

Paper

A review of RSPCA research into wildlife rehabilitation

A. Grogan, A. Kelly

Wildlife rehabilitation is defined as 'the treatment and temporary care of injured, diseased, and displaced indigenous animals, and the subsequent release of healthy animals to appropriate habitats in the wild' (Miller 2012). Vets are frequently presented with wildlife casualties and although there are a number of texts available to help vets with the treatment of wild animals, such as the BSAVA Manual of Wildlife Casualties (Mullineaux and others 2003) and papers produced by experienced wildlife vets (eg, Bexton and Couper 2010, Couper and Bexton 2012), there still remains questions regarding which individual animals can, or should, be treated, which animals will survive treatment and which animals will survive after they have been released back to the wild. The RSPCA believes that the welfare of wildlife casualties can be improved by investigating which injuries or illnesses are most likely to result in a successful release for each species, and by collecting data on postrelease survivorship. As a result, there have been a number of papers published based on the work of the RSPCA's four wildlife centres: East Winch in Norfolk, Mallydams Wood in East Sussex, Stapeley Grange in Cheshire and West Hatch in Somerset. This paper summarises this research, to guide those in the profession with an interest in this subject to papers that may prove useful to them.

Review of admissions

All wildlife casualties admitted to the RSPCA's four wildlife centres are logged onto a database so that each casualty can be identified and its record retrieved and analysed. Variables recorded on admission (where possible) include: species, age, sex, location found and reason for admission. The latter can cause some debate; often the reason for admission as described by the person presenting the animal may bear no relation to the ultimate diagnosis. For example, a fledgling found on the ground with no apparent injuries can be admitted as an orphan, and then subsequently identified as a cat (*Felis catus*) victim following detailed examination by an experienced vet. The veterinary diagnosis is therefore recorded retrospectively.

The data on the RSPCA's database, along with more detailed medical records, can be analysed, providing information that can assist in the prognosis of some casualties. For instance, the RSPCA commissioned the University of Bristol to conduct an analysis of medical records for eight different species admitted to its centres between 2000 and 2004. The species involved were the blackbird (*Turdus merula*) (n= 680), the house sparrow (*Passer domesticus*) (n= 543), the tawny owl (*Strix aluco*) (n= 587), the starling (*Sturnus vulgar-*

is) (n= 629), the fox (*Vulpes vulpes*) (n= 780), the hedgehog (*Erinaceus europaeus*) (n= 754), the badger (*Meles meles*) (n= 548) and pipistrelle bats (*Pipistrellus* species) (n= 666) (Molony and others 2007).

Many of the data analysed were categorical (eg, sex= male or female) or ordinal (eg, time in care= number of days) and animals that were euthanased or died within 48 hours of admission were excluded. Other factors used in the analysis had to be categorised; for instance, to categorise severity of illness/injury, the researchers used the notes made by the attending vet to produce six categories, with a range of 1= no apparent damage/injury to 5= moribund and/or blind and/or fractured pelvis (6 was an additional category to denote ocular injuries in owls). A similar scoring system has been used in an analysis of injured birds of prey submitted to Calgary Zoo in Canada (Brookfield and others 2005).

The results showed that the RSPCA's wildlife centres are typical of other wildlife centres around the country – around 40 per cent of casualties are released, which compares favourably with the 42 per cent recorded in a survey for the British Wildlife Rehabilitation Council (BWRC) (Kirkwood 2003). The factors analysed had no significant effect on the outcome, with one exception: severity of injury was important across all species. This analysis highlights the need for a sound triage policy as it indicates that those animals with a greater severity of illness or injury were less likely to be released. Animals with injuries like complex fractures or deep tissue wounds not only had poor release rates, but also had longer periods in care, which raises questions about the welfare of such casualties. Poor triage equals poor welfare as any wildlife casualty admitted into care will be stressed, not just from its injuries, but also from being in close proximity to people and unfamiliar surroundings. Such stress will not be conducive to recovery and this must be considered when deciding on the fate of casualties. Cost may also be a consideration here. Any veterinary intervention will incur a cost and major surgical treatment can be expensive. So if it is unlikely that the animal can be returned to the wild, can the cost of surgical treatment be justified? This is all part of the ethical landscape in which veteri-

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narians and wildlife rehabilitators must work and decisions regarding the treatment of a casualty must be taken with a true sense of perspective.

Reviews of admissions to wildlife centres can be found in the literature, but there is an apparent bias towards birds of prey. Some examples are a study by Calgary Zoo (Brookfield and others 2005), a review of raptor admissions to a wildlife centre in Tenerife (Rodriguez and others 2010), and a review that looks at the causes of morbidity in wild raptors admitted to a centre in Spain (Molina-Lopez and others 2011). More general reviews are scarce: one reports on the admissions at a rehabilitation centre in South Africa (Wimberger and Downs 2010) and in a second paper, comments that the lack of research leads to variations in the treatment and care of wildlife casualties (Wimberger and others 2010).

Some studies have focussed on one particular species. Kelly and Bland (2006) reviewed the data for 205 European sparrowhawks (*Accipiter nisus*) admitted to Stapeley Grange between 2000 and 2004. They reported that admissions for this species were largely seasonal, with most birds being admitted between July and September. Collisions or other traumatic injuries accounted for the majority of cases (70 per cent) and only 24 per cent of casualties were released. Again, the veterinary treatment notes were used to define five categories of clinical diagnosis: 1 = concussion/head trauma, 2 = fracture, 3 = undetermined trauma, 4 = no apparent damage, and 5 = other. The biggest single diagnosis was the fracture of wing bones, with the location (eg, radius or ulna) and type of the fracture being important factors in determining the fate of the bird. In addition, many birds had multiple fractures and head trauma consistent with collision injuries. Only 12 of 110 birds diagnosed with such fractures were released, which concurs with previous studies that stated the more severe the injury, the less likely the animal is to be released (Molony and others 2007).

Kelly and others (2011) examined the factors influencing the release of 2653 woodpigeons (*Columba palumbus*) admitted to Stapeley Grange between 2005 and 2009. Juveniles accounted for 68 per cent of the sample and many were admitted as 'orphans', while many adults were admitted with injuries where the cause was unknown. However, the second most common reason for admission for both adults and juveniles was that they had been attacked by cats. Again, severity of injury was a significant factor as to whether a bird was released or not, along with age and weight on admission. Juveniles (31 per cent) were more likely to be released than adults (14 per cent).

These papers provide similar conclusions: the more severe the injury or illness, the less likely it is that the animal will be released, let alone survive in the wild. Many vets would probably not hesitate to euthanase a wood pigeon presented at their surgery but they might well be tempted to treat a sparrowhawk or a peregrine falcon (*Falco peregrinus*). However, these papers would indicate that severity of injury remains a decisive factor across many, if not all, species and so the decision to treat should be the same regardless of whether the species is perceived to be endangered or not.

Veterinary treatment

RSPCA vets have a wealth of experience in treating wildlife and at least nine papers have been published by them in veterinary journals to assist vets in the clinical diagnosis and treatment of wild animal casualties. Examples of these include the treatment of road casualty badgers (Cousquer 2005a) and avian casualties (Cousquer 2005b), and the veterinary care of the hedgehog (Robinson and Routh 1999) and the mute swan (*Cygnus olor*) (Cracknell 2004, Routh 2000). More recent examples are on the veterinary care of British bats (Bexton and Couper 2010) and owls (Couper and Bexton 2012).

Some papers also provide more detail on particular cases of interest, such as the ophthalmological findings in wild tawny owls admitted to one RSPCA centre (Cousquer and others 2010) and the management of a roe deer (*Capreolus capreolus*) casualty (Benato and Bexton 2011).

Survival to release

A previous study estimated the number of wildlife casualties admitted to wildlife rehabilitators in the UK at between 30,000 and 40,000

a year (Molony and others 2007). To test this, we used a list of 123 rehabilitators based in England and Wales, and looked for information on their websites regarding the numbers of wildlife casualties they received during 2011. Of these, 23 provided either an annual estimate or a specific figure for the number of admissions in 2011. The total number admitted, based on this information, was 54,526. If we add to this the 16,639 admitted to the RSPCA's four wildlife centres, there were at least 71,000 wild animals admitted to wildlife establishments in 2011. Assuming the estimates on these websites are accurate, this means that at least double the number of casualties are admitted to rehabilitation centres than Molony's original estimate.

Assuming a release rate of 40 per cent, over 28,000 rehabilitated wild animals were released in the UK in 2011. Many rehabilitators consider releasing an animal to be the measure of success (Fig 1). However, the RSPCA believes that success in wildlife rehabilitation is the successful integration of the casualty animal back into the wild; the animal should have as good a chance of surviving in the wild as its wild counterpart. Rehabilitation should only be attempted when it is believed that there is a good chance that this will be the case. The RSPCA does not, for instance, release animals that have had limbs amputated, even into secure environments. It does not believe these animals will be able to integrate with the wider population.

Where an animal is expected not to survive, or to remain permanently disabled or otherwise unfit for life in the wild, then it should be euthanased as soon as possible to prevent further suffering. Exceptions to this policy may be considered where the quality of life of the animal in a captive or semi-captive environment can be assured; however, this is seldom the case. It could be argued that keeping disabled wild animals in captivity may cause more suffering if it is not possible to ensure a suitable quality of life for the lifespan of the animal. For example, hedgehogs with amputated limbs are unable to groom properly (Bullen 2002) and may become infested with *Caparinia* species mites and ticks on the ipsilateral side.

Postrelease survival

To be confident that rehabilitated animals can survive in the wild, they need to be tracked using methods commonly employed by wildlife biologists. Such work has been done before, for example, Bristol University, funded by the RSPCA, not only showed that many 'orphan' fox cubs were not, in fact, orphans (Robertson and Harris 1995a), but also demonstrated the benefits of radiotracking by showing that foxes that were released using soft release pens (where an enclosure is used to acclimatise the animal before release) have distinct advantages over those that were not (Robertson and Harris 1995b). More recently, the RSPCA's four wildlife centres have been using radiotracking and, in one case, satellite tracking to collect data on the survival of rehabilitated animals. These data, along with data obtained using other methods, eg, the bird-ringing scheme maintained by the British Trust for Ornithology (BTO), provide us with important information about the survival of casualties after release.

One study undertaken on four tawny owls released from Stapeley Grange showed that three of the birds survived beyond 28 days and that, based on an analysis of pellets found, they appeared to be foraging successfully (Bennett and Routh 2000). Leighton and others (2008) then studied another 16 rehabilitated tawny owls, 13 of which were tracked for between 13 and 81 days, and six were tracked for more than six weeks, thought to be the critical period for rehabilitated raptor survival (Martell and others 1991, 2000). Additional data was obtained from ring recoveries; of 112 tawny owls ringed in RSPCA centres between 1995 and 2003, 18 (16 per cent) have been recovered, six live and 12 dead, with 12 birds surviving beyond six weeks and seven birds surviving more than one year after release. The survival rates from these studies compare favourably with an 18.7 per cent ring return rate for young wild tawny owls ringed in Finland (Francis and Saurola 2004). Further research has shown that tawny owls will survive perfectly well if hard released, as opposed to being soft released from an aviary (Griffiths and others 2010).

Other species being studied include blackbirds, little owls (*Athene noctua*), jackdaws (*Corvus monedula*), buzzards (*Buteo buteo*) and collared doves (*Streptopelia decaocto*), along with several species of mammal. The numbers of 'orphaned' polecats (*Mustela putorius*) being admit-

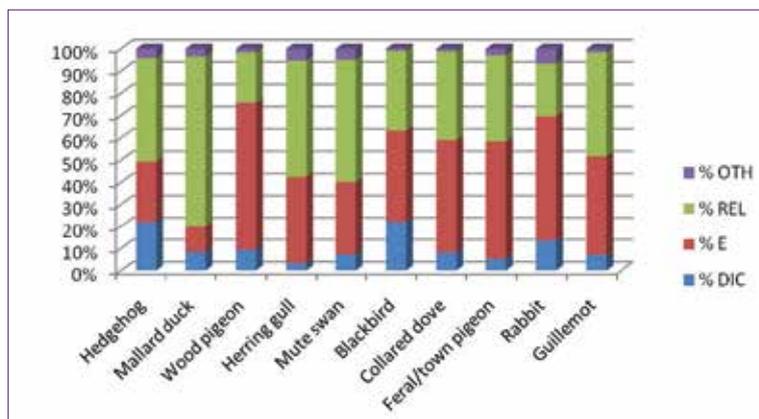


FIG 1: The outcomes from wild animals presented to RSPCA veterinary practices. DIC Died in care, E Euthanased, REL Released, OTH Other

ted to Stapeley Grange has been steadily increasing over the years. This species is of conservation concern as its distribution was recently restricted to parts of Wales, but it is now recolonising parts of western England. The rehabilitation of this species could help in its conservation and so radiotracking is important from both an animal welfare and conservation perspective. A total of 137 polecats were admitted to Stapeley Grange between 1997 and 2008, of which 89 were 'orphans' (Kelly and others 2010). A total of 43 per cent of adults and 89 per cent of juveniles were subsequently released, with 32 juveniles radiotracked between 2005 and 2008. Of these, 26 were still alive after 14 days and at least 16 were still alive after one month. In total, the signal was lost for 18 animals between 13 and 103 days; two animals were trapped and collars removed (on day 57 and 104) as part of the ongoing monitoring programme; four animals were killed by cars (between three and 52 days) and eight animals shed their collars (between three and 60 days). Five of the surviving polecats were subsequently either retrapped (after 265 days) or found as road traffic casualties (between 68 and 265 days). These data indicate that 'orphaned' polecats are not disadvantaged by rehabilitation. It is acknowledged that a certain number will die by various causes, but it is estimated that road traffic accidents (RTAs) alone account for up to 70 per cent of polecat deaths during their first year (Birks 2008).

Pipistrelle bats are another mammal that the RSPCA has tracked after release. Many juvenile bats are 'orphaned' every year and there are many bat carers around the country that rear and release them, but others were more reluctant to do so, believing that preflight juvenile bats could not be released back to the wild (Stebbing and Walsh 1989). Some initial radiotracking of hand-reared orphaned bats indicated that this was indeed the case as all of the five bats in question were taken back into care within 48 hours of release (Kelly and others 2008). It was concluded that bats need more flight experience before release and so the RSPCA built a bat flight (as pictured in Bexton and Couper 2010) where juvenile bats could exercise freely and forage on wild food. Five bats were released from this flight cage in 2006 with radiotransmitters attached and were tracked for between five and 10 nights, indicating that they could adapt to life in the wild (Kelly and others 2008). At least two of the bats in this study were tracked for 10 days; unfortunately, the battery life was limited due to the size of the tag (0.35 g), which in turn is limited by the size of the animal. Another 10 bats have since been tracked with similar results. In addition, all bats were ringed with aluminium C-rings (provided by The Mammal Society) fitted to the forearm. One ringed bat subsequently returned to one of the bat boxes at Stapeley Grange 1300 days after release. This bat was lactating and so may have entered the breeding population (Kelly and others 2012). Further evidence on rehabilitation success for bats has been shown for Kuhl's pipistrelle (*Pipistrellus kuhlii*) (Serangeli and others 2012), where the authors report survival for up to 14 days. The use of facilities for exercising animals prerelease has been reported before, but for birds of prey rather than bats. Fitness programmes for peregrine falcons and brown goshawks (*Accipiter fasciatus*) were shown to improve the birds' chances of survival after release (Holz and others 2006). The RSPCA has since built two specialist flight aviaries for birds of prey at its centres and more are planned.

The RSPCA has also used satellite tracking for investigating the survival of rehabilitated common seals (*Phoca vitulina*) (Morrison and others 2011). Seals are wide-ranging marine mammals, capable of travelling long distances and so are difficult to track using very high frequency (VHF) technology. In 2003, the RSPCA was offered the opportunity to work with the Sea Mammal Research Unit (SMRU), based at St Andrew's University, to track some rehabilitated common seals alongside wild common seals that were being tracked as part of separate project. Six rehabilitated seals that had been fitted with satellite transmitters (as described by Fedak and others 2002) were released into the Wash in February 2004. The transmitters not only relayed the seals' position via satellite, but also provided information on dive depth and duration. The rehabilitated seals were tracked for a mean of 126.2 days (± 27.48 ; shortest= 100 days, longest= 175 days), similar to that for non-rehabilitated seals. Furthermore, there appeared to be no significant difference in the diving abilities of the rehabilitated and non-rehabilitated seals based on percentage of time at sea spent diving (Morrison and others 2011). However, the rehabilitated seals ranged more widely; one seal originally found abandoned in Kent returned to that area and travelled widely in the English Channel.

There are a limited number of postrelease studies described elsewhere in the literature. Fajardo and others (2000) reported on the survivorship of rehabilitated barn owls (*Tyto alba*) in Spain and Allbritten and Jackson (2002) gave a summary of the survival of Western Screech owls (*Otus kennecottii*) in Oregon, USA. There have also been a number of studies on hedgehogs (Morris and others 1993, Morris and Warwick 1994), some of which have been reviewed in this journal (Morris 1998), that appear to demonstrate that this species is also capable of surviving the rehabilitation process.

There have been many studies on the survival of reintroduced or translocated animals; such studies are often essential for the conservation of species and practitioners need to know if the animals survive. There are many reintroduction programmes in progress but, unfortunately, many fail for a variety of reasons, such as stress (Teixeira and others 2007). Translocations, or reintroductions using animals sourced from the wild, as opposed to captive-bred populations appear to have a better success rate possibly due to wild-bred animals having an innate ability to survive (eg, McDougall and others 2006, Jule and others 2008). Translocations mimic, in many ways, rehabilitation, especially with 'orphaned' animals which, having been admitted to the centre, usually require very little veterinary treatment and are reared until they reach a suitable age for release. Some have argued that rehabilitation could act as a model for reintroductions (Kelly and others 2010), with conservationists learning from the methods used by welfarists (Harrington and others 2010). One example of this, although it is not acknowledged as such, is a project where non-viable bearded vulture (*Gypaetus barbatus*) chicks are removed from the nest and reared for reintroduction programmes (Margalida and others 2010).

Conclusion

In summary, this review indicates that, of the species studied, rehabilitated wild animals do have a good chance of surviving back in the wild. However, radiotracking, while good for assessing short-term survival,

does not usually allow us to follow an animal for extended periods of time to see if the animal becomes part of the breeding population. Ringing, and other forms of marking, can provide more information about longer term survival, but this is limited unless more visible 'Darvic' rings are used, such as those currently deployed on herring gulls (*Larus argentatus*) and mute swans. Admissions are another restricting factor; most of the animals that have been studied have been juveniles because they provide a good sample size and because they are often released as a group in the same place. Juveniles are also of greater concern as they have little or no experience of life in the wild and so may lack the skills necessary for survival. Adult animals have more life skills but because they suffer various injuries this creates a more complex set of variables, and because they are returned to the point of capture, they are often more difficult to study. Some initial work has been done on adult sparrowhawks to complement existing work (Kelly and Bland 2006), but it has been limited due to a lack of suitable candidates admitted to the RSPCA's centres.

The knowledge gained from this research has helped the RSPCA to develop protocols for wildlife rehabilitation. Further research is required to answer particular questions relating to certain techniques and there are other species for which some basic data are required. The RSPCA continues to work with universities and other external researchers, for example, there are currently two projects at Swansea University, one of which, an investigation into the use of satellite telemetry for tracking rehabilitated oiled guillemots (*Uria aalge*), has already resulted in a literature review of the welfare implications of using such devices (Vandenabeele and others 2011). The RSPCA will continue to publish the results of such research in the most relevant journals and a full list of existing publications can be found at www.rspca.org.uk/sciencegroup/wildlife/currentresearch.

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