Use of gulls rather than terns to evaluate American Mink *Mustela vison* control

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Ratcliffe *et al*. (2006) compared the breeding biology of terns *Sterna spp*. on the Uists, Western Isles, where American Mink *Mustela vison* (hereafter 'mink') had been removed, and on nearby Lewis, where there had been no mink control. They showed that hatching success was significantly higher on the Uists, indicating that mink removal improved this aspect of breeding, but found no significant difference in colony productivity between the two areas. The years in which the comparisons were made, 1993 and 2005, were years of low tern productivity, probably caused by poor weather and food shortage, respectively. The authors considered that such factors overrode any effect of mink by killing young terns before mink could take them, and suggested that any effects of mink would be more detectable in years of high tern productivity when more young terns survived.

This is a problem I have encountered in another part of Scotland – on small islands in the sealochs and sounds of mainland Argyll, including Mull and the adjacent part of Highland Region (hereafter 'Argyll'). For almost 20 years, we have been removing mink from near tern colonies and comparing productivity with similar colonies in unprotected areas, using broadly the same field methods as Ratcliffe *et al*. (2006). There have been years when mink removal led to marked improvement of tern productivity, but there were also years when other factors severely reduced tern productivity and mink removal had no detectable effect. Ratcliffe *et al*. (2006) and my own work demonstrate that tern breeding performance is so variable that it is of limited value as an indicator of the success of mink control. If mink removal is to be justified, we must be able to show that it has immediate measurable benefits.

Showing that mink are absent in trapped areas by searching for signs such as scats and dens can be difficult, particularly since any mink are likely to be present at low density. Moreover,

Table 1. Common Gull *Larus canus* productivity in areas with and without American Mink *Mustela vison* control in Argyll and Lochaber.

	Areas with mink control			Areas without mink control			
Year	No.of pairs (No. of colonies)	No. of fledged young	Productivity (chicks/pair), 'a'	No. of pairs (No. of colonies)	No. of fledged young	Productivity (chicks/pair), 'b'	% that mink reduced productivity by = (a-b)/a
1996	477 (6)	385	0.807	460 (24)	84	0.182	77
1997	547 (10)	378	0.691	577 (20)	230	0.399	42
1998	700 (10)	612	0.874	357 (9)	134	0.375	57
1999	828 (18)	510	0.616	506 (26)	132	0.261	58
2000	682 (13)	490	0.718	764 (36)	281	0.368	49
2001	899 (19)	760	0.845	471 (31)	182	0.386	54
2002	760 (13)	508	0.668	375 (14)	89	0.237	65
2003	652 (18)	383	0.587	584 (36)	220	0.377	36
2004	761 (15)	504	0.662	285 (10)	138	0.484	27
2005	636 (8)	703	1.105	493 (16)	138	0.28	75
2006	715 (18)	704	0.985	544 (31)	134	0.246	75
2007	552 (9)	258	0.467	455 (17)	118	0.259	45

Table 2. Herring Gull *Larus argentatus* productivity in areas with and without American Mink *Mustela vison* control in Argyll and Lochaber.

	Areas with mink control			Areas without mink control			
Year	**No.of pairs (No. of colonies)**	**No. of fledged young**	**Productivity (chicks/pair), 'a'**	**No. of pairs (No. of colonies)**	**No. of fledged young**	**Productivity (chicks/pair), 'b'**	**% that mink reduced productivity by = (a-b)/a**
1997	698 (6)	703	1.01	1709 (14)	809	0.473	53
1998	754 (6)	805	1.07	2507 (25)	860	0.343	68
1999	1700 (7)	1373	0.808	6492 (42)	2465	0.38	53
2000	1637 (8)	1978	1.21	6905 (48)	5427	0.786	35
2001	1386 (7)	1145	0.826	6791 (46)	4266	0.628	24
2002	1294 (9)	1198	0.926	5571 (38)	3639	0.653	29
2003	1521 (10)	1174	0.77	5675 (50)	3298	0.581	25
2004	1650 (10)	1473	0.893	2183 (11)	1159	0.531	41
2005	1031 (9)	887	0.86	2929 (20)	1557	0.5316	38
2006	2198 (11)	2299	1.05	3066 (23)	2064	0.67	36
2007	1073 (11)	798	0.744	3337 (28)	2477	0.742	0.3

at any time, more mink may arrive from untrapped areas nearby (Birks 1986). Arguably, the only practical and effective way to demonstrate that local mink control has been successful is to show that it has prevented the damage that mink were causing.

Mink can cause widespread breeding failure of a variety of ground-nesting birds, as well as terns. Since tern breeding success is a poor indicator of the success of mink control, breeding success of other species may serve the purpose better. In Argyll, we have measured the annual breeding success of Common Gull *Larus canus* and Herring Gull *L. argentatus* colonies since 1996 and 1997, respectively, both in areas where mink have been removed (usually to protect terns) and in areas with no mink control. New methods have been developed for this purpose, allowing simple and rapid determinations of gull productivity (Craik 2000) and more efficient control of mink (Craik 2008). The study area includes most colonies along the mainland coast between Mallaig in the north and West Loch Tarbert in the south. In areas without mink control, in any year there were some island colonies with good productivity that were naturally free of mink for various reasons (chiefly distance from the mainland shore), and some colonies with zero or low productivity, some of which were affected by mink; this applied to both gull species.

In each of the years 1996–2007, the productivity (total number of fledged young /total number of pairs in a group of colonies) of Common Gulls was considerably higher in the mink-free group than in the mink-affected group (Table 1). This was also true for Herring Gulls in each of the years 1997–2006. The exception was in 2007 when productivity was almost identical in the two groups of Herring Gulls (Table 2). This seems to have been because, in 2007, some Herring Gull colonies lost many or most eggs and young during a storm-tide in mid May, while some others were more than usually affected by Brown Rats *Rattus norvegicus*.

Hence, gull productivity provides a much more reliable indicator of the success of mink control than the breeding success of the terns, even when the mink control may be directed primarily at conserving tern colonies.

Footnote: Ratcliffe *et al*. (2006) state in their Discussion: 'For example, in south-west Scotland between 1990 and 2006, 58% of unprotected tern colonies were not mink-affected (J. C. A. Craik, unpubl.)', 'unprotected' here meaning those with no mink control. While 42% of unprotected colonies showed definite signs of mink predation, the other 58% included some colonies which had low or zero productivity for unknown reasons, and where the possibility of predation by mink could not be excluded. Thus their statement should be rephrased: '*At least* 42% of unprotected colonies are known to have been attacked by mink.'

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Use of gulls rather than terns to evaluate American Mink *Mustela vison* control. A response to Craik (2008)

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I thank Clive Craik for the opportunity to clarify points made in the 2006 paper. Clive presents a convincing argument that gull rather than tern productivity was a better indicator of the benefits of mink control during his study. However, I maintain that I was justified in restricting the analysis to terns in my study for three reasons:

The Hebridean Mink Project was designed to produce conservation benefits for a range of taxa that included terns, but not gulls. Therefore I was obliged to test the efficacy of the project in terms of changes in the breeding success of terns, since that of gulls was irrelevant to the project's objectives.

In contrast to Clive's study area, gulls and terns on the Western Isles occupy discrete habitats that differ with respect to mink predation risk. Gulls nest inland on moors where mink are rare, while terns nest on the coast where mink are more common. As such, gull productivity on the Western Isles will be less sensitive to removal of mink than that of terns.

An analysis of Clive's own data demonstrated that tern productivity during 1998–2006 at colonies protected from mink was on average 253% higher than that at unprotected ones (Ratcliffe *et al.* 2008). As such, tern productivity clearly has a greater value as an indicator of the effects of mink removal than Clive's commentary suggests.

I concede the point in the Footnote concerning the detectability of mink predation being less than one. Quantifying the likelihood of an unprotected colony escaping mink predation is therefore difficult, but data certainly show that unprotected colonies can, on occasion, escape predation and experience high productivity. Hence, detecting the effects of mink control statistically requires sampling at a large number of colonies, and certainly more than the two sampled on Lewis in 1992.

Reference

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