Compensatory mitigation: the authors reply

We recently suggested that offsets might be a useful tool for reducing impacts of seabird bycatch in fisheries where direct measures are ineffective (*Front Ecol Environ* 2007; **5[6]**: 325–31). Priddel (*Front Ecol Environ* 2007; **5[8]**: 407–08) voiced the opinion that offsets may cause more harm than good and contested the information and assumptions in the cost-effectiveness analysis we used to illustrate the approach. Here, we address some points raised by Priddel.

Priddel (1) dismissed our model outright because he rejects our assumption that removing rats could eliminate the current loss of 50% of eggs and chicks (ie breeding success). He goes on (2) to dismiss rats as a threat to flesh-footed shearwaters on Lord Howe Island (LHI). He also (3) claims that we did not read his manuscript (Priddel *et al.* 2006), the source of some data in our model.

(1) Based on available evidence, it is reasonable to expect large increases in breeding success with the eradication of rats from seabird colonies. For example, following eradication on two islands, the breeding success of little shearwater populations (a congener of flesh-footed shearwaters) increased from 43% and 5% to 68% and 56%, respectively (Pierce 2002). Likewise, the breeding success of another congener, Audubon's shearwater, increased from 0% to >85% on Hardy Island (Lorvelec and Pascal 2005). While rat eradication will obviously not eliminate all burrowing seabird egg and chick mortality, drastic increases in breeding success are common following eradication. Our estimates of productivity are close to the upper bound of what has been reported in the literature (see our previous letter in *Front Ecol Environ* 2007; **5[7]**: 351–52).

(2) While Priddel dismisses rat predation as a threat, we are not aware of any rat impact studies on flesh-footed shearwaters breeding on LHI or on any other population. Priddel *et al.* (2006) recognize this: "The degree to which mice or rats prey on flesh-footed shearwater eggs and chicks is unknown". The authors go on to state that "there was no direct evidence of rats preying...[on] eggs or chicks"; however, they do not present any information to support their claim.

The causes of mortality for eggs and chicks would be hard to determine using the study design of Priddel *et al.* (2006). Their mortality estimates are based on the inspection of 113 burrows with eggs over 4 days in January and April. Of those, 57 nests failed to produce fledglings. Based on their data, parent mortality could account for 26 failures. The remaining failures are due to unidentified sources, potentially including plastic ingestion and rat predation. Assuming that mortalities are evenly spread over Priddel *et al.*'s observation period, 2.25 deaths would be expected per week. Even with intensive nest inspections and carcass autopsies, it is unlikely that one would document rat predation using Priddel *et al.*'s sampling design and effort. Priddel and colleagues do an excellent job at estimating the past impacts of clearing and urbanization on flesh-footed shearwater population size, but they do not address ongoing mortality sources, such as rat or plastic impacts, and their current impact on demography.

Globally, however, there is ample evidence to suggest that rats may be impacting flesh-footed shearwaters on LHI (see our previous letter in *Front Ecol Environ* 2007; **5[7]**: 351–52; Jones *et al.* in press). Even Priddel *et al.* (2006) cite anecdotal evidence that rats could affect flesh-footed shearwaters, since invasive predators have extirpated other colonies.

(3) Claiming that we did not read Priddel *et al.* (2006) is disingenuous. We received an advance copy of the manuscript prior to publication, and conversed with the authors by phone and e-mail on specifics of their paper multiple times prior to our publication in *Frontiers*.

Priddel makes an important point about justifications for island restoration and who should pay for those actions. We agree that there are many justifications for the eradication of rodents from LHI. We did not claim, however, that the potential threat of rats to flesh-footed shearwaters is a justification for eradication; rather, we asserted that the seabird population might benefit from the eradication. We disagree that allowing fisheries to offset their residual impact by paying for other conservation interventions lets other stakeholders "off the hook". With respect to LHI, the government is the default institution responsible for abating the impact of rats on the Commonwealth's natural heritage. Priddel points to legislation that supports that claim. Australian governments have demonstrated their responsibility and willingness to commit the funds necessary for the conservation of their natural heritage, including a recent commitment of AU$24.6 million for invasive mammal eradications on Macquarie Island.

Despite fears or hopes, compensatory mitigation is no panacea (Donlan and Wilcox in press). We

agree with Priddel that rodent eradication from LHI is a critical conservation target in the Pacific, and the Australian Government should not hesitate to pay for it. But there are hundreds of additional islands in the Pacific where invasive mammal eradication would also result in biodiversity gains, and for the majority there is no funding, governmental or otherwise, in sight. With the many challenges compensatory mitigation brings, perhaps it could also generate the necessary capital to bring those conservation opportunities within grasp.

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