

ERADICATION OF RODENTS AND FERAL CATS ON ISLANDS

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Keywords: eradication, rodents, feral cats, *Felis catus*, *Rattus rattus*, *Rattus norvegicus*, *Rattus exulans*, islands, introductions, conservation, predation, pest control, extinctions

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Summary

For centuries, several species have been introduced by humans to islands all over the world. Some of them are important threats to native faunas. The introduction of feral cats and rodents were responsible for the extinction or severe decline of autochthonous plant species, invertebrates, reptiles, birds, or mammals in several insular ecosystems. The current knowledge of the effects of these allochthonous species on coastal and oceanic islands comes mainly from studies done in New Zealand and other Pacific islands, where human introductions of alien species were extremely important during the last 200 years. There are a huge number of methods proposed to control or eradicate feral cats and rodents on islands with very variable results according to the island's conditions and the protocols employed. From 1980, technical publications provided basic guidelines to design a control program for feral cats and rodents for inhabited large islands and those without human settlements. For both feral cats and rodents, case studies of successful eradications, as well as the problems found on some islands in applying these methods are shown. The detected interactions between introduced

predators and prey and other known drawbacks of eradication programs are also discussed.

1. Introduction

Introduced species are widely recognized as one of the most important threats to native faunas on islands, even one the size of Australia. In Australia, feral cats were introduced to the continent by European sailors on the west coast during the seventeenth century. On just this island, ~25 species of vertebrates have become extinct since the arrival of Europeans 200 years ago. In addition, 119 terrestrial vertebrates are currently listed as endangered. The number of global extinctions on islands usually has a positive correlation with the number of successful introductions of alien species, at least in the case of birds. The history of introduction of rodents (Rodentia) and feral cats (*Felis catus*) in new locations is the history of human dispersal: cats, as habitual companions of sailors onboard and rodents, especially rats (*Rattus* spp.) and mice (*Mus* spp.), as permanent stowaways in vessels.

There are three main alternative actions when facing foreign species that cause unacceptable damage to native wildlife. These are either limiting the population to levels within which damage is tolerable (control), eliminating the species (eradication), or doing nothing. Obviously, the best situation is to prevent the introduction. After the introduction, the solution for some allochthonous species on islands, such as rodents and feral cats, seems to be eradication. This can be also the best choice in economic terms. But this strategy is not always feasible and in some cases, an alternative solution might be a better choice. In fact, even if an introduced species can be only considered a potential danger for native fauna due to its origin, without an actual knowledge of its effect, in some cases control measures could be undertaken on the basis of that potential damage. If the decision is to control or eradicate an introduced species, the management must start as soon as possible, because the control will be much more difficult when the introduced species is established in a large area of the island.

When control or eradication is decided, the launch of a realistic program must take into account not only funding sources and the available scientific and technical information. Sociological constraints could be also important in some areas and the eradication cannot take place without the involvement of local people and a careful explanation of the reasons and final targets of the program.

2. Planning the Control and Eradication

Prior to starting a control or eradication program some elements to take into account are:

- Evaluation of the feasibility of control.
- Enough funding and appropriate distribution of funds.
- Very high level of commitment in personnel involved.
- Careful planning, taking into account political, social, physical, and biological constraints.

- Arrangement of a pilot trial to determine the effectiveness of the eradication method.
- Continuity of the program, to ensure a long-term effect of the eradication or control.
- Design of a monitoring program to check the results in relation to efforts and costs.

Then, we can summarize the steps of control and/or eradication of rodents or feral cats on islands:

- Monitoring known populations of introduced feral cats or rodents. This includes the establishment of population's boundaries for the introduced species and an estimation of the basic demographic parameters as population density and sex and age structure.
- Design of a strategy to avoid further introductions. This implies a control program of vessels and other potential transporters of allochthonous species, as well as an information campaign among people involved in overseas transport and management of merchandise.
- List of known impacts on native species. One of the most difficult points to achieve is the clear demonstration of a real impact of an introduced species on native plant and/or animals. In some cases, it is advisable to start a control program even if we lack this clear demonstration of a negative effect (see Section 1).
- In the case of feral cats, favor maximum harvest through recreational hunting. Hunters form an influential lobby that can radically disturb or favor the control program. Their commitment will avoid the employment of uncontrolled methods by themselves, as venom use.
- Eradication or control program from habitats where feral cats and rodents are in conflict with native species.
- Favor investments in habitat improvement to benefit native species rather than allochthonous species. It is clear that human activities tend to favor the presence of allochthonous species, most of them better adapted to humans than native species of islands.
- Design of a wide information campaign to involve general public in future planning and control of introduced species.

3. Feral Cats

Feral cats are very important predators on insular native species. One of the reasons is the particular strategy of this species, with a very early sexual maturity of females, at their sixth month of life, two litters each year, and an average of five kittens per litter. Thus, a single female can produce more than 3200 offspring during a period of 12 years. In addition, cats are very mobile animals; an adult male can have a home range of ~2 ha (0.2 ha in the case of adult females). Juveniles are even more vagile, with home ranges of several hectares and the possibility of moving across more than 10 km from the breeding colony. This tendency of juveniles to dispersal is the main source of filling vacant territories of disappeared males, even far from the colony of origin. However, even if the capacity of cats to kill native wildlife is unquestioned, it is hard to determine its real impact on the prey population in continental areas. The situation could be different on offshore islands, where the negative impact of feral cats is well documented.

3.1. Origins of Feral Cat Populations

Cats were, perhaps, domesticated in Neolithic times and were transported by humans during the very early migrations across the Mediterranean Sea. Feral cats came from domestic animals, abandoned by their previous owners or fed only scarcely. That situation promotes a particular behavior of domestic cats, which can live in a mixed way, leaving urban areas during the night for hunting, and returning to the towns and villages the next morning. This is the current situation in many areas of some Mediterranean islands as Mallorca and Menorca (Balearic Islands, Spain). In other cases, cats leave definitively urban areas, adopting a completely wild way of life, creating feral breeding colonies. We lack accurate information on the daily and seasonal movements of feral and domestic cats, as well as correct estimations of their home ranges and population dynamics. That information would be especially useful in planning control measures. Another known origin is farms where cats are bred to control rat and rabbit populations. Those cats are poorly fed and, consequently, act as the source of increasingly large feral populations.

3.2. Current Situation of Feral Cats on Islands and Continental Areas

At the beginning of the twenty-first century, feral cats are extremely abundant all over the world. In the United States alone, feral cats exceed 30 million. Controlling them by employing ethical methods was started around 1990, when the association Alley Cat Allies (ACA) was created. In 1999, ACA had 40 000 active members. ACA organizes seminars each year of training in nonlethal control strategies for feral cats, arranging a large network of friends of feral cats, and offering sterilization programs. It publishes a series of brochures on feral cat control, relocation of cats, how to tame feral cats, rabies and the feral cats, and several more. ACA also publishes a periodical, *Alley Cat Action*. The main strategy of ACA is the avoidance of uncontrolled reproduction of feral cats by employing a method of capture, castration, and release. In this way, they obtain stable breeding colonies, reducing birth rate, and improving the general health of the individuals. Other local or state organizations in the USA. are the Feral Cat Coalition (FCC; San Diego, California), SF/SOCA (San Francisco, California), the American Humane Association, Peninsula Humane Society, and the Cat Action Team (Massachusetts). Some biologists see the strategy followed by ACA or FCC as protecting the cat population but doing really nothing to combat the problem of cat predation. A similar situation regarding feral cat problems exists in most of the European countries and, probably in extensive areas of Asia and Africa, even if concrete data is scarce for these continents.

In Australia, feral cats are considered one of the principal problems, together with introduced herbivores and fires, for the conservation of small native animals. In desert areas of Australia, feral cats are among the very few mammals able to survive during severe droughts, adapting their reproductive cycles to the unpredictable periods of heavy rains. During droughts, feral cats can live long periods of time with only the water provided by living prey. In the Northern Territory of Australia alone, a population of ~60 000 feral cats was estimated in a census in 1993.

For an example from western Europe, in Spain the population of feral cats of the island of Mallorca was continuously increasing from 1990 over most of the island, according to internal reports of the Black Vulture Conservation Foundation (BVFC). In Mallorca, feral cats are killing game species such as rabbits, especially those released from hunting farms, and causing several disturbances in urban and touristic areas. Hunter associations and other people decided to employ poisons in baits to kill cats, promoting a serious mortality in other species such as the Black Vulture (*Aegypius monachus*). The situation caused the launch of a scientifically based control program of feral cats by the BVCF, trying to stop the uncontrolled use of poisons. It is interesting to point out that this particular campaign in Mallorca, as well as in other places, was started with the aim to control feral cats in order to stop the uncontrolled use of poisons. The effects of feral cats themselves on the native fauna, and the improvement of public health conditions, were recognized only as collateral positive effects of the control program. The program started in Mallorca includes both short-term and long-term measures. In the short term, the use of cage traps is proposed, as the only suitable and ethical method of capture, including the training of people in a common protocol. Then, the creation of a network of natural areas where captured cats will be relocated, within hunting areas and the terrain of the Associations of Animal Protection. A third short-term target is a wide information campaign about the dangers of using poisons. This information has to be widely disseminated, to include all people involved in cat protection and control, from hunters to farmers, tourists, and regional officials of Nature Conservation. Long-term activities would include a control of feral cat populations with the capture of individuals, castration, and release of some of them to maintain natural breeding colonies. In this way, it is possible to maintain reduced and controlled breeding colonies that impede the access of foreign individuals and allow the effective control and castration of newborns.

In Canary Islands (Spain), as an example of an oceanic subtropical archipelago, feral cats are the most important threat to the native vertebrates fauna. In Hierro, the smallest island of the archipelago, feral cats are the main predators of an endangered giant lizard, *Gallotia simonyi*. The effects of feral cats were studied during 1995 and 1996, in the framework of the LIFE program to recover the giant lizard, sponsored by the European Union (LIFE B4-3200/94/743). The analysis of fecal pellets demonstrated that feral cats are preying upon giant lizards at the accessible areas of the natural range of the species. Thus, feral cats are the key point in the conservation of this endangered lizard.

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Biographical Sketch

Valentín Pérez-Mellado is Professor of Zoology at the University of Salamanca (Spain). He was also visiting professor at the universities of Alienate and Florence. He is currently working on natural history, ecology, and behavior of insular reptiles. During the last twenty five years, his research was mainly focused on Mediterranean islands, mountains of the Iberian Peninsula and North Africa, with field research on Pacific islands, South America, and Caribbean islands. On the Balearic archipelago, he studied the effects of insularity on lizard populations inhabiting small coastal islets. He published more than 150 scientific papers covering several aspects of feeding and foraging ecology of amphibians and reptiles, systematics of lacerated lizards, antipredator behavior and demographic characteristics of these populations, and the effects of predators on naïve prey. He is working on escape responses of lizards from introduced and native predators, as well as on prey and plant discrimination of chemical cues by lacerated lizards. He is the author of four books and the editor of one.