

Unplanned restoration: Pallid swifts recover twenty years after rat removal from a Mediterranean island

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Abstract - Results from an experimental study from 1994 suggested that Black Rats, introduced on small Mediterranean islands, restricted Pallid Swift nesting to a small number of sites inaccessible to rats. We report here that the removal of rats in 2000 to restore a seabird population was followed by an unplanned increase of nesting Pallid Swifts through an increase in the number and variety of nest sites used, including low and easily reachable sites.

Keywords: islands, unexpected restauration, nest sites, nest site selection, nest predation

INTRODUCTION

In a 1994 experimental study using fake nests Penloup et al. (1997) suggested that introduced Black Rats *Rattus rattus*, by their predation on nests, limited Pallid Swift *Apus pallidus* nesting to rare, hard to reach, vertical cracks. The study area in the Lavezzi islands (Strait of Bonifacio) included 10 islets. Rats were present on all but three, and Pallid Swifts on seven islands. The study design included two islands with rats (Lavezzu: 66 ha, 1-3 pairs of Pallid Swift; Ratino: 3.8 ha, no Pallid Swift) and two islands without rats (Poraggia: 2.3 ha, 40-45 pairs of Pallid Swift; Sperduti AKA Perduto: 1.8 ha, 18-22 pairs of Pallid Swifts). After rats were eliminated from Lavezzu and

from its outlying islets in 2000, to restore the breeding success of a colonial seabird, the Cory's Shearwater *Calonectris diomedea* (Lorvelec & Pascal 2005), regular checks confirmed the subsequent absence of rats and the lack of rat recolonization. A rapid and noticeable increase in Cory's Shearwater breeding success followed (Pascal et al. 2008). But how the disappearance of rats affected the remainder of the local species, including the number and location of nesting swifts, had not been assessed so far. We report here on the fate of Pallid Swifts on Lavezzu Island 20 years after rats were eliminated from it and compare it to their status on the other islands with or without rats studied at the time.

MATERIALS AND METHODS

Lavezzu is flat with several rock outcrops isolated from each other. The Pallid Swift is a common bird with a fragmented distribution ranging from the islands of Macaronesia, in the Atlantic Ocean, to the Persian Gulf, regions with an oceanic, Mediterranean, or sub-desert climate (Chantler et al. 2020). The black rat, a proficient climber on trees and rocks (Nowak 1991), is well-distributed in the Mediterranean Basin, including on its islands. It was established on Lavezzu at least since medieval times (Vigne et al. 1994), an ancient presence confirmed by genetics (Abdelkrim et al. 2009). Very well suited to the ecological constraints of Mediterranean islets, occurring locally at very high density (Cheylan 1988), black rats greatly affected the island avifaunas, eliminating some species and reducing others to very small populations, among them Pallid Swifts (Martin et al. 2000, Ruffino et al. 2009).

In May and June 1994, we placed artificial nests containing Japanese Quail *Coturnix japonica* eggs coupled to automatic cameras (Penloup et al. 1997). The study compared rat islands (Lavezzu, Ratino) and rat-free islands (Poraggia, Sperduti). To test the influence of rat predation we placed the artificial nests in a range of sites typically used by Pallid Swifts, but varying in the accessibility to rats, and we monitored the actual nesting of swifts with direct observation on all these islands during the breeding season.

Twenty years after rat removal one member of the initial team (JCT) revisited the different islands to census their Pallid Swift populations.

RESULTS

Results of the initial study showed that rats, when present, were the main cause of artificial nest predation, whereas Common Raven *Corvus corax* caused most of the small number of predations that occurred on islands without rats. In presence of rats, only the sites most inaccessible were occupied. This left the swift population on the main island of Lavezzu restricted to less than 3 pairs (Penloup et al. 1997) nesting in a single deep vertical crack in the roof of a

1 m overhang situated 4 m off the ground. This contrasted with many of the nest sites found on nearby islands without rats, such as Sperduti or Poraggia, where most nest sites used by the swifts were located on shallow horizontal rock cavities, situated close to the ground.

The recent Pallid Swift census we did on Lavezzu Island during the breeding season (28 June 2019, 1-2 July 2020, and 23 June 2021) twenty years after rat eradication confirmed that the only nesting site known in the 1990s was still occupied in 2019-21. It had five active nests. But, we also identified new localities in two rocky outcrops, one with two nests, the other one with eight sites with birds-entering and exiting cracks, and with 28 prospecting birds flying around exploring the same sites. Finally, we also observed small groups of prospectors visiting two more sites. From a handful of pairs present in 1994, we estimated the 2020 tally at 20-50 pairs. Moreover, among the new sites we found on Lavezzu was a horizontal crack typical of the cracks where quail egg predation by rats had peaked in our experiments. The site was similar to the accessible sites used on islands that never had rats. On Poraggia and Sperduti, visited on 22 June, 2021, the situation was still unchanged, all shelter the same population of swifts as they did in the 1980s. On Ratino, landed on 22 June, 2021, rats were still present and swifts absent.

DISCUSSION

While the 2000 eradication aimed at relieving predation pressure on a local seabird, the Pallid Swift recovery illustrates the broader benefits to expect from the removal of invasive mammals from islands, benefits that can only be documented by combining pertinent reference data with an increased monitoring of eradication outcomes (Kerbiou et al. 2004, Jones et al. 2016).

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