

BALANCING COSTS AGAINST BENEFITS OF BLACK RAT
MANAGEMENT ON MEDITERRANEAN ISLANDS

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Modern restoration programs should be evaluated in terms of ecological impact and benefits for native ecosystems. Furthermore, economic aspects (i.e. cost-effectiveness) should be also considered. The Black rat (*Rattus rattus*) has been worldwide introduced in island ecosystems. The detrimental impact of this species on native ecosystems has been well documented in last decades, especially on seabird populations, and a considerable effort has been put into practice in order to remove or mitigate it. Here we present results from an eight-year study on nine Tyrrhenian islands, with area ranging from 0.5 to 239 ha, where rat control was carried out by using second-generation anticoagulants. In this study we aim at: (i) assessing the impact of the Black rat on colonial seabird species, especially on Cory's shearwater (*Calonectris diomedea*), (ii) comparing the results of two alternative management strategies, such as eradication, i.e. the removal of each individual from the island, and containing, i.e. temporary removal of rats only in close proximity to bird colonies, (iii) assessing benefits of local populations (especially to seabirds and endemic lizards) deriving from temporary or permanent rats removal, (iv) estimating non-target effects on seabird populations deriving from use of toxic baits and (v) evaluating the cost-effectiveness of the two control strategies.

Rats were successfully eradicated in all but one the islands, where the eradication project is still in progress. Containing was performed in two islands, in order to protect seabird colonies. Both eradication and containing positively affected Cory's shearwater's reproductive success (χ^2 test, at least $P < 0.05$). Non target effects at population level, investigated for two bird species (i.e. *Larus michahellis* and *Falco peregrinus*), were not significant, as for none of the two target species was recorded a numeric decline in the year following the rat eradication, but incidental loss of individuals were recorded for some bird species.

Finally, cost-effectiveness analysis (CEA) suggested that eradication is especially suitable for islands with small area and with a widespread distribution of colonies or scattered pairs, while containing could be considered for larger islands.