The effect of translocation and temporary captivity on wildlife rehabilitation success: an experimental study using European hedgehogs (Erinaceus europaeus)

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AIM

This research aimed to establish the effects of translocation (release into a new area) of hedgehogs on both the individuals moved and the wild population in the area new animals were introduced to. The study also examined whether a period of captivity before relocation affected the survival of released hedgehogs.

CONCLUSION

Hedgehogs kept in captivity for more than a month before translocation survived longer after release than those translocated after minimal time in captivity. There was no evidence of competition between released hedgehogs and the existing local population.

'MATERIALS AND METHODS'

Twenty suburban gardens were chosen to meet criteria for hedgehog release sites specified by the RSPCA and The Wildlife Hospital Trust, Buckinghamshire.

Five groups of hedgehogs were used in this study:

Group No.	'Treatment'	Details
1	**Rehabilitated translocated**	20 adults that had spent less than 1 month at the Wildlife Hospital Trust
2	**Directly translocated**	20 adults translocated from the Uist Islands* with less than 6 days in captivity
3	Translocated after longer captivity period (**captive-translocated** group)	23 adults translocated from the Uist Islands* with more than 1 month in captivity
4	Free-living wild hedgehogs** at release sites (**recipient-wild** group)	20 free-living wild hedgehogs captured and re-released within 50m of each of the release gardens
5	Free-living wild hedgehogs** not at release sites (**control-wild** group)	26 free-living wild hedgehogs captured and re-released in suburban gardens more than 3km away from the release gardens***

Table 1. Five groups of hedgehogs used in this study

**Part of the programme of removal of hedgehogs from the Uist Islands, Outer Hebrides, Scotland to reduce the predation of eggs from seabird breeding colonies.*

***Free-living wild hedgehogs were captured under licence from English Nature, UK.*

****The typical range of hedgehogs is thought to be less than 40ha – equivalent to a circular diameter of 0.36km, so animals in group 5 should live completely independently from those in other groups.*

Due to the large number of animals involved in the study, hedgehogs from each group were released in 4 batches between May and August 2004.

All hedgehogs included in the experiment weighed more than 500g, and were marked using coloured heat-shrink tubing glued to spines for identification, and fitted with a radio transmitter weighing 7g glued to spines on the back of the animal. Supplementary food was provided for one week after release.

Radio-tracking was used during daylight hours to locate all of the hedgehogs every 2-3 days for eight weeks in order to monitor survival. A random sample of 11 animals within each release batch were also tracked for 6 hours (at night) during weeks one, four and seven after release in order to examine activity levels. All

animals were recaptured approximately every 10 days for weight recording and examination for ticks, mites and signs of injury.

Four types of movement were calculated from the data collected during the night-time radio-tracking:

1. nightly range area
2. minimum distance travelled
3. average speed of travel
4. percentage of time spent active

RESULTS

Survival rates

Statistical analysis of data collected showed that batch, timing and location of release did not affect post-release survival rates of the hedgehogs studied.

Treatment Group	Probability of survival (%)
1. Rehabilitated-translocated	73
2. Direct-translocated	41
3. Captive-translocated	82
4. Recipient wild	94
5. Control wild	64

Table 2. The probabilities of survival of the five different groups.

Statistical analysis of survival patterns showed that animals in the directly-translocated group (2) were less likely to survive than animals in the other groups. The survival rate of the wild recipient group (4) was greater than those of groups one, two and five (but not group three). There was no difference between the survival rates of animals in groups 1, 3 and 5.

Body mass (weight)

The directly translocated group (2) lost considerably more body mass (maximum percentage mass loss 33.3% ± 16.0%) than the other four groups (between 5.3% - 13.1% loss).

Ranging (movement) behaviour

The two wild groups (4 & 5) of hedgehogs had larger nightly ranges (km^2) than animals in the other groups throughout the study, although the average ranges of the translocated animals did increase over the eight week monitoring period.

Animals in groups 4 and 5 also travelled larger distances than the other groups in week 1, but by week 4 there were no differences between the five groups. Data from animals tracked in week 7 show that captive-translocated hedgehogs (group three) travelled a smaller distance, and more slowly, than the other groups. No other differences were found in speed of travel.

Average time spent active showed no differences between groups in each week monitored, but the direct-translocated group (2) were less active overall than animals in the other groups. The last know locations of group 2 animals were furthest from the release sites (but not significantly more than group 3).

There were no differences between the average distances between nests or length of use of individual nests between groups or between sexes. Choices of nest site and construction were considered to be similar for all groups.

DISCUSSION

The survival rate for rehabilitated individuals was similar to rates reported from other studies for rehabilitation in rural areas, and to the control wild group in this and other studies, so suggesting that the rehabilitation process for hedgehogs is successful in matching survival rates of wild populations.

However, the directly translocated group (2) had a significantly poorer survival rate than the other two translocated groups. As both group 2 and group 3 had come from the Uist Islands and so had similar experiences apart from the extended captivity of group 3, the authors suggest that:

1) ”direct translocation had a damaging effect on survival”

2) “…a short period of captivity prior to release greatly improved the chance of survival.”

The authors suggest two possible theories to explain the apparent advantage of a period of captivity – it “enables individuals to put on weight and/or become accustomed to the stress associated with manipulation by and proximity to humans”.

Greater body fat reserves have been shown to improve post-release survival in various species. Both rehabilitated and captive-translocated animals gained about 20% of their body mass during captivity, while the direct-translocated group gained only 6% during their captivity of less than six days. The authors suggest that the higher weight loss recorded in the direct-translocated group (33%) may have resulted from the use of the animals' fat reserves and other body tissues for energy, which could have "reduced their chances of survival".

Handling stress during translocation has been shown to reduce the survival of translocated red squirrels (*Squirius vulgaris)* and rabbits (*Oryctolagus cuniculus)* (Letty *et al.,* 2000 and Wauters *et al.,* 1997 respectively, cited in Molony et al., 2006). However, the authors suggest that a longer period of captivity may allow animals to become accustomed to handling enough to experience less stress, which may contribute to an improvement in body condition at the point of release.

The authors propose that further work is needed to establish the captivity period that would optimise the body condition of translocated hedgehogs at the point of release.

Analysis of data on the movements of the hedgehogs appears to show that navigation and hazard recognition in a new area did not pose any significant problems to direct-translocated animals, because there was no evidence to show that their behaviour was different from rehabilitated or captive-translocated animals.

Animals from all three translocated groups showed limited movements compared with the two wild groups. This may promote their survival because the major hazards to adult hedgehogs in urban areas (roads, predation by badgers (*Meles meles*) ponds, netting and uncovered drains and molluscicides, Reeve, 1994 cited in Molony 2006) are less likely to be encountered in a smaller range.

In contrast with studies in other species, there was no evidence of the introduction of new animals having any effect on the resident population of hedgehogs. The resident population at the release sites (group 4) showed no changes in behaviour or body mass that might indicate an increased level of competition, but in fact had higher survival rate than the separate wild population studied (group 5). It was suggested that this was due to the high levels of suitable food available in urban gardens (Reeve, 1994, cited in Molony, 2006).

CONCLUSION

The results of this study suggest that temporary captivity may be a useful strategy for translocation of wild animals, and provide an alternative to other methods such as the use of tranquillisers to reduce handling stress. Further study is needed to establish optimum time periods for reducing stress and optimising weight gain in different species. The results also supported the strategy of rehabilitation of hedgehogs into surburban gardens, showing that good survival rates are achieved without negative effects on the resident wild population.