eaten from them).

Biological: Contraceptive methods of control are currently experimental, but the potential for effective control using contraceptive methods is promising. National Wildlife Research Center (USA) scientists are working on several possible formulations that may make effective oral immunisation possible (Nash and Miller, 2004).

Integrated management: Guidelines for the Eradication of Rats From Islands Within the Falklands Group offers guidelines for the eradication of rats from islands, based on the experiences in eradicating rats from the Falklands group. This paper offers guidelines for the eradication of rats from islands, based on the experiences in eradicating rats from the Falklands group.

Pathway

Rattus rattus usually stow away in freight carried within the hull, holds and living spaces of ships

Principal source:
Compiler: IUCN SSC Invasive Species Specialist Group

Review: Dick Veitch, Auckland, New Zealand.

Publication date: 2011-01-11

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Puffinus mauretanicus CR
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Rattus enganus DD
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Nesoryzomys fernandinae VU
Nesoryzomys narboroughi VU
Nestor meridionalis EN
Oceanodroma homochroa EN
Oligosoma acrinasum NT
Oreomystis mana EN
Oryzomys nelsoni EX
Otus insularis EN
Pachyptila vittata LC
Peromyscus madrensis EN
Phalacrocorax featherstoni EN
Philesturnus carunculatus NT
Phoebastria albatrus VU
Phoebetria fusca EN
Pomarea fluxa EX
Pomarea mira EX
Pomarea nukuhivae EX
Porzana atra VU
Procellaria aequinoctialis VU
Procellaria conspicillata VU
Procellaria westlandica VU
Prosobonia cancellata EN
Psittacula eques EN
Pterodroma alba EN
Pterodroma cookii VU
Pterodroma hypoleuca LC
Pterodroma leucopetera VU
Pterodroma magentae CR
Pterodroma sandwichensis VU
Ptilinopus chalcus VU
Ptilinopus insularis VU
Puffinus auricularis CR
Puffinus griseus NT
Puffinus newelli EN
Puffinus yelkouan NT
Rattus adustus DD
Rattus elaphinus NT
Rattus feliceus NT
Rattus jobiensis NT
Rattus macleari EX
Rattus simalurensis EN
FULL ACCOUNT FOR: Rattus rattus

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Status</th>
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<tr>
<td>Rattus tunneyi</td>
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BIBLIOGRAPHY

103 references found for Rattus rattus

Management information


Summary: Eradication case study in Turning the tide: the eradication of invasive species.


**Summary:** The association between capture success of stoats (*Mustela erminea*) and ship rats (*Rattus rattus*) and landscape-scale environmental predictors was explored using trapping data from three stoat control areas located in podocarp/broadleaved forest in New Zealand. Stoat capture success was higher at trap sites where a rat was also captured at the same trap or a stoat was captured at a neighbouring trap. Drier trap sites with good soil drainage and increased proximity to the operational trapping boundary were also associated with increased stoat capture. Rat capture success was higher at trap sites where a rat had been captured at a neighbouring trap, and at trap sites that were on steeper ground, more easterly facing and within forest habitat. Trap sites with generally poor soil conditions, i.e., sites with lower soil calcium levels and wetter sites with poor drainage, and increasing distance from the forest edge were also associated with increased rat capture. There were highly variable relationships between rat and stoat capture and landscape-scale environmental predictors between the three stoat control areas. This could be due to differing topography, but also to the highly correlated nature of many of the topographic, climate and habitat predictors. Further research specifically designed to separate these effects should focus on the variables identified as common between all stoat control areas in this study. Additional investigations of whether rats captured in double trap sets act as additional bait for stoats would have practical benefits for stoat control areas. The variability of the results emphasises the importance of ensuring that traps are abundant and widespread in stoat control operations.


**Summary:** Available from: http://sisbib.unmsm.edu.pe/BVrevistas/biologia/v17n2/pdf/a07v17n2.pdf [Accessed 23 February 2011]


**Summary:** A Guide To The Identification And Collection Of New Zealand Rodents, information on trapping methods.

Dilks, P and Towns, D., 2002. Developing tools to detect and respond to rodent invasions of islands: workshop report and recommendations. DOC SCIENCE INTERNAL SERIES 59


**Invasive Species Specialist Group,** 2003. Takitimu Conservation Area (Cook Islands) - Landowning clans in charge of the Kakarori Recovery Programmes. In: **Aliens 17. Invasive Species Specialist Group of the IUCN Species Survival Commission**

**Summary:** Available from: http://www.issg.org/pdf/aliens_newsletters/A17.pdf [Accessed 12 March 2010]

**IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4.**

**Summary:** The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List also includes information on taxa that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (i.e. are Data Deficient); and on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e. are Near Threatened).


**IUCN South-Eastern European e-Bulletin December 2006. Issue 11:** Rats exterminated in important colony of Eleonora's falcon

**Summary:** The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List also includes information on taxa that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (i.e. are Data Deficient); and on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e. are Near Threatened).


**IUCN/SSC Invasive Species Specialist Group (ISSG). 2010. A Compilation of Information Sources for Conservation Managers.**

**Summary:** This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.


**New Zealand Ecological Society**

**Summary:** Available from: http://www.newzealandecology.org.nzje/free_issues/NZJEcol20_1_45.pdf [Accessed December 11 2007]


**Summary:** French language. Information about impacts, eradication methodology, results and discussion in French.


**Summary:** Eradication case study in Turning the tde: the eradication of invasive species.


**Summary:** Available from: http://www.conservationevidence.com/Attachments/PDF242.pdf [Accessed 12 March 2010]

Marine Turtle Newsletter No. 106, 2004

**Summary:** Describes the rat eradication on Sangalaki Is. as part of a green turtle (Chelonia mydas) conservation programme.


**Summary:** Eradication case study in Turning the tide: the eradication of invasive species.

**Summary:** Describes observations and conservation through rat eradication.


**Summary:** This report describes a successful rat eradication project on Sangalaki Island, East-Kalimantan in detail.


**Summary:** Eradication case study in Turning the tide: the eradication of invasive species.


**Summary:** Eradication case study in Turning the tide: the eradication of invasive species.


**Summary:** Available from: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1730&context=icwdm_usdanwrc [Accessed 19 February 2008]


**Summary:** Eradication case study in Turning the tide: the eradication of invasive species.


Pacific Invasives Initiative (PII). 2006. Eradicating invasive species from Kayangel Atoll, Palau

**Summary:** Available from: http://www.isss.org/cii/PII/demo/kayangel.html [Accessed 12 March 2010]


**Summary:** Available from: http://www.isss.org/cii/PII/demo/mtPanie.html [Accessed 12 March 2010]


Summary: Eradication case study in Turning the tide: the eradication of invasive species.


Summary: Eradication case study in Turning the tide: the eradication of invasive species.

The Garry Oak Ecosystems Recovery Team (GOERT)., 2007. Exotic vertebrate species in Garry oak and associated ecosystems in British Columbia


Summary: This database compiles information on alien species from British Overseas Territories. Available from: http://www.jncc.gov.uk/page-3660 [Accessed 10 November 2009]


General information


Cet article présente la situation actuelle et les impacts des populations introduites de mammifères dans les îles. Les moyens de contrôler ces populations sont également présentés.

Summary: This article presents the current situation and impacts of introduced mammal populations. Control methods are also discussed.


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Bilan des introductions des mammifères terrestres dans les Antilles françaises et analyse de leurs impacts.

Abstract: The breeding population of the Bonin Petrel (Pterodroma hypoleuca) on Midway Atoll has declined dramatically since the accidental introduction of the black rat (Rattus rattus). During 1993 and 1994, we examined the effects of rat predation on Bonin Petrel reproductive success by monitoring nesting petrels in six study sites, three of which were treated with rodenticide (treatment) and three that were not (control). Results indicate that the incubation stage of the petrels nesting cycle is most vulnerable to rat predation. Both unattended and incubated eggs were attacked by rats. Rat predation was not observed on petrel chicks in study nests. However, incidental observations of chick remains outside of petrel nests suggest that rat predation on chicks may occur, but at a low frequency. Sites with low burrow density suffered more from rat predation than sites with higher burrow density. The rodenticide Vengeance trademark appeared to successfully suppress the rat numbers in treated sites. The number of nests that failed due to rat predation was significantly lower in two of the three treatment sites when compared with their paired control sites. In addition, the indications of rat activity were lower at these two treatment sites than at the paired control sites. Therefore, this study provides some evidence that rodenticide application is successful in reducing the number of rats, which in turn reduces the amount of rat predation and is associated with an increase in the reproductive success of Bonin Petrels.

Summary:

Nous avons examiné les effets de la prédateur rats (Rattus rattus) sur la reproduction du petrel de la bonin (Pterodroma hypoleuca) sur Midway Atoll. Pendant les années 1993 et 1994, nous avons étudié l'impact de la présence de rats sur le succès de reproduction des petrels en suivant les oiseaux dans six sites de recherche, trois desquels ont été traités avec un raticide (traitement) et trois qui n'ont pas été traités (contrôle). Les résultats indiquent que l'incubation est la période la plus vulnérable à la prédateur de rat. Les œufs abandonnés et les œufs en incubation ont été attaqués par les rats. La prédateur de rat n'a pas été observé sur les poussins de petrel dans les nids de recherche. Cependant, les observations de poussins restés à l'extérieur des nids de petrel suggèrent que la prédateur de rat sur les poussins peut se produire, mais à une fréquence faible. Les sites avec une rare densité de burrows ont souffert plus de prédateur de rat que les sites avec une densité de burrows plus haute. Le rodenticide Vengeance a semblé supprimer avec succès la présence de rats dans les sites traités. Le nombre de nids qui ont échoué à cause de la prédateur de rat a été significativement plus faible dans deux des trois sites de traitement par rapport aux sites de contrôle. En outre, les indications de présence de rats ont été plus faibles dans ces deux sites de traitement par rapport aux sites de contrôle. Ce travail fournit des éléments de preuve que l'application de rodenticide est efficace en réduisant le nombre de rats, qui réduit à leur tour l'impact de la prédateur de rat et est associé à une augmentation du succès de reproduction de Bonin Petrels.