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Post-release survival of orphaned wild-born polecats *Mustela putorius* reared in captivity at a wildlife rehabilitation centre in England

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ABSTRACT: Many thousands of rehabilitated wildlife casualties and captive-reared orphans are released back to the wild each year. Most wildlife rehabilitators equate release with success, and very little is known about the post-release survival of rehabilitated wildlife. We measured the post-release survival of orphaned polecats *Mustela putorius*, a species of conservation concern and currently a UK Biodiversity Action Plan (BAP) priority species. Between 1997 and 2008, 137 polecats were admitted to the RSPCA (Royal Society for the Prevention of Cruelty to Animals) Stapeley Grange Wildlife Centre in northwest England. Of these, 89 (65%) were orphaned juveniles. Forty-three percent of adults and 89% of juveniles were released back to the wild following rehabilitation. Between 2005 and 2008, we radio-tracked 32 juvenile polecats at 5 release sites in Cheshire and North Wales, UK. These individuals were tracked for 3 to 104 d (median = 27.5). Of the 32 radio-tracked animals, 26 (81%) were still alive after 14 d, and a minimum of 16 (50%) were still alive after 1 mo. Twelve percent were known to have died in road traffic collisions, 22% shed their collars, and the signal was lost for 56%. Those for which the signal was eventually lost were tracked for 13 to 103 d (median = 38.5 d). Two female polecats trapped following release in 2007 had lost 30% and 18% of their body weight, respectively. The data suggest that the survival of rehabilitated polecats is sufficient to justify the resources used in the rehabilitation process and that the animals' long-term welfare is not compromised by being held in captivity.

KEY WORDS: Polecat · *Mustela putorius* · Post-release survival · Wildlife rehabilitation · Restoration ecology

INTRODUCTION

Large numbers of captive-bred and wild caught animals are released into the wild annually, often as part of conservation or translocation strategies (e.g. Wolf et al. 1996, Moorhouse 2004, Mathews et al. 2005, 2006, Maran et al. 2009, Peters et al. 2009, Pinter-Wollman et al. 2009). These include the reintroduction of captive-born animals and/or the translocation of wild-caught animals. However, reintroduction of captive-bred animals and translocation of wild-caught animals into the wild have had low levels of success (Beck et al. 1994, Ginsberg 1994, Mathews et al. 2005, Jule et al. 2008). In a survey of translocation programmes in North America, Australia and New Zealand, Griffith et al. (1989) concluded that only 44% (N = 80) of translocations of endangered or threatened avian and mammalian species could be described as successful. Translocations of wild-caught animals were more likely to succeed than releasing captive-bred animals (Griffith et al. 1989). A review of these programmes some years later revealed an increase in the number of programmes in which the population was self-sustaining (Wolf et al. 1996), with 53% of programmes involving endangered or threatened avian and mammalian species being described as successful. However, when native game species

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were included, the overall success rate was 66% and 67% in the 2 studies, respectively (Griffith et al. 1989, Wolf et al. 1996). More recently, Fischer & Lindenmayer (2000) assessed the published results of reintroduction, translocation and supplementation programmes over a 20 yr period and found that reintroduction success had not changed over the time period surveyed. Of 116 reintroductions, only 26% were considered to be successful, although the outcome of 47% was classified as 'uncertain', highlighting the need for continual monitoring and reporting. Reintroductions did appear to be more successful when source animals were wild-born (31% versus 13%), but other factors such as the number of animals released and persistence of the original reason for the species decline were also shown to be important (Fischer & Lindenmayer 2000). Although the use of wild-born animals in restoration projects may be more successful than using captive-bred individuals (Fischer & Lindenmayer 2000, Hayward et al. 2007, Jule et al. 2008), translocating wild animals to unfamiliar habitats or territories may affect their welfare (Molony et al. 2006, Moorhouse et al. 2007, Pinter-Wollman et al. 2009). Sub-optimal habitat and naivety to the local environment may lead to competition-induced stress, exposure to disease and vulnerability to predation. This may result in a reduction in survival or an inability to integrate with the population (Sarrazin & Legendre 2000, Bar-David et al. 2005, Letty et al. 2007, Pinter-Wollman et al. 2009). Releasing animals into locations that are already occupied can have an effect on the existing population and could also prove fatal to the resident and/or released animals. The low success rate of these strategies emphasises the need for post-release monitoring of reintroduced or translocated animals to determine their post-release survival and whether their welfare has been compromised (Macdonald 2009).

The rehabilitation of sick, injured or orphaned wildlife is a growing source, globally, of wild animals being released into the wild. In the UK, the Royal Society for the Prevention of Cruelty to Animal's (RSPCA) 4 wildlife centres admit over 14000 wildlife casualties annually. Release rates range from 25 to 90%, depending on species and reason for admission/severity of injury (Kelly & Bland 2006, Molony et al. 2007). Although 75% of admissions are birds, many orphaned mammals are also admitted, including hedgehogs *Erinaceus europaeus*, red foxes *Vulpes vulpes*, badgers *Meles meles*, pipistrelle bats (*Pipistrellus* spp.) and polecats *Mustela putorius*.

Polecats are widespread in western Europe, where their status is either uncertain or is showing signs of decline (Birks & Kitchener 2008). In Britain, although formerly widespread, the polecat was subjected to a severe range contraction and decline in numbers during the 19th century, resulting in its population being mainly restricted to a small refuge in mid-Wales by the early 20th century (Langley & Yalden 1977). This decline was largely due to intense persecution by gamekeepers, associated with sporting estates (Langley & Yalden 1977, Packer & Birks 1999). However, the range of polecats has expanded in Britain over the last 5 decades, largely due to reduced persecution, an increase in the numbers of rabbits *Oryctolagus cuniculus* and because they are habitat generalists (Blandford 1987, Birks & Kitchener 1999, Birks 2008). The polecat is now widely re-established in central England and Wales, with small, outlying populations in northern England and Scotland (Birks 2008). The population has been estimated at about 48000, representing an annual increase of 2.4% since 1997 (Birks 2008), mostly in England. Polecats are currently listed as a species of conservation concern and have recently been listed as a UK Biodiversity Action Plan (BAP) priority species.

Most recorded polecat mortality in Britain is due to anthropomorphic causes, with road traffic collisions (RTCs) being responsible for 68% of mortality in a population in the English Midlands (Birks 2000). Although males are generally more at risk of RTCs than females, during the main lactation and weaning period (June), females are more vulnerable to RTCs than males (Birks & Kitchener 1999). At this time of year, orphaned kits may be found by members of the public and brought to wildlife rehabilitation centres, where they are hand-reared and released later in the same year.

Unfortunately, many wildlife rehabilitators equate release back into the wild with success (Sharp 1996), and very little is known about the post-release survival of rehabilitated wildlife. Rescued wild-born and subsequently hand-reared animals may fare less well than animals raised in captivity by their parents. This could potentially result from poor diet in captivity (less than appropriate milk replacers for example), lack of opportunity to learn or develop social skills resulting in inappropriate social responses to conspecifics (particularly if imprinted on humans), lack of opportunity to learn how to hunt, lack of familiarity with local prey, and the possibility that rescued wildlife may be poor quality in relation to other individuals in the population. Captivity itself may result in increased cumulative effects of stress (Moorhouse et al. 2007). However, the effect of stress is rarely considered in translocation, reintroduction or wildlife rehabilitation programmes (Teixeira et al. 2007, Linklater et al. 2010). Yet, captivity may confer benefits, as animals can build up or replace fat reserves, which may be vital when relocated to a new area (Molony et al. 2006).

Wildlife rehabilitation is often criticised by conservationists as being of little value to the conservation of the species involved and a waste of time and resources (Sharp 1996). If rehabilitated wildlife casualties are unable to integrate with the wild population and demonstrate normal behaviour, their welfare may be compromised, the animals could suffer and many may be unable to survive. The wildlife rehabilitation community therefore has a responsibility to demonstrate that the post-release survival of rehabilitated casualties is sufficient to justify the rehabilitation process.

Some studies have focussed on the factors affecting the likelihood of release of rescued wildlife (Kelly & Bland 2006, Molony et al. 2007). These studies have demonstrated that it is possible to use factors such as body condition, age, sex and clinical diagnosis to determine the likelihood of release back to the wild. However, few studies have investigated the survival and behaviour of rehabilitated wildlife following release. In the UK, the RSPCA has recognised that the welfare of rehabilitated animals may be compromised if they do not have the skills required to survive in the wild following release. To that end, the RSPCA has recently embarked on a programme of post-release monitoring of a wide range of rehabilitated wildlife species, using survival as a benchmark of success. For example, the RSPCA has measured the post-release survival of hand-reared, orphaned pipistrelle bats (*Pipistrellus* spp.) using radio-tracking (Kelly et al. 2008) and juvenile tawny owls *Strix aluco* using both radio-tracking and leg-band recovery data (Leighton et al. 2008). These studies have demonstrated post-release survival times that justify the resources invested in the rehabilitation process. To our knowledge, RSPCA Stapeley Grange in Cheshire, UK, is the only wildlife rehabilitation centre in the UK to care frequently for and release orphaned polecats. Owing to the welfare concerns outlined above and the considerable resources invested in caring for these animals, it is vital that they are monitored post-release and their survival and behaviour assessed.

Here, we retrospectively examined the clinical record cards of polecats admitted to RSPCA Stapeley Grange Wildlife Centre between 1997 and 2008. We describe the reasons for admission and outcomes for adults and juveniles. We tested the hypothesis that hand-reared, orphaned polecats could survive independently in the wild by radio-tracking 32 orphaned polecats between 2005 and 2008 to measure their post-release survival. Rehabilitation was considered to be successful if the animals were still alive after 1 mo. In addition, a small number of released polecats were trapped (under licence from Natural England) following release to monitor their body condition. We discuss our results in the context of criticism aimed at wildlife rehabilitation and the ethical implications of interventions for the welfare of wildlife casualties.

MATERIALS AND METHODS

Admission reasons and outcomes. All polecats were examined by a veterinary surgeon on admission to Stapleley Grange, and those considered unsuitable for rehabilitation due to the severity of injury were euthanised to prevent further suffering. The reasons for admission were recorded as: collision (usually with cars); trapped; injury (cause unknown); weakness; orphan; other (abnormal behaviour, bite wound, tame). For individual recognition, all polecats suitable for rehabilitation were microchipped on admission using Animal Identification Transponders (12×2.12 mm, Petlog) implanted subcutaneously between the scapulae.

All polecats were weighed on admission and their body condition assessed. The following information was recorded: weight, age (adult or juvenile), sex, and date and location found. Age was determined by examining the teeth, pelage and in males whether the testicles had descended. Weight in relation to time of year when animals were admitted was also taken into account.

Orphaned juvenile polecat kits were socialised into groups of 4 to 5 to mimic the litter size found in wild polecats. Animals were kept in caged runs with a wood chip substrate measuring $7 \times 1.52 \times 2.44$ m (height $\times$ width $\times$ length), containing an area for them to sleep and plastic tubing to mimic rabbit burrows. Diet consisted of dead mice and fresh rabbit carcasses to give them the opportunity to deal with natural food sources.

Radio-tracking. Between 2005 and 2008, 32 fully-grown juvenile polecats were fitted with TW3 transmitters fitted on teflon collars (Biotrack), under sedation whilst undergoing a final veterinary health check 1 wk prior to release. Anaesthesia was induced by administering 5% isoflurane (Isoflo, Abbott Animal Health) by mask, with the animals allowed to recover in air following the health check and transmitter attachment.

The collars, including the transmitters, weighed approximately 15 g and accounted for less than 2% of the body weight of the polecats on release. The transmitters included a mortality sensor with the pulse rate doubling if the tag was stationary for 6 h or more. If the tag subsequently moved, the pulse rate was reset to the original rate, until the tag was stationary for a further 6 h. The battery life of the transmitters was approximately 3 mo, with an approximate range of 1 km.

Polecats were allowed to recover before being returned to their pens where they were observed for 7 d prior to release to ensure that the collars were not causing any welfare concerns. All polecats were weighed on the day of release.

Polecats were radio-tracked from 22:00 h to 06:00 h at night for 1 wk following release, with fixes being taken at 30 min intervals. An attempt was made to locate each polecat once during daylight (daily following release) until approximately 7 d after the last contact was made. Fixes were taken on foot, using triangulation to locate the focal animal (White & Garrott 1990).

Release protocol. In Britain, polecats are found in a wide range of habitats but are generally associated with lowland woodland edge, field boundaries and farm buildings in areas with high rabbit abundance (Birks 2008). Release sites were chosen to include these habitat types but also taking into account the proximity of game-rearing and busy roads. Abundance of rabbits was taken into consideration, as rabbits accounted for 85% of the diet of polecats in a West Midlands population study (Birks & Kitchener 1999). Most polecats were released between September and October (Table 1), which corresponds to the time that young wild polecats disperse from the mother (Birks 2008). One group of 3 polecats was released in November 2005 due to practical and operational reasons (Table 1). To maximise the chances of survival, a soft-release protocol was used for all juvenile animals. Once the juvenile polecats were deemed capable of independent living, a soft-release enclosed pen measuring 1.83 × 1.83 × 3.66 m (height × width × length), was constructed at the release site. The release pens were constructed in an area of shade and hidden from view to minimise disturbance to the animals. The pens consisted of a solid iron structure with 2.5 mm mesh and dug approximately

Table 1. *Mustela putorius.* Fate of all 32 polecats radio-tracked between 2005 and 2008. M: male, F: female. C1, C2, C3: release sites in Cheshire (England), NW: release site in North Wales, S: release site in Shropshire (England). RTC: road traffic collision. The figures in parentheses in the final column show the number of days post-release for those polecats subsequently found dead (RTC). Body weights on release include the weight of the collar (15 g). Dates are dd/mm/yy. NR: not recorded

Polecat	Sex	Release site	Release weight (g)	Release date	Last contact date	Fate	Days
1	M	C1	1808	17/09/05	05/10/05	Lost signal	18(172)
2	M	C1	1446	17/09/05	16/11/05	Lost signal	58(68)
3	M	C1	1578	17/09/05	17/11/05	Lost signal	59
4	M	C1	1712	17/09/05	06/10/05	Lost signal	19
5	M	C1	1594	17/09/05	12/11/05	Trapped alive	57
6	M	NW	2106	29/11/05	19/01/06	RTC	52
7	F	NW	942	29/11/05	19/12/05	Collar off	21
8	F	NW	1064	29/11/05	09/12/05	Collar off	11
9	F	NW	NR	20/10/06	22/10/06	RTC	3
10	M	NW	1183	20/10/06	02/11/06	RTC	13
11	M	NW	2074	20/10/06	11/11/06	RTC	22
12	F	NW	889	20/10/06	22/01/07	Lost signal	94
13	F	NW	998	20/10/06	22/01/07	Lost signal	94
14	M	C2	1735	03/10/07	31/10/07	Collar off	27
15	F	C2	975	03/10/07	15/01/08	Trapped alive, collar on	104(265)
16	F	C2	995	03/10/07	10/11/07	Collar off	39
17	F	C2	939	03/10/07	01/12/08	Trapped collar off	60 (258)[a]
18	F	C2	935	03/10/07	24/10/07	Lost signal	21
19	M	C3	1190	27/10/07	19/11/07	Lost signal	23
20	F	C3	830	27/10/07	07/02/08	Lost signal	103
21	M	C3	2070	27/10/07	05/12/07	Lost signal	39
22	M	C3	2200	27/10/07	05/12/07	Lost signal	39
23	M	C3	1700	27/10/07	30/10/07	Collar off	3
24	M	C2	1400	30/09/08	21/11/08	Lost signal	52(138)
25	M	C2	1395	30/09/08	13/10/08	Lost signal	13
26	M	C2	1435	30/09/08	19/11/08	Lost signal	50
27	F	C2	825	30/09/08	21/10/08	Collar off	21
28	F	C2	970	30/09/08	07/11/08	Lost signal	38
29	M	S	1326	09/10/08	03/11/08	Lost signal	25
30	F	S	795	09/10/08	06/11/08	Collar off	28
31	F	S	895	09/10/08	22/10/08	Lost signal	13
32	F	S	965	09/10/08	23/10/08	Lost signal	14

[a]Trapped alive on 1 December 2007 and then again on 17 June 2008

30 cm into the ground to prevent the polecats from escaping during the acclimatisation period. The pens were completed with soil substrate and fresh foliage. Bedding and plastic piping from their runs at Stapeley Grange Wildlife Centre were transported to the release pen with the animals. All release sites were chosen for their suitability of habitat and set up on private land with the landowners' consent. The polecats were allowed to acclimatise to their surrounding for approximately 7 d before release. During the acclimatisation period and for approximately 7 d after release, they were supplied with support feed (mice and rabbits). Five dead mice per polecat were provided at dusk on each day, and on Days 3 and 6, 1 fresh rabbit carcass was provided for the group. Support food in similar quantities was provided around the cage for 7 d after the release. The cage was left *in situ* for at least 7 d following release to minimise disturbance.

Trapping. Live-trapping was used to monitor the condition of released polecats. Trapping effort was carried out over a 3 wk period at a release site in Cheshire, under a licence issued to A. K. by Natural England. Ten single-ended mink traps measuring 16 × 18 × 59 cm (height × width × length) were baited with a dead mouse, placed at random around the release site in a 1 km^2 area and checked twice daily. Any trapped polecats were scanned to determine the presence of a microchip, weighed and immediately released.

Fig. 1. *Mustela putorius.* Percentage of adult polecats admitted to Stapeley Grange Wildlife Centre (Cheshire, UK) for different reasons between 1997 and 2008

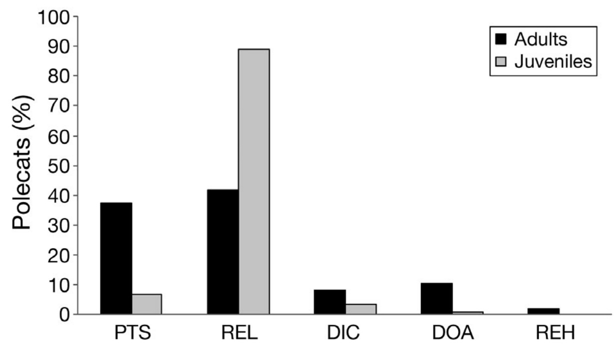

Fig. 2. *Mustela putorius.* Outcomes for adult and juvenile polecats admitted to Stapeley Grange Wildlife Centre (Cheshire, UK) between 1997 and 2008. PTS: put to sleep (euthanised), REL: released, DIC: died in care, DOA: dead on arrival, REH: rehomed

RESULTS

Admission reasons and outcomes

Adults

Forty-eight adult polecats were admitted between 1997 and 2008. Of those that were sexed (N = 43), 60.5 % were male. Admissions were recorded in all months, with the exception of May. The most common reason for admission was collision with a motor vehicle (51.5 %, Fig. 1). Admission weights ranged from 1041 to 2200 g (median = 1455 g) and 370 to 850 g (median = 694 g), for males (N = 18) and females (N = 12), respectively. The outcomes for all adult polecats are shown in Fig. 2. Twenty adults (41.6 %) were released back into the wild at the original recovery site. Adult males (57.7 %) were more likely to be released than females (29.4 %). Eighteen adult polecats (37.5 %) were euthanised to prevent further suffering, all but one of these less than 48 h following admission. Four adult polecats died in care, despite treatment, all within 48 h of admission. Time in captivity for released adult polecats ranged from 1 d, for those returned to the wild on the same day, to 42 d (median = 11 d).

Juveniles

Eighty-nine juvenile polecats were admitted between 1997 and 2008, of which 52 % were male. The majority of juveniles (70 %) was admitted in June and July of each year. Eighty (91 %) of these were described as 'orphans', with 5 (7 %) being the victims of collisions with motor vehicles. A further 2 (3 %) had sustained injuries for which the cause was uncertain, and 1 juvenile was rescued after becoming trapped in a compost bin. On admission, weights ranged from 68 to 942 g (median = 350 g) and 32 to 750 g (median = 397 g) for males (N = 16) and females (N = 19), respectively. Fig. 2 shows the outcomes for all juvenile polecats admitted between 1997 and 2008. One juvenile polecat was dead on arrival, and 6 were euthanised to prevent further suffering, either on admission or within 48 h. Three died within 48 h of admission, despite treatment. Seventy-nine juveniles (89 %) were subsequently released back into the wild; of these, 49% were male. Time in captivity for those individuals subsequently released ranged from 7 to 155 d (median = 83 d).

Radio-tracking

Between 2005 and 2008, 32 juvenile polecats (17 male and 15 female) were fitted with radio-tracking collars prior to release. All releases took place from mid-September to late November and according to the same protocol (see 'Release protocol'). The release weights (including the collar) ranged from 795 to 1064 g (median = 941 g) and 1183 to 2200 g (median = 1594 g) for females and males, respectively. The fate of all 32 polecats is shown in Table 1. Seven polecats lost their collars; these were retrieved, 3 to 39 d post-release (median = 21 d). The signal was lost for 18 polecats, 13 to 103 d post-release (median = 38.5 d). Loss of signal indicated that either the animal had moved out of range and could not be found, the battery life of the transmitter had expired, transmitters had failed or that the animal had died and the transmitter had simultaneously failed. Four polecats were killed in RTCs, 3 to 52 d post-release. A further 3 polecats were trapped alive, 57, 60 and 104 d post-release, respectively. Three of the polecats for which the signal was lost and the polecat that was trapped alive after 104 d were subsequently the victims of RTCs 68 to 265 d post-release (Table 1).

Trapping

Two female polecats were trapped alive, following release in October 2007. One was trapped on 6 occasions between 23 November 2007 and 17 June 2008 (having survived for 258 d) and the second on 5 occasions between 27 November 2007 and 15 January 2008. The latter was subsequently found dead, the victim of an RTC, on 24 June 2008, having survived for 265 d post-release. There was considerable change over time in their body weights (Fig. 3). Female 1 had lost 31% of her release body weight after 258 d, and Female 2 lost 18% of her body weight within 104 d.

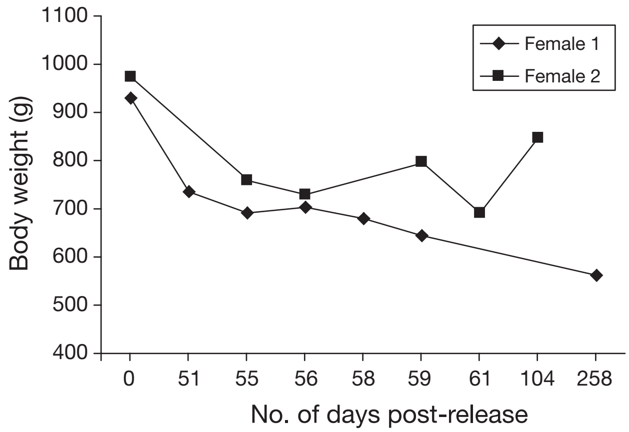

Fig. 3. *Mustela putorius.* Body weights of 2 female polecats trapped on several occasions following release. Female 1 was trapped alive for the final time 258 d post-release, and Female 2 was trapped for the last time 104 d post-release. Female 1 was subsequently found dead (road traffic collision) 265 d post-release

DISCUSSION

The data presented here provide evidence that orphaned and rehabilitated polecats can survive in the wild following release. Of the 32 radio-tracked polecats, 81% were alive after 14 d, and a minimum of 50% were still alive after 1 mo. This compares favourably with the survival of captive-bred European mink *Mustela lutreola* released in Germany as part of a reintroduction programme, in which a minimum of 60% and 48% were confirmed alive after 14 d and 1 mo, respectively (Peters et al. 2009). In that study, 42% of captive-bred mink fitted with intra-peritoneal transmitters died (1 to 86 d following release). However, the fate of 18 radio-tracked animals was unknown, as the signal was lost and these animals could also have died. In another European mink re-introduction project in Estonia, Maran et al. (2009) reported 59 and 30% alive after 14 d and 1 mo, respectively, with 37% confirmed as having died. For black-footed ferrets in North America, Biggins et al. (1998) reported only 30% still alive after 30 d. In the current study, only 9 polecats (28%) were confirmed to have died. However, the fate of the other 23, once the signal had been lost, is not known, and these animals may also have died. Although the 9 polecats confirmed to have died were the victims of RTCs, this cannot be seen as a failure of the rehabilitation process. Mortality as a result of RTCs is common in polecat populations, with up to 70% of juvenile polecats being killed on the roads in their first year (Birks 2008). We should expect a similar percentage of released polecats to be killed by RTCs. Indeed, RTCs are a major mortality factor for wildlife in general (Loos & Kerlinger 1993, Philcox et al. 1999, Fajardo et al. 2000). Polecats are known to take some food as carrion (Birks & Kitchener 2008), and this makes them vulnerable to being killed in RTCs as they may scavenge road-killed rabbits. It has recently been demonstrated that the presence of rabbits close to roads increases polecat mortality in a Spanish population (Barrientos & Bolonio 2009).

Of the 32 polecats radio-tracked in this study, 7 (22%) lost their collars within 3 to 39 d, 4 were killed by RTCs within 52 d (3 of these within 22 d) and the signal was lost for 18. It is not clear whether collar loss was the result of failure of the collar attachment or due to the animals losing weight and the collar becoming looser and subsequently falling off. However, all recovered collars were complete, suggesting that the animals may have lost weight and the collars slipped off. We cannot, however, be sure that collar loss is attributable to weight loss: 2 of the female polecats that were trapped in 2007 had lost up to 31% of bodyweight, but one of these had lost the collar and the other had retained it. Loss of signal could have been due to expiration of battery life, failure of the transmitter, death of the animal and failure of the transmitter, or the animal simply moving out of range and not being found. Transmitters were fitted with mortality sensors, which transmitted a constant signal if the transmitter had not moved for 6 h. Therefore, it is unlikely that an animal could die within range of the receivers and not be located unless the transmitter had been damaged. Five of the polecats for which the signal was lost were subsequently relocated. Three of these, tracked for 18, 52 and 58 d, were subsequently found freshly dead, victims of RTCs, 172, 138 and 68 d post-release, respectively. Two were trapped alive on several occasions up to 104 and 258 d post-release, respectively, with the former being found dead 265 d after release, the victim of an RTC. The data for these 5 polecats suggest that those animals for which the signal was lost may have simply moved out of the area and despite extensive searches were not re-discovered. However, we have no knowledge of the fate of the 13 polecats for which the signal was lost, and they may well have died. One of those subsequently relocated (found dead after 68 d) was found to have remains of a wild rabbit in its stomach on post mortem, indicating that it had been feeding on natural food sources, although it could have scavenged a road-kill rabbit, making it vulnerable to being killed by an RTC. Two female polecats were trapped on several occasions and were found to have lost 31% and 18% of their body weight. One was subsequently found dead (the victim of an RTC) 265 d post-release. On release, these 2 females weighed 975 and 930 g, within the range for female polecats in the West Midlands (Birks & Kitchener 2008), but 24 and 18%, respectively, above the mean (787 g). Unfortunately, we were only able to trap a small number of released polecats, and more trapping effort is required to assess long-term survival and body condition.

Wildlife rehabilitation is often criticised as having no conservation value and being a waste of time and resources (Sharp 1996). However, wildlife rehabilitation is usually undertaken from an animal welfare perspective. The failure of many reintroduction or translocation programmes may compromise the welfare of individual animals involved in these projects. Although Griffith et al. (1989) reported a low success rate for translocations, a review of these programmes indicated an increase in the number resulting in self-sustaining populations, with 67% subsequently being described as successful. However, Fischer & Lindenmayer (2000) reported that only 26% of 116 programmes could be described as successful, although a further 47% were uncertain. We do not know what percentage of successful or failed projects fulfilled IUCN guidelines or used suitable release stock (IUCN 1998). Given that translocation and reintroduction programmes using wild-caught animals are more successful that those using captive-bred animals (Griffith et al. 1989, Wolf et al. 1996, Fischer & Lindenmayer 2000, Hayward et al. 2007, Jule et al. 2008), rehabilitated wildlife may be a valuable source of animals for conservation programmes if it can be demonstrated that rehabilitated wildlife can survive independently following release. For example, the reintroduction of rehabilitated orangutan *Pongo pygmaeus* and Bornean gibbons *Hylobates muelleri* has contributed to the conservation of these critically endangered species (Cheyne 2007, Russon 2009). Wildlife rehabilitation can make a valuable contribution to the reintroduction and conservation of endangered species. We believe that rehabilitated polecats could be used to reinforce or supplement existing populations or could be reintroduced to former parts of their range, circumstances that would fulfil the IUCN guidelines on reintroductions (IUCN 1998, Macdonald 2009).

There are thought to be in excess of 650 wildlife rehabilitation centres in the UK, with as many as 30 000 to 40 000 animals being taken into care annually (Molony et al. 2007). However, this ‘profession’ is largely unregulated and has no governing body responsible for setting and monitoring standards. In addition, there is no requirement for formal training as there is in much of the USA. Consequently, there is little scientific basis for the work and little information about what is being achieved. Return to the wild is often seen as ‘success’, despite the fact that in most cases wildlife rehabilitators have little or no knowledge of the post-release survival of wildlife casualties. This has clear and obvious implications for the welfare of the animals involved. Some rehabilitators view euthanasia as a failure, rather than a welfare tool, and those that do use euthanasia as a welfare tool, such as the RSPCA, are often criticised for it. The ethics of interventions for the welfare of free-living wild animals were discussed by Kirkwood & Sainsbury (1996). They suggested that wildlife rehabilitation is justifiable under certain conditions, particularly where human activities have directly or indirectly resulted in the requirement for intervention. Euthanasia on welfare grounds is justifiable if wildlife casualties are unlikely to recover and are in pain or distress. This forms the basis of the RSPCA policy on wildlife rehabilitation, which states that rehabilitation will only be attempted if there is a good chance of return to the wild.

There is now a body of evidence emerging that wildlife rehabilitation is successful based on the post-release survival of the animals involved (Leighton et al. 2008, Kelly et al. 2008, present study). Kelly et al. (2008) radio-tracked 5 hand-reared, orphaned pipistrelle bats for between 5 and 10 nights, demonstrating that these animals were able to survive, at least in the short term. A further 10 bats have since been radio-tracked for similar time periods, and 6 ringed bats exhibited minimum post-release survival ranging from 27 to 236 d (A. Kelly unpubl. data). Using radio-tracking and leg-band returns, Leighton et al. (2008) showed that hand-reared, orphaned tawny owls could survive independently in the wild. Thirteen birds were radio-tracked for between 16 and 84 d (median = 38 d). Thirty-five percent were radio-tracked for more than 6 wk, the time period considered to indicate successful rehabilitation of raptors, since the birds are clearly capable of hunting independently (Martell et al. 1991, 2000). Leg-band returns demonstrated longer-term survival. Of 112 birds banded, 18% were recovered, with the time elapsed between release and recovery ranging from 1 to 2246 d (median = 123 d). The leg-band recovery data showed that 65% survived longer than the critical 6 wk period (Leighton et al. 2008).

We believe that the rehabilitation and release of polecats in the UK serves a useful conservation purpose but is also justified from an animal welfare perspective. In the future, we hope to compare our post-release survival data for wild-born, orphaned polecats with those for captive-bred polecats when those data become available. In the meantime, we recommend that wildlife rehabilitators undertake more post-release survival work to determine whether their methods of rehabilitation can be considered successful. We would also encourage further collaboration between wildlife rehabilitators, conservationists and ecologists to examine the merits of wild-born individuals versus captive-bred individuals for use in reintroduction or translocation projects.

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