

## Cat eradication significantly decreases shearwater mortality

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Introduced predators are a leading threat to seabird populations world-wide and cats (*Felis catus*) have probably had the most universally damaging effect (Moors & Atkinson, 1984). Eradication of feral cat populations from seabird colonies is a conservation priority (Tershy *et al.*, 2002) and there are many studies that demonstrate the benefits of these actions for seabirds (e.g. Forsell, 1982; Cooper *et al.*, 1995). However, detailed estimates of the effects of cat predation on seabird population viability are lacking in spite of the fact that such data could provide important support for land managers attempting to promote eradication programmes for seabird restoration.

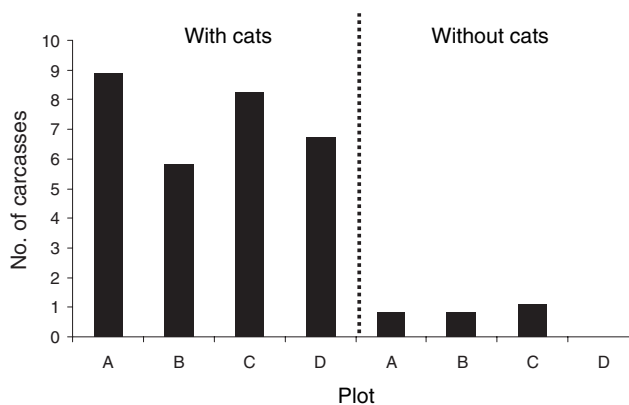
In an earlier study published in *Animal Conservation* (Keitt *et al.*, 2002), we measured seabird mortality and used a population model to estimate the impacts of cat predation on a burrow-nesting seabird, the black-vented shearwater (*Puffinus opisthomelas*) breeding on Natividad Island, Baja California Sur, Mexico. After this study was completed cats were eradicated from Natividad Island as part of an island restoration programme (Wood *et al.*, 2002). In this note we report new data from Natividad Island that provides post-eradication estimates of seabird mortality and demonstrates the benefits of introduced predator eradication.

In our previous paper (Keitt *et al.*, 2002) we used two methods to quantify shearwater predation by cats: (1) a direct count of shearwater mortality using carcass deposition rates; (2) an energetic approach whereby cat caloric intake was estimated from an allometric equation. Prior to eradication, the direct count of shearwater mortality yielded an average of 7.4 carcasses per month in the four mortality plots ( $n = 4$ ,  $SD = 1.4$ ). After eradication, shearwater mortality decreased significantly, averaging 0.7 carcasses per month in the four plots ( $n = 4$ ,  $SD = 0.4$ ,  $P = 0.002$ ,  $t$ -test,  $t = 10.374$ ) (Fig. 1). Extrapolating to the colony as a whole, shearwater mortality decreased by more than 90%, from more than 1000 birds per month prior to eradication to fewer than 90 birds per month after feral cat eradication. This residual

mortality of fewer than 90 birds per month was probably due primarily to predation by western gulls (*Larus occidentalis*) and peregrine falcons (*Falco peregrinus*).

Some bias in the data may have resulted from differences in sampling period between years. Prior to eradication, we counted the number of carcasses accumulated in plots from mid egg incubation through late chick rearing (14 April to 28 July 1997). After eradication, we counted the number of carcasses accumulated from early egg laying through mid chick rearing (1 March to 15 June 2002). Because attendance at the colony by shearwaters is higher earlier in the breeding season (Keitt, 1998) any bias that occurred would probably have increased the carcass deposition rate in the post-eradication sampling period and not affected our final conclusions.

Pre- versus post-eradication mortality rates differ by 923 birds per month. Assuming this mortality resulted from the 25 cats removed by the eradication effort in 1998, then each cat was responsible for killing 36.7 birds per



**Fig. 1.** Average number of black-vented shearwater carcasses encountered per month on four 100 m × 200 m plots before and after cat eradication on Natividad Island. Mortality in 1997, when cats were present,  $X = 7.4$  carcasses per month ( $n = 4$ ,  $SD = 1.4$ ) was significantly higher than 2002 after cats were eradicated,  $X = 0.7$  carcasses per month ( $n = 4$ ,  $SD = 0.4$ ) ( $P = 0.002$ ,  $t$ -test  $t = 10.374$ ).

month. This is close to the 45 birds per month estimated in the original article based on cat metabolic rates and caloric requirements and only slightly lower than the 40.5 birds estimated using the 1997 data from the mortality plots.

The data collected from Natividad Island after cats were eradicated support our original conclusions that cats were responsible for the mortality of large numbers of black-vented shearwaters. While there are many factors that can contribute to the endangerment of seabird populations, this study clearly demonstrates that the removal of non-native predators at breeding colonies can provide dramatic benefits to the long-term viability of seabird populations.

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