SHORT COMMUNICATION

IMPACT OF VAGRANT PREDATORS ON THE NATIVE FAUNA: A SHORT-EARED OWL (*Asio flammeus*) PREYING ON MADEIRAN STORM PETRELS (*Oceanodroma castro*) IN THE AZORES

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The impact of introduced predators on the native fauna of oceanic islands has proven to be catastrophic in many cases. In some instances, however, predation is caused by very few individuals arrived without any human assistance. Here, I report on the impact of a vagrant Short-eared Owl on the small population (200 breeding pairs) of cool-season Madeiran Storm Petrels from Praia Islet (0.12 km^2), off Graciosa Island, Azores archipelago. The owl fed almost exclusively on storm petrels and killed between one and two individuals every night. The number of prey remains found suggests that it must have been present on the islet *ca* two weeks before its presence was noticed. Although the Short-eared Owl is a rare vagrant in the Azores, these observations show that a single individual may have a strong impact on a vulnerable population of Madeiran Storm Petrels.

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INTRODUCTION

Introduced species are known to have severely depleted the native fauna and flora of numerous islands worldwide and represent the second cause of loss of biodiversity after habitat changes (VITOUSEK et al. 1997). The impact of introduced predators on oceanic islands can be dramatic for the native avifauna (ATKINSON 1985; VEITCH 1985), mainly because most of the indigenous species have evolved without predators on land and lack adequate adaptive behaviour (LACK 1968; WARHAM 1990). However, predation may also be due to the presence of a very small number of stragglers which arrived on their own. For example, in 1987, a vagrant Snowy Owl *Nyctea scandiaca* targeted Bermuda Petrels *Pterodroma cahow* at the unique breeding locality of this endangered species (a few tens of breeding pairs only), resulting in the loss of at least five pre-breeding birds (WINGATE *in litt.* 1991; AMOS 1991). Because they are often exhausted upon arrival and unfamiliar with the area, vagrants tend to establish themselves on the first available land mass and opportunistically exploit the local food resources. Here, I report on the impact of a vagrant Short-eared Owl *Asio flammeus* on the indigenous birds of a small offshore islet in the Azores.

METHODS

Observations took place on Praia Islet (39º03'N, 27º57'W), a 0.12 km^2 islet free of introduced predators, between 4 and 11 December 2002. I saw the Short-eared Owl almost every day during this period (always a single bird). As soon as I noticed its presence, I entirely visited the islet daily, in order to collect prey remains and pellets and to assess its impact on the local fauna as accurately as possible, especially on the small population (200 breeding pairs, MONTEIRO et al.

1996b, 1999) of cool-season Madeiran Storm Petrels *Oceanodroma castro* for which a restoration program has been undertaken (BOLTON 2001). To avoid double countings, I removed all prey remains from the site upon discovery, and I comptabilized only right wings whenever I found single wings. Prey remains were examined on the islet; pellets were measured (length and diameter) using a vernier calliper and analysed at the lab. However, I excluded pellets when assessing the impact of this owl because (1) the wing bones that they contained might correspond to the missing parts of some of the wings collected, and (2) prey remains were much more conspicuous on the ground and much easier to find than pellets, a great percentage of which was probably regurgitated within the Tamarisk *Tamarix africana* thickets where the owl used to roost, making them inaccessible.

RESULTS

The number of remains found (one head plus the partially consumed body, wing pairs linked by the fork, and single right wings) corresponded to a minimum of 25 cool-season Madeiran Storm Petrels killed by the owl. I also found seven entire pellets plus some parts of pellets. All of them only contained remains of Madeiran Storm Petrels, and three contained wing bones. The length of the pellets ranged from 43 to 67 mm (mean: 54 mm) and their diameter was comprised between 22 and 29 mm (mean: 26 mm, $N = 7$). The daily rhythm of my visits associated with discoveries of fresh remains throughout my stay on the islet enabled me to estimate the predation rate of this Short-eared Owl between one and two storm petrels per night. One of the petrels consumed by the owl had been ringed as a "more than one year old" individual in 1996.

88% of the remains and all the pellets that I found were distributed in two definite areas, one of which harbouring high densities of breeding petrels. This area comprised a steep rocky cliff and several tens of artificial nests built by BOLTON (2001) to increase the breeding population of Madeiran Storm Petrels on the islet.

DISCUSSION

The Short-eared Owl does not normally occur in the Azores where it was recorded only four times during the 20th century (three solitary individuals and a group of four), on São Miguel and Terceira Islands (LE GRAND 1993). Therefore, this species seems to be a rare vagrant in the archipelago. Because the Short-eared Owl has an holarctic distribution (MARKS et al. 1999), this individual may have come from continental Europe as well as from Northern America. The Short-eared Owl is partially migratory, movements during the autumn taking place from August to late October (CRAMP 1985; MARKS et al. 1999). The wintering area of the species lies from the north of the United States to Mexico for the American population, whereas most of the European migrants overwinter in central and western Europe and in northern Africa. Consequently, the latitude of the Azores (36°55' to 39º43'N) falls within the limits of the wintering range of the species.

In the Azores, the native predators are the Yellow-legged Gull *Larus cachinnans atlantis*, which breeds on the neighbouring (*ca* 2 km) Baixo Islet, the Common Buzzard *Buteo buteo rotschildi*, which nests on Graciosa Island, 1 km from Praia Islet, and the Long-eared Owl *Asio otus,* which also nests on Graciosa Island, although probably in small numbers (LE GRAND 1993). In addition, neither of the former two species is a nocturnal predator; yet, some individual Yellow-legged Gulls prey on Madeiran Storm Petrels, although predation essentially takes place on Baixo Islet (MONTEIRO et al. 1996a). Long-eared Owls exceptionally occur on Praia Islet, and their impact on Madeiran Storm Petrels is generally negligible, even though the population from this islet has already been targeted by one individual (M. BOLTON, unpubl. data). However, I neither saw nor heard any Long-eared Owl during my stay on the islet, making me confident that predation could be exclusively attributed to this vagrant Short-eared Owl. Besides, the size of the pellets was similar to that recorded in continental Europe for the species (length: 35 to 70 mm, diameter: 18 to 26 mm, CRAMP 1985).

In the normal parts of its range, the bulk of the diet of the Short-eared Owl is made up by small rodents, but this species readily shifts towards birds if a shortage of small mammals occurs (CRAMP 1985; MARKS et al. 1999). Short-eared Owls can kill birds up to the size of a Moorhen *Gallinula chloropus* and occasionally prey on British Storm Petrels *Hydrobates pelagicus* (C. M. PERRINS pers. comm. in ALLAN 1962; CADIOU 2003). There are neither mammals nor large insects on Praia Islet, and I did not find any remains of other bird species during my stay in December 2002. However, I returned to the islet for a few hours on 5 February 2003, for another study; the owl was still present. Again, I found remains of Madeiran Storm Petrels in the same areas as in December, but I also found one pair of Little Shearwater *Puffinus assimilis baroli* wings; this species breeds on Praia Islet, egg-laying occurring from late January-early February onwards (MONTEIRO et al. 1996a, 1999). Nevertheless, the absence of Little Shearwater remains in December, although several tens of individuals were present on Praia Islet at night, and the fact that the islet harboured the same bird species in December and in February strongly suggest that Madeiran Storm Petrels were the main (and probably quasi-exclusive) prey of this Short-eared Owl.

The number of kills comptabilized on 11 December suggests that the owl arrived on the islet on *ca* 25 November, assuming a mean capture rate of 1.5 storm petrel per night. However, and because I excluded pellets when assessing the impact of this predator (see Methods), an earlier arrival of the latter cannot be dismissed. The daily capture rate estimated for this Short-eared owl corresponds to 70-75 g of daily food intake, given that cool-season Madeiran Storm Petrels weigh 49 g on average (MONTEIRO et al. 1996a). This estimate compares with those obtained in continental Europe (remains of 2-3 micromammals on average per pellet, CRAMP 1985). Unfortunately, time constraints prevented me from collecting and comptabilizing prey remains during my visit in February. However, based on these calculations, I could evaluate the number of Madeiran Storm Petrels predated between 11 December and 5 February. To do this, I also assumed that (1) a Little Shearwater (body mass: 172 g, MONTEIRO et al. 1996a) provided as much food as three Madeiran Storm Petrels, and (2) except from the shearwater, this vagrant owl preyed on storm petrels only (for the reasons invoked in the previous paragraph, the latter assumption seems realistic). Thus, the owl might have consumed 81 more Madeiran Storm Petrels between my two stays on Praia Islet.

Therefore, these findings show that a single Short-eared Owl can have a strong short term impact on a small storm petrel population. The Madeiran Storm Petrel is classified as "not globally threatened" according to the IUCN Red List criteria (SCHREIBER & BURGER 2002). However, this species is considered "vulnerable" in the European part of its range, where breeding numbers total fewer than 10,000 pairs (TUCKER & HEATH 1994). In the Azores, the population has been dramatically declining since the introduction of mammalian predators by the Portuguese in the fifteenth century, current estimates being *ca* 1000 breeding pairs only (MONTEIRO et al. 1996b, 1999). In addition, the existence – in the Azores as well as at other localities – of two morphs which differ in their breeding phenology, morphology and vocalisations (MONTEIRO et al. 1996a; MONTEIRO & FURNESS 1998; NUNES 2003) might lead to the revision of the taxonomic status of the Madeiran Storm Petrel (MONTEIRO & FURNESS 1998) and, consequently, to that of the conservation status of each seasonal population. Although the owl was present during the incubation and the chick-rearing periods of Madeiran Storm Petrels, its impact was likely to be much higher on prospecting pre-breeders than on established breeders. Indeed, the former are the most vulnerable, spending much more time in the open air (both flying and on the ground) than the latter when on land (MOUGEOT & BRETAGNOLLE 2000). However, the ringing date of one of the predated storm petrels showed that this bird was an adult, likely to have bred at least once during its life. Given that population dynamics of long-lived species such as petrels depend predominantly on adult survival rate (WEIMERSKIRCH et al. 1987; JOUVENTIN & WEIMERSKIRCH 1988), one may also wonder

about the long term consequences of the presence of this owl for the vulnerable Azorean population of cool-season Madeiran Storm Petrels.

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