

THE BEHAVIOUR AND SURVIVAL OF REHABILITATED HEDGEHOGS (*ERINACEUS EUROPAEUS*)

P A Morris[†], K Meakin and S Sharafi

Biology Department, Royal Holloway and Bedford New College,
Egham, Surrey TW20 0EX, UK

[†] Contact for correspondence and requests for reprints

Abstract

Full 'rehabilitation' of sick and injured wild animals should include restoration to the wild. Few attempts have been made to discover the fate of released 'rehabilitated' animals, a significant omission in terms of animal welfare. They may die, unable to find adequate food or nest sites in unfamiliar places. They may be ostracized or even attacked by wild resident conspecifics.

*Eight 'rehabilitated' hedgehogs (*Erinaceus europaeus*) were released into farmland and radio-tracked to monitor their movements and nesting; they were also weighed frequently. Three wild hedgehogs caught on site were studied in parallel.*

Only one animal remained close to the release site throughout the eight week study. The rest scattered, perhaps seeking more familiar terrain. One animal died, possibly not having fully recovered from its original disorder. Of the seven others, three survived at least seven weeks, but two then met with accidental deaths (drowning and road kill). Contact was lost with four animals, but circumstances suggested that they were probably still alive at least five weeks after release. There was no evidence of negative interaction with local wild hedgehogs nor any indication of difficulty with foraging, nesting or finding their nests again. Body-weights were generally maintained or increased.

It is concluded that rehabilitated adult hedgehogs can probably cope well with release.

Keywords: *animal welfare, behaviour, hedgehog, rehabilitation, survival*

Introduction

For some, the term 'wildlife rehabilitation' means nursing sick and injured animals back to good health. In fact, for wild animals, the process should include successful restoration to a free-living existence on an equal footing with wild individuals. Many individuals and welfare organizations invest considerable resources such as time, facilities, money and emotional commitment in nursing sick and injured wildlife with the aim of returning them to the wild. However, there seem to have been few systematic attempts made to monitor the fate of these 'rehabilitated' animals. Many are released in places of presumed safety which are nevertheless unfamiliar to the creatures themselves. The animals may be attacked by established residents of their own species; they may also

become geographically disorientated. After a period of captivity they may lack stamina and the ability to locate (or recognize) sufficient food in their new environment.

At worst 'rehabilitation' may actually condemn the animals to death by starvation. Release to the wild without knowledge of what might happen, far from being a praiseworthy humanitarian act may in fact be inhumane and irresponsible, a waste of veterinary resources and also potentially illegal, constituting the abandonment of a captive animal.

The present study was set up specifically to monitor the fate of hedgehogs (*Erinaceus europaeus*) released from normal periods of veterinary care at the hands of the Royal Society for the Prevention of Cruelty to Animals (RSPCA).

The specific objectives were to explore four issues:

1. Geographical orientation

Do hedgehogs released in an unfamiliar place learn their way about or become disorientated?

Can they build suitable daytime nests and find them again on subsequent nights?

Do they establish a normal-sized home range and settle down within it?

2. Survival

What proportion of the released animals are still alive after three weeks - presumably long enough to have died of starvation?

What proportion succeed in the wild and are still alive after four and eight weeks?

3. Foraging success

Can the hedgehogs find sufficient food to maintain their body-weight and perhaps increase it?

Do they feed but inadequately, suffering progressive weight loss?

4. Welfare

Is the rehabilitation of hedgehogs, including return to the wild, in the best interests of their welfare and is farmland/village 'countryside' the best place to release them?

Methods

A previous study, with similar aims, was carried out in Yorkshire in 1986 (Morris *et al* 1991, Morris *et al* in press). Financial constraints limited it to three weeks and only four hedgehogs, one of which died. The present study, carried out in 1991, aimed to follow the fate of a larger sample of animals for a longer period.

Eight hedgehogs were provided by the RSPCA in a condition ready for release after varying periods of veterinary care. These were taken to Flatford Mill Field Centre in Suffolk (National Grid Reference: TM 0733), an area typical of places likely to be chosen by anyone wanting to release wild animals in 'the country', away from urban development. The Centre is surrounded by a mosaic of pasture, hay meadow and arable land, with hedges, copses and village gardens. Access by observers at night was facilitated by the paths and tracks which traverse it.

The hedgehogs were anaesthetized using Halothane (RMB Animal Health Ltd, Dagenham) to allow a small patch of spines to be clipped short. To these was glued a radio-transmitter ('Biotrack', Wareham, Dorset) giving each hedgehog a unique radio frequency which was used as its individual identity number. The transmitters incorporated a self-luminous tag which allowed visual location of animals at night from up to 50m away. As far as the authors know, the technique of marking the animals by radio-transmitters does not usually affect the overall behaviour of the animals. The hedgehogs were weighed and released immediately after recovery from anaesthesia, at dusk on the lawn adjacent to the Field Centre. No supplementary food was offered and no nest boxes were provided.

The radio-transmitters allowed the hedgehogs to be located from up to 300m away and the luminous tags aided precise location so that they could be recaptured. Position fixes were recorded by (x, y) coordinates on a map of the study area covering 1000m x 800m, ie 0.8 km². This is between 1.5 and 10 times the area of wild hedgehog home ranges reported from previous studies (Reeve 1982, Morris 1986, 1988). The coordinates were fed into a computer to calculate distances travelled and 'minimum convex polygon' home range areas. The latter are constructed by linking the outermost position fixes, with no re-entrant angles, and calculating the area of the enclosed polygon (Kenward 1987, White & Garrott 1990). Hedgehogs were also marked with quick-drying aerosol paint to allow recognition if the transmitters were lost, but unfortunately the paint marks only persisted for a few days. For at least the first week the animals were located every night if possible, and ideally at least once per hour during their activity periods. They were normally active for about eight hours per night. The hedgehogs were weighed when first found each night; the positions of their daytime nests were also located and recorded.

Throughout the study the weather was very warm and mostly dry. It was not dry for long enough to cause food shortages for the animals and there was often dew at night. Table 1 lists the animals studied.

The study occupied two periods between which the animals were not monitored for four weeks:

Phase 1 (12 July - 2 August 1991; three weeks)

Hedgehogs were released and all monitored as closely and frequently as possible every night.

Phase 2 (30 August - 6 September; one week)

Efforts were made to re-establish contact with as many animals as possible, weigh them and find their nests.

The Flatford area supports a thriving wild hedgehog population. At least 10 were seen or heard in the study area during the first three weeks (*Phase 1*), some of which were 'courted' by our released animals or vice versa. No aggressive incidents were observed.

Table 1 List of animals studied.

Identity number	Sex	Weight at release (g)	Source	Length of captivity	Notes
Released hedgehogs					
210	F	800	London N8	7 weeks	Caught in rat trap
215	M	850	Unknown	Unknown	
229	F	550	Unknown	5 weeks	Snuffly
249	F	665	Unknown	1 month	Weight 480g
274	F	895	Birmingham	3 weeks	
298	F	655	Stanmore	1 month	Ataxic, lethargic, weight 500g
315	M	790	Ealing	Unknown	Facial injury
350	M	840	King's Norton	1 month	Respiratory difficulties
Wild hedgehogs					
243	F	515			
271	M	730			
326	F	650			

One wild male and two wild females were caught, tagged, weighed, then released and monitored as control animals, in an attempt to establish a 'norm' with which the behaviour of released animals could be compared. More than three proved too many to cope with at the same time as the released animals, especially once the latter began to disperse widely.

Results

During *Phase 1* most of the animals remained on the study area or nearby, but became widely scattered and difficult to monitor regularly. One (229) sickened and died, having perhaps been released prematurely. Another (274) became entangled in undergrowth due to its transmitter snagging among grass and brambles. It suffered 'fly strike', but was rescued, cleaned up and released again.

On release, one animal (315), a fully adult male, immediately headed away at speed and did not return. He was recaptured and started off again, this time with a telephone number on its transmitter. Within a week he had disappeared off the study area and had been reported by telephone, having been seen in the gardens of East Bergholt, over 1km north of the original release point. He was still in the village, but further away, three weeks after release and had gained 80g in weight, a 10 per cent increase. He was not sighted again.

Another animal (210) fell into the river and swam to the other side. She was retrieved, but crossed the river at least twice more, heading westwards. She is probably the one reported later from Ardleigh, some 4km south of the original release point, being played with by a dog (see later, Table 3).

During our four week absence from 3 to 29 August, a local newspaper published an account of the study which elicited three telephone reports from the public. These indicated dispersal over unexpectedly long distances from the release point. One was from Stratford St Mary, 3km NW; a second from Ardleigh, 4km SW and a third from Brantham, 2km east. The identity of the animals is not known, only that they were in good health when last seen.

By week seven, one of the females (274) had travelled 2km south west to Dedham. It is not known how long she had been there, but she had increased her body-weight by about 20 per cent and was subsequently found to have substantial fat deposits (she was not pregnant). Her daytime nest was located among some outbuildings. Unfortunately, the following night she was killed by a car, suffering two broken legs and a ruptured liver.

Evidently some of the animals had now dispersed over an area in excess of 30 square kilometres. Despite extensive searches, driving over 50km of local roads, most of these animals were not re-located, nor were they among the four animals found dead on nearby roads during the search.

Orientation

In *Phase 1* the majority of animals (six out of eight - number 229 being dead and number 315 in East Bergholt) seemed to learn their way about very quickly. Crucially, they managed to locate suitable sites for daytime nests, eg under brushwood, in hedges, in brambles etc, and find their way back to these nests at the end of each night. In several cases a hedgehog would go to a new nest and then, at a later date, return to one it had used before. This suggests that the animals had successfully learned how to find their way about in their new environment. Table 2 shows the nesting pattern for number 210. It is exactly what would be expected from previous studies of wild hedgehogs (Reeve & Morris 1985, Morris 1988). Number 210's nesting pattern is particularly interesting because in warm weather, hedgehogs often do not bother to build a proper nest. They therefore do not need to return to the same place each day, or to a previously used place, yet our animals usually did so. The exception was number 298 who seemed to spend

Table 2 Nest sites used by hedgehog 210 during *Phase 1* of the study.

Date	Nest					
	A	B	C	D	E	F
	Habitat					
	Ivy hedge	Nettles & grass in garden	Cornfield hedge	Under cut branches on island	Field edge across river	Field edge across river
13.7.91	X					
14.7.91						
15.7.91		X				
16.7.91			X			
17.7.91	X					
18.7.91	X					
19.7.91				X		
20.7.91						
21.7.91						
22.7.91	X					
23.7.91	X					
24.7.91	X					
25.7.91	X					
26.7.91	X					
27.7.91	X					
28.7.91	X					
29.7.91	X					
30.7.91					X	
31.7.91						X

(X indicates site used: gaps indicate nights when nest not located)

every day in a new place. However, her exact location was often indeterminate, being in a relatively inaccessible copse, and all her daytime resting places were very close

together, within a 30m radius. Thus she was still displaying the typical pattern of foraging widely and returning 'home' each day.

By the end of the study, one female (249) had established a home range close to the original release point and remained within it. She foraged in the fields 100m east of the Field Centre and nested in the hedges and long grass bordering them. After three weeks her home range covered a total of 0.062km², it had expanded to 0.158km² (15.8ha) by the end of eight weeks. This is consistent with home range sizes expected for wild female hedgehogs from studies elsewhere on farmland (Morris 1988).

A second animal (298) had remained in the vicinity of the release point, having set up a regular pattern of foraging behaviour. Her transmitter became detached some time after the third week, leaving her undetectable and without positive identification. She is believed to be the animal found drowned in the river Stour at Flatford Mill in week seven of the study. This animal had the remains of transmitter glue on her spines. However, owing to the absence of distinguishing features she may have been the wild female (243) whose transmitter had been wrenched off previously by a member of the public - a female believed to be number 243 was found the night before the drowning. If this dead hedgehog was number 243, then it is hard to see how it managed to weigh, with a full stomach, less than it had 24 hours previously. Assuming the drowned animal was female 298, then it had abandoned its newly established home range, returned to the Mill and drowned in the river.

Survival

Of the eight released animals, one sickened and died of apparent respiratory difficulties within the first two weeks. After three weeks, long enough for the animals to die or starve if they were going to, seven animals (87.5%) were alive and well.

By week five, during our absence, the animals were no longer being regularly monitored. Nevertheless, reports of our hedgehogs had come in as a result of chance observations by members of the public. These and subsequent findings confirm that at least six (75%) were still alive at that time.

By the beginning of *Phase 2*, seven weeks after release, at least three (37.5%) were still alive (249, 298 & 274), all with enhanced body-weights; see below. The four animals not accounted for and which could not be found (210, 215, 315 & 350) probably include those reported by members of the public from Ardleigh, Brantham and Stratford St Mary (4km, 2km and 3km respectively from the original release point). All must have been in good health to have travelled so far and number 350 had certainly put on weight when last monitored by us in East Bergholt. At least some of these animals are likely to have survived.

Eight weeks after the release, three of the animals were known to be dead (one as a result of illness, one drowned, one killed by a car); a reminder of the hazards to which all hedgehogs are exposed. One, number 249, was known to be alive and four were unaccounted for (210, 215, 315 & 350), but unlikely to all be dead.

Thus, the bleakest analysis would suggest a minimum survival of 12.5 per cent after eight weeks, with the probability that at least one of the missing four was also still alive, ie a potential 25 per cent survival. A more positive summary would be that two of the eight died from accidents that could have equally befallen any wild hedgehog, and even then had survived at least seven weeks. Of the other five, at least one (ie 20%) had survived and several more had probably also survived in view of their apparent good health and long distance emigration. If the drowned hedgehog was in fact number 243, then number 298 has to be added to the list of animals unaccounted for and perhaps still alive; increasing the survival figures a little. Table 3 provides a summary.

Table 3 Known and presumed fate of eight released hedgehogs.

Identity number	Alive after 3 weeks	Alive at 4-5 weeks	Alive at 7 weeks	Fate at end of study, eight weeks after release
210	Yes	Probably	Unknown	Unknown; probably one last reported at Ardleigh as caught by dog week 4
215	Yes	Unknown	Unknown	Unknown
229	No	-	-	Died of respiratory difficulties, evidently not fully recovered from RSPCA treatment
249	Yes	Yes	Yes	Alive and well; still at Flatford
274	Yes	Yes	Yes	Killed by car
298	Yes	Yes	Yes	Probably drowned
315	Yes	Probably	Unknown	Unknown; possibly the one reported from Stratford St Mary in week 5
350	Yes	Probably	Unknown	Unknown; possibly it (or 215) was the one reported from Brantham in week 5

Foraging and body-weights

The warm humid nights and frequent dews offered ideal foraging conditions. A variety of habitats was also available. It was usually not possible to see what the hedgehogs ate, but two were observed to feed on dead rabbits, which were plentiful. Food was put out by local householders particularly for hedgehogs, but few of the released animals appear to have found it. An exception was the one believed to be number 298 which drowned nearby. Her stomach was very full of amorphous material, possibly milk-soaked bread

(it certainly looked unlike any of the hedgehogs' natural food items, which are normally diverse and have a clear structure); she had also been eating arthropods. A female (274) also ate food put out in another garden nearby. When found at Dedham, she was feeding on food scraps in punctured refuse bags, which she may have been opening herself. Number 315 is likely to have encountered food bowls in the gardens of East Bergholt, which may account for his large weight gain.

During *Phase 1*, most animals were weighed every night for up to 18 nights. Weights fluctuated widely from night-to-night, partly due to whether or not the animal had urinated or defaecated just before being weighed. Also, if the animal was among the first found and weighed that night its stomach might have contained 10-20g less food than if it had been caught and weighed several hours later. This made it unwise to interpret weight data unless there were several observations. No significance should be read into the variability of body-weights night-to-night. Curiously, the released animals seemed less variable in their individual weights than our three regularly monitored wild ones (see Table 4).

Table 4 Variation in body-weight (as indicated by the coefficient of variation, CV%) of released captive and wild hedgehogs over nights 1-18.

Identity number	n	Mean weight (g)	SD	CV% = SD/mean x 100 ^a
Released hedgehogs				
210	13	783.4	21.7	2.7
215	11	807.7	48.3	5.9
249	8	679.4	33.7	4.9
274	7	867.1	28.5	3.3
298	13	603.8	34.0	5.6
315	5	817.0	39.9	4.9
Wild hedgehogs				
243	9	578.0	42.5	7.3
271	7	789.3	47.1	5.9
326	7	627.0	41.6	6.6

^a Mean coefficient of variation percentages for released and wild hedgehogs are 4.5% and 6.6% respectively.

Daily weight fluctuations were sufficiently large to obscure trends. More important than daily weights is the trend over time to increase or decrease body mass. The *Phase 1* weight data for each animal were therefore subjected to regression analysis to reveal overall changes. Figure 1 shows regression lines for two of the hedgehogs. For number 210 the trend was upward, but not statistically significant, ie despite the fluctuations, it was maintaining its weight. For number 298 there appeared to be a downward trend, the only animal to show this, but it is still not statistically significant owing to the variations from day to day. This illustrates the potential dangers of drawing conclusions from data sets that are highly variable or too small. Only number 298 shows a significant change (decrease) in *Phase 1*; significant increases are shown by numbers 249 and 274 when *Phases 1* and *2* are combined.

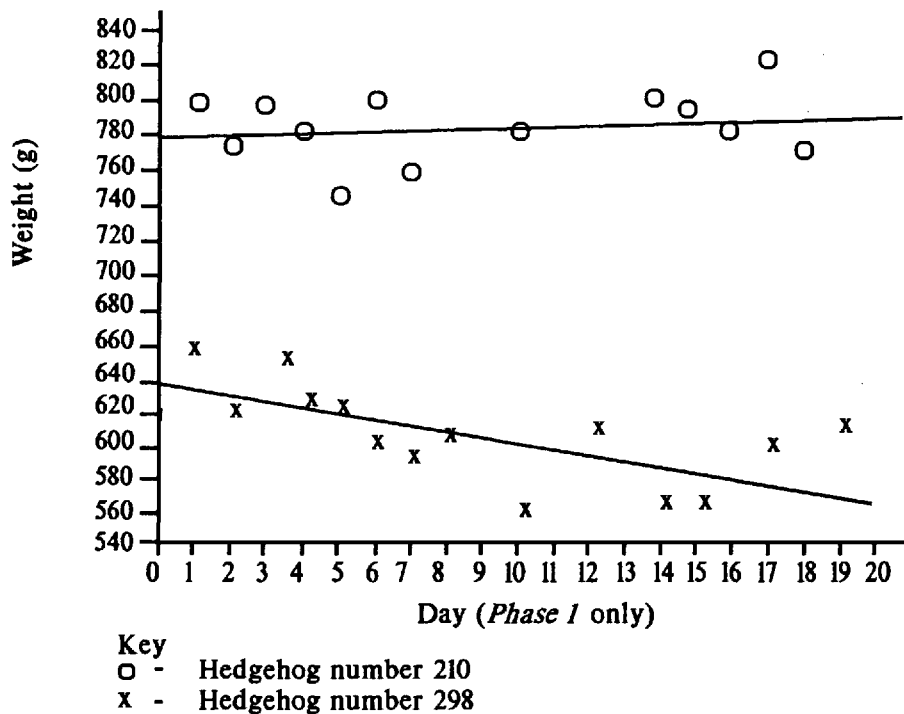


Figure 1 Daily body-weights of hedgehogs 210 and 298 during *Phase 1* showing regression (trend) lines.

Over the first three weeks, several animals showed a slight tendency to lose weight, but this was not statistically significant. Some initial weight-loss is to be expected as animals changed from captivity with abundant food and no exercise, to the reverse. One (315) definitely gained weight. Only one animal (298) appeared to be losing weight consistently. If she was the one drowned in week seven, she had managed to arrest that trend.

In *Phase 2*, only two of the released captive hedgehogs could be recovered and weighed again; numbers 274 and 249. Number 274 had gained substantially, weighing about 20 per cent above her previous mean body-weight. The weights for 249 during *Phase 1* fluctuated sufficiently that an apparent downward trend was in fact not statistically significant, indicating that she was generally maintaining her weight over the first three weeks. Over the whole study period, her recorded weights indicate a statistically significant upward trend, with a 15-20 per cent increase in her mean body-weight between *Phases 1* and 2 (Figure 2). This is particularly noteworthy because two of the wild hedgehogs living nearby (271 & 326) did not increase their weights over the same period. Thus number 249 was surviving at least as well as they were.

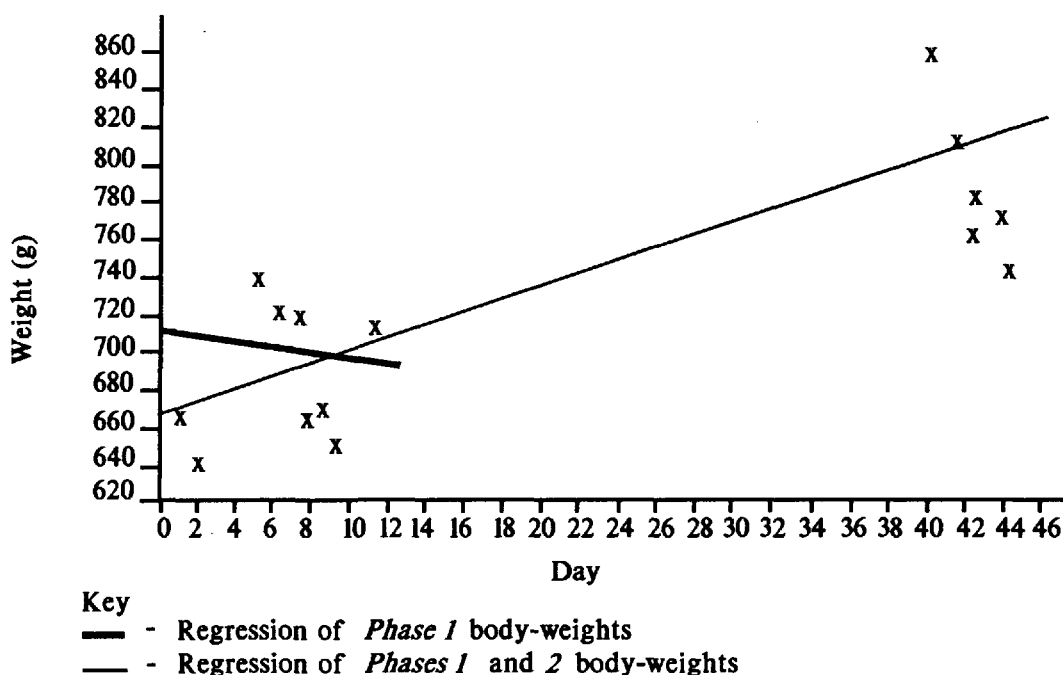


Figure 2 Regression lines of body-weight data for hedgehog number 249.

Comparison with wild hedgehogs

The three local wild hedgehogs (243, 271 & 326) were intended to provide a comparison with released captives; a yardstick against which their activity and success could be gauged. The concept of such a comparative study is undermined by individualistic behaviour. It is difficult to say what is 'normal', even with a large sample of hedgehogs. These three demonstrate this. Two were females, chosen because females tend to show less variability in their movements and are easier to monitor than males. However, one had a habit of appearing in the middle of the day and returning to her nest at odd times.

She frequented the National Trust tea garden where a visitor caught her and tore off the transmitter. We did not replace it in case this exacerbated any skin damage resulting from the incident. Thus her behaviour was aberrant and monitoring was truncated as a result of an unexpected intervention.

Otherwise the wild hedgehogs behaved as expected: they returned to regularly used nests and their home ranges were up to 0.014km² (1.4ha) per night and up to 0.15km² (15ha) cumulative. The home ranges encompassed fields and gardens and were similar in area to those of farmland hedgehogs elsewhere. The body-weights of numbers 271 and 326 showed no statistically significant increasing or decreasing trend, either over the first three weeks or over the eight week study period as a whole.

Public relations

Nocturnal radio-tracking inevitably causes disturbance to the human residents. The people of Flatford were very accommodating, once they knew our purpose: they also allowed free access to all gardens. The local public houses agreed to display posters asking for information about marked hedgehogs. It was this that led to a newspaper reporter publicizing the story, resulting in three of the essential reports indicating long distance emigration. Without these we would have had no idea of the fate of over half of the released animals beyond *Phase 1*.

The success of the present study owed much to local co-operation. This, and the generally high level of public interest and sympathy for the study revealed a genuine interest in hedgehogs and also warm support for the concern shown by the RSPCA for wild animals.

Discussion

The most conspicuous feature of this study is that at least half the study animals travelled more than 2km from the release site and never returned. This degree of emigration was remarkable because the environs of Flatford Mill appear to offer excellent hedgehog habitat. Hedgehogs are not territorial, so the departure of ours is unlikely to have been the result of aggression from the local animals. No aggressive encounters were observed and the first to depart (315) was a large fully adult male who should have been able to defend himself if necessary. Three of the four emigrants (215, 315 & 350) were males and previous studies (Reeve 1982, Morris 1988) suggest that these are likely to be more active than females. Even so such major movements were unexpected. A possible explanation lies in the fact that the released hedgehogs probably came mostly from urban situations (315 certainly did). Perhaps the animals' responses were due to being confronted with a totally unfamiliar environment. The emigrations may have been in search of more familiar terrain. This is partially borne out by the fact that number 315 immediately left the study area, was retrieved and departed again; but having reached the gardens of East Bergholt, he remained there for at least a week.

This may suggest that farmland and 'the countryside' is not after all the best place to release hedgehogs, especially if they originate from urban habitats. However, the success of number 249, and the abundance of wild hedgehogs, shows that the site was highly suitable for at least some individuals.

It has been suggested that hedgehogs should only be released in urban areas, though this may be seriously harmful to animals of rural origin. Moreover, the high density of traffic at night in urban areas might substantially increase the mortality rate among released animals, especially if they wander instead of quickly settling down. Perhaps our animals should have been provided with supplementary food, though when this was done in a previous study (Morris *et al* 1991) the hedgehogs did not eat it.

It would be worth conducting another study to monitor the dispersal and survival rate of a larger sample of hedgehogs released in urban areas. It seems inappropriate that so many hedgehogs are released in towns and suburbia, with no information about what happens to them. Detailed radio-tracking in an urban habitat is difficult and perhaps unnecessary. A simpler and cheaper study could be carried out to monitor the survival and dispersal of a cohort, using reports from the public. Public assistance contributed significantly to the present study even though little attempt was made to solicit it. The hedgehogs used were all adults; lower survival rates might be expected if juveniles were released, particularly in dry or cold weather. After early October none should be released unless they weigh at least 450g as they will not survive hibernation (Morris 1977).

Three quarters of our hedgehogs were alive and healthy a month after release. It is likely that most were still surviving two months after release. At least some stand a good chance of living a further two or three years, like their wild counterparts. This is success, of a kind - rehabilitation cannot confer immortality. Two of our study animals were eliminated by accidents that equally threaten the rest of the population. Their demise was not immediate and was unrelated to the fact that they had had veterinary treatment. Their deaths do not necessarily indicate a lack of success in rehabilitation.

The present study suggests that some attention should be paid to a hedgehog's origins when choosing a site for its release. Nevertheless the use of urban release sites should not be encouraged until more is known about the consequences of doing so. It is also not known what happens to juvenile animals taken into captivity and reared over winter for release later. These will have little or no previous experience of life in the wild and may not fare as well as the adults used in the present study. Further investigations are needed to clarify both these issues.

Animal welfare implications

This study has clearly shown that hedgehogs released into farmland/village 'countryside', where wild hedgehogs already exist, are not seriously disadvantaged. They can and do survive well. There was no evidence of aggressive treatment by local animals, suggesting that in this essentially non-territorial species (Reeve 1982), released animals are accepted by locally resident conspecifics. This was also noted in an earlier study (Morris *et al* 1991, Morris *et al* in press), where extensive social interactions between wild and

released animals were monitored.

Rehabilitation in these circumstances does not appear to be contrary to the welfare interests of hedgehogs. The veterinary resources expended on the treatment of sick or injured hedgehogs appear justified, at least to the extent that full rehabilitation to the wild is an apparently achievable aim.

It should be noted that these remarks apply only to hedgehogs. Other species, particularly social ones such as badgers, pose additional problems. Appropriate species-related investigations of a similar nature are needed; extrapolation from the present one is not justified.

Acknowledgements

The authors thank Edward Jackson, Director of Flatford Mill Field Centre, and his staff for so smoothly accommodating the unusual and inconvenient consequences of nocturnal fieldwork. They are also grateful to the residents of neighbouring properties for free access to their gardens and land and for timely information about hedgehogs they had seen. The authors thank Dr M Burgis for assistance in the preparation of this paper and the RSPCA for their financial support.

References

- Kenward R E 1987 *Wildlife Radio Tagging*. Academic Press: London
- Morris P A 1977 An estimate of the minimum body weight necessary for hedgehogs (*Erinaceus europaeus*) to survive hibernation. *Journal of Zoology* 203: 291-294
- Morris P A 1986 Nightly movements of hedgehogs (*Erinaceus europaeus*) in forest-edge habitat. *Mammalia, Paris* 50: 395-398
- Morris P A 1988 A study of home range and movements in the hedgehog *Erinaceus europaeus*. *Journal of Zoology* 214: 433-449
- Morris P A, Munn S and Craig-Wood S 1991 Rehabilitated hedgehogs: can they cope? *Proceedings of the 3rd Symposium of the British Wildlife Rehabilitation Council* pp9-14.
- Morris P A, Munn S and Craig-Wood S (in press) The effects of releasing captive hedgehogs into the wild. *Field Studies*.
- Reeve N 1982 The home range of the hedgehog as revealed by a radio tracking study. *Symposium Zoological Society London* 49: 207-230
- Reeve N and Morris P A 1985 Construction, siting and use of summer nests by the hedgehog *Erinaceus europaeus*. *Mammalia* 49: 187-194
- White G C and Garrott R A 1990 *Analysis of Wildlife Tracking Data*. Academic Press: London