Kangaroo translocation: program efficiency and welfare goals

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Abstract

There have been few evaluations of macropod translocation programs and those that have been undertaken have invariably reported only on their usefulness from 'conservation' perspectives (i.e. in order to facilitate in-situ breeding programs for threatened species or reintroductions to species-depleted areas) (Short *et al* 1992, 1995 Delroy *et al* 1995, Campbell and Croft 2001, Higginbottom and Page 2008, Tanner and Hocking 2001). The IUCN (1995) guidelines for reintroductions are only for conservation purposes. National Parks and Wildlife Services similarly only consider translocation from a reintroduction and conservation perspective (NPWS 2005). No evaluations have considered the welfare benefits for wildlife, and kangaroos in particular, where the species has been decreed to be relatively more regionally 'abundant' but has become isolated through human interventions.

This paper provides the results of a translocation program and post-release monitoring of 87 wild and semi-wild juvenile and adult eastern grey kangaroos. Forty-one per cent of the translocated and released kangaroos had been rehabilitated from injury. The program was undertaken at two sites over 24 months for welfare, not conservation, reasons. Monitoring indicates a 97 per cent survival rate. The program also ensured that the conservation imperatives of the relocated species, other species and the landscape were not compromised. This paper will discuss capture methods, medication, pre-release, release, monitoring and costs. It also assesses the program using animal welfare criteria which have not previously been taken into account.

An assessment of the program's efficiency was made against six factors identified by Croft (2008), as well as against the welfare criteria on animal capability of Nussbaum (2002). The results of this translocation program suggest that, if carried out appropriately, it can be a highly successful, low-cost tool for animal welfare in circumstances in which animals have been artificially contained, or adversely impacted and their habitat compromised through human intervention. The paper argues that to kill kangaroos in such situations, an increasingly common practice by governments in this country, when there is an effective minimal harm alternative that meets program efficiency criteria and Nussbaum's animal welfare capability considerations is unethical, cruel and unjust.

Key words: Kangaroo translocation, animal welfare, kangaroo rehabilitation, animal justice.

Kangaroo translocation: program efficiency and welfare goals*

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1. Introduction

> *Based on welfare concerns, lack of known conservation benefits, ineffectiveness in reducing large source populations, and the expense and logistical requirements involved, translocation of eastern grey kangaroos is not considered to be an appropriate management technique for reducing kangaroo numbers. Translocation will not be permitted for such purposes.* (ACT Kangaroo Management Plan p. 91).

This paper has been stimulated by lazy and dishonest statements such as the above, which have become an increasingly commonplace institutional excuse for killing kangaroos when their grazing habitat becomes isolated through human property development activity. The paper is specifically a response to the 2008 herding and brutal slaughter of at least 514 kangaroos by the current Commonwealth and ACT Labor Governments at the former Belconnen Naval Transmission Station (BNTS) in Canberra. This BNTS site is within sight of Australia's Parliament House, where the coat of arms, with its kangaroo, must now sit somewhat ironically across the public entrance. We argued then and we argue now in this paper that this and similar acts of institutional kangaroo slaughter in contained urban, peri-urban and semi-rural areas around this country (e.g. Majura Firing Range and Callum Brae in the ACT, Maria Island in Tasmania, Waroona Shire Council in WA, Bathurst City Council in NSW, South Morang in Victoria, Katherine in the Northern Territory, and others) where translocation and other minimal harm measures were possible, are unethical and unjust (Garlick and Carter 2009).

There have been few evaluations of macropod translocation programs and those that have been undertaken in this country have invariably reported only on their usefulness from conservation perspectives (i.e. in order to facilitate in-situ breeding programs for threatened species or reintroductions to species-depleted areas (Short *et al* 1992, 1995, Copley 1994, Delroy *et al* 1995, Campbell and Croft 2001, Higginbottom and Page 2008, Tanner and Hocking 2001). Similarly, at a policy level translocation is reported only as a mechanism for species introduction and reintroduction (IUCN 1995, NP&WS 2005). Such approaches simply reflect the narrow view of conservation as a crude numbers game in which animals are merely objects of instrumental value rather than individual living creatures with intrinsic worth.

* The authors wish to acknowledge the valuable contribution to this project of release site property owners Mr Brett Clifton and Ms Gabi and Ms Jutta Brinkmeyer and veterinarian Dr Howard Ralph.

When it comes to animals, the narrow conservationist generally does not discuss questions of cruelty and brutality. There are invariably no expressions of wonderment, appreciation or concern and the animals in question are simply seen as objects to be counted, tinkered with and then discarded, or brutally killed, under the metaphoric of it being 'humane', as we are witnessing with kangaroos. For the narrow conservationist some species are expendable in order to protect others, although causality is rarely proven and the ethics, when there are minimal-harm welfare alternatives (e.g. translocation, exclusion fencing, wildlife corridors, sterilisation etc.) are utterly lacking.

Increasingly, with low and medium-density urban and semi-rural sprawl and the loss of traditional habitat through planning and development that is ignorant of the basic requirements of wildlife, kangaroos have in many places become isolated in small pockets. However, there have been no comprehensive evaluations that have considered the welfare alternatives for wildlife, and kangaroos in particular, where the species has been decreed to be relatively more regionally 'abundant' but has become isolated through human interventions. Institutions charged with animal welfare argue (without any real science-based evidence) against kangaroo movement on the basis of anthropocentric statements that it is more 'humane' to kill them than it is to adopt harm minimisation welfare measures. In most respects there is confusion between welfare and conservation responsibilities and no assessment framework by which to judge animal welfare is offered.

This paper provides the results of a translocation program and post-release monitoring of 87 wild and semi-wild juvenile and adult eastern grey kangaroos for animal welfare purposes. The program was undertaken in six release groups at two privately-owned sites, with monitoring for various periods. The program of translocation also ensured that the conservation imperatives of the relocated species and other species were not compromised and these goals are also discussed. In describing the kangaroo translocation process, the paper discusses capture methods, medication, transport, pre-release, release, monitoring and costs. In addition to assessing efficiency criteria, this paper also assesses the kangaroo translocation program using animal welfare criteria that have not previously been employed.

2. Context

In April 2010, the ACT Government released its Kangaroo Management Plan. Elsewhere we have argued that it is a dishonest, unscientific, inconsistent, biased and unethical report that fosters a culture of disrespect and harm (http://candobetter.org/node/1998). In this 'Plan' we are told that in the ACT, while it is acceptable to plan and carry out development with total disregard for wildlife habitat, when the kangaroo becomes isolated as a consequence of this its relocation to a safe habitat is not permitted and it must be killed. Other jurisdictions around the country and at least one national animal welfare organisation appear to support this approach and. behave similarly.

In its Plan (ACT Government 2010) the ACT Government supports its opposition to kangaroo translocation with the following arguments:

- The *certainty* that many animals would die, during and following the process (of translocation) [our emphasis]. This is put forward in the Plan as a welfare concern;
- The illogicality of undertaking large-scale, expensive movements of one of the most common animals in the ACT, which has no known threats to its long-term survival;
- The difficulty of finding suitable release sites for large numbers of animals. (p. 88).

In relation to point one, the ACT Kangaroo Management Plan report only refers to two previous kangaroo translocation studies, although there have been others. The studies referred to are Campbell and Croft (2001) and Higginbottom and Page (2008), both relatively small scale with 20 kangaroos in the former and 13 in the latter. In the Campbell and Croft study four kangaroos were not released due to injury and the remaining 16 that were translocated and released all survived over a two year monitoring period. In the Higginbottom and Page study three kangaroos died in the capture process and the remaining 10 were apparently successful releases, having been monitored for 12 months. In any reasonable person's assessment these results clearly do not support the ACT KMP statement of 'certainty that many animals would die' in a kangaroo translocation exercise. In a review of a number of early translocation projects Short *et al* (1992) argue that fox predation appeared to be the major cause of poor survival, rather than the translocation process *per se*. Where there are fox control programs in place the release survival rate from translocation is significantly greater (Short *et al* 1995).

Point two in the ACT Government KMP is particularly strange, claiming that there is illogicality in translocating an apparently relatively regionally abundant wild animal that finds itself entrapped by land development plans. One could respond how illogical it seems that a gentle, inoffensive and iconic animal, whose habitat has been compromised or destroyed by humans, should be killed when there are more ethical options that present better life outcomes for the animal but still make land available for rapacious housing and commercial development in the ACT.

There is clearly a substantial threat to the kangaroo's long-term survival in the ACT from the loss of habitat for property development and the consequent kangaroo killing carried out by the ACT and Federal Governments. Land development is a significant government revenue source in the ACT. To say there are no known predators of the kangaroo is itself an illogical statement when the kangaroo is the subject of the largest land-based slaughter of wildlife by humans on the planet. On welfare grounds, in our view, it remains a very logical action to move any animal faced with a harming situation when the alternative is, from what we have seen many times over, death through gross brutality. The idea that killing is the 'humane' option for kangaroos simply does not hold up, based on the witnessed evidence of such kangaroo killing programs as at BNTS and other sites and the findings on kangaroo shooting revealed in the report 'A Shot in the Dark: A report on kangaroo harvesting' (Ben-Ami 2009). The other claim made in the ACT Kangaroo Management Plan is that kangaroo translocation is 'expensive', but no data on costs are provided suggesting that such a conclusion is a matter of opinion as to what the term

'expensive' actually means. An FOI request to obtain the government's estimate of costs of a translocation option for the kangaroos at the BNTS was refused. Our experience with the cost of kangaroo translocation is discussed later in the paper and suggests that the institutions involved in killing kangaroos put a depressingly low value on the life of this iconic animal.

Point three in the ACT Kangaroo Management Plan claims translocation is not viable because of the difficulty of finding suitable release sites for the kangaroos that are moved. As no research evidence is presented to support this claim we would argue it represents unsubstantiated conjecture. We have never found this to be a problem, with many large private landowners, with suitable properties within a reasonable translocating distance and where land conservation values will not be compromised are quite willing to assist kangaroos to have a safe home.

Clearly, such institutional statements about the efficacy of kangaroo translocation programs have been based not only on very insubstantial research findings, but also on an incomplete review and an incorrect interpretation of the literature. The unfortunate outcome of such documents as the ACT KMP is that popular myth, rather than good science and ethical value, is perpetuated by institutional interests.

Following Fischer and Lindenmeyer (2000) we have examined a more comprehensive sample to assess kangaroo translocation than previous studies, and have included monitoring and analysis.

3. Assessment framework

The framework we have used to assess the kangaroo translocation programs we have undertaken comprises two dimensions, viz: the efficiency criteria which Croft (2008) has identified for animal conservation and the animal welfare criteria based on capabilities identified by Nussbaum (2002) based on the original capabilities work of Sen (1985).

3.1 Efficiency criteria

An assessment of the translocation program's efficiency was made against six factors identified by Croft (2008). These are conservation-based criteria and comprise:

- Survival of the translocated individuals. Croft suggests this should be assessed over a 24-month period to allow the first cycle of offspring to occur, which he says is a period of 18 months from conception to weaning in Eastern Grey Kangaroos. This will depend of course on the age of the translocated animal, with older translocated animals expected to conceive much sooner. However, from a welfare perspective we would not rate this particular measure of survival highly, as the intent of a welfare-based translocation program is not primarily to re-populate a diminished population. In our view, if an animal has successfully survived a reasonably lengthy monitoring period this would be a sufficient indicator for this criterion.
- Subsequent breeding success observed through regular sighting. Again, while breeding success may be a useful conservation goal it does not indicate a good welfare outcome.
- Maintenance of body condition compared to resident population.

- Cost and time outlay (no guiding parameters of efficiency were provided here).
- Resident population not compromised. We also recognise this as an important criterion from a welfare perspective of a translocation exercise.
- No degrading of the existing environment through overgrazing, with measurement against benchmarks such as plant diversity, cover, soil compaction and landscape function.

These efficiency criteria are ostensibly focused on conservation objectives rather than welfare goals. To balance this we have used a second set of welfare-specific assessment criteria.

3.2 Welfare criteria

For this we use the capabilities approach of Indian Nobel Laureate economist Amartya Sen (1985 and 2009), which has been applied to the animal circumstance by Martha Nussbaum in her 2002 and 2003 Tanner Lectures on Human Values (*Beyond the Social Contract: Towards Global Justice*). It provides a mechanism for action towards animals that: (a) is not driven by a need for commodity accumulation and income generation through exchange, the received neoliberal view that underpins current institutional action toward the kangaroo and shallow conservation analysis; and (b) provides an alternative to the approach towards non-human animals that is based on anthropocentric concepts of 'humaneness' and instrumental value. For animals to have flourishing lives what is relevant here is a combination of all the following capabilities (pp501-504):

Nussbaum's capabilities for animals include:

1. **Life:** All animals are entitled to continue their lives, whether or not they have a conscious interest.
2. **Bodily Health:** All animals are entitled to a healthy life.
3. **Bodily Integrity:** Animals have direct entitlements against violations of their bodily integrity by violence, abuse and other forms of harmful treatment.
4. **Senses, Imagination, and Thought:** Ensuring animals have access to sources of pleasure, such as free movement in an environment that stimulates and pleases the senses.
5. **Emotions:** Animals are entitled to lives in which it is open to them to have attachments to others, to love and care for others and not to have those attachments warped by enforced isolation or the deliberate infliction of fear.
6. **Practical Reason:** The capacity to frame goals and projects and to plan its life – plenty of room to move around and opportunities for a variety of activities.
7. **Affiliation:** Animals are entitled to form attachments and engage in characteristic forms of bonding and interrelationship. They are also entitled to relations with humans, where humans enter the picture in a way that is rewarding and reciprocal, rather than tyrannical. At the same time they are entitled to live in a world public culture that respects them and treats them as dignified beings.
8. **Other Species:** If humans are entitled to live with concern for, and in relation to, animals, plants and the 'world of nature', so too are animals in relation to species not their own.

9. **Play:** Animals are entitled to the protection of adequate space, light and sensory stimulation in living places and, above all, the presence of other species members.
10. **Control over Environment:** Being part of a political conception that is framed so as to respect them, and is committed to treating them justly. It is important however, that animals have entitlements directly, so that a human guardian has standing to go to court, as with children, to vindicate those entitlements. On the material side, for non-human animals, the analogue to property rights is respect for the territorial integrity of their habitat, whether domestic or 'in the wild'.

The question of quantitative human capability measurement for welfare has been considered by Anand *et al* (2009). How we might apply quantitative data to Nussbaum's list of animal capabilities raises different issues of avoiding anthropocentrism. These are being examined in a separate forthcoming paper.

4. Target population

Wild injured infant, juvenile and adult eastern grey kangaroos are continually brought to us for rehabilitation at our wildlife recovery centre. These animals have a range of injuries resulting from motor vehicle accidents, plain and barbed wire fence entanglement, dog and fox attack and shooting. Injuries include tail and limb fractures, pelvic, head, nerve and ligament injury, severe wounds and myopathy. Once fully rehabilitated these animals are translocated to safe release sites in bonded groups. The animals are in care for periods from a few weeks to one year, depending on their size and the extent of their injury/injuries. It is important to emphasise that many of the kangaroos rehabilitated and then translocated for release in the program described in this paper were not simply healthy hand-raised orphaned infants, but rather included larger juvenile and adult wild animals recovered from severe injuries.

5. Translocation process

We have used two sites for the translocation program described in this paper. Release site - delayed release, not release site – immediate release, methods were used at both sites. One release site (Site #1) involved vehicle travel of one and a half hours from the wildlife recovery centre and the other release site (Site #2) half an hour.

5.1 Capture methods and medication,

At least three days before translocation, animals were treated with Fluphenazine (0.5 to 2.0 mg/kg) to reduce anxiety. Animals were captured within a large enclosure by the authors using one of the following methods: (1) hand net and blanket, (2) tailed while eating or (3) voluntarily somersaulting into a bag. They were sedated with Diazepam (0.1ml/ kg) and weighed. The larger animals were placed in large hessian bags with the top tied. Animals were never sedated without being confined in a bag. They were given prophylactic treatment for worms (Panacur 25 at 1ml/ 5kg), coccidiosis (Baycox 0.4ml/ kg) and stress (Vitamin E/Selenium at 0.025ml/kg). There were no losses during this stage and all 87 animals were captured in this way.

5.2 Transport

Sedated animals were moved by the authors by motor vehicle to large enclosures at the two release sites and allowed to awake from their sedation with the carer in attendance (Figure 1). Numbers moved each vehicle trip varied between one and five, depending on the circumstances. All animals coped well with this.

Figure 1. Translocated kangaroo waking from sedation at pre-release site

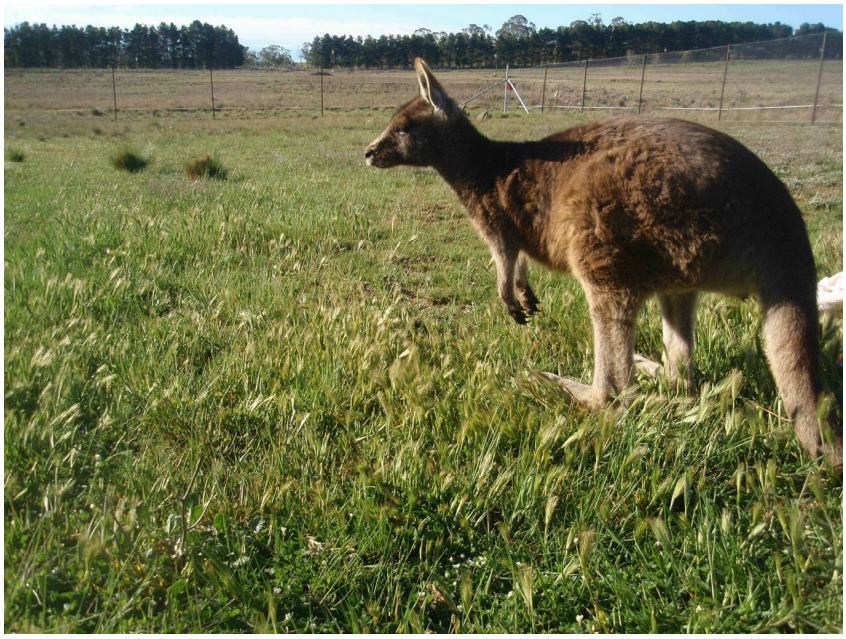
5.3 Pre-release

The pre-release enclosures were around 1ha with plenty of natural grass, shelter, water and kangaroo pellets (Figure 2). Animals remained in the pre-release enclosures in mobs for variable periods (1-20 weeks) depending on factors such as the weather, season, animal weight, and place on relocation schedule. Initially a core number of four to six animals was moved on the first day of translocation. Of the 87 animals translocated, two were retrieved during the period in the pre-release enclosure. Both developed myopathy after severe thunderstorms and both were members of the core number for their groups. It is more stressful for the core number in a translocated group because subsequent translocated animals awake at the pre-release site amidst the core number which they are already familiar with and which are a calming influence. Careful selection of the core number is advised.

5.4 Release sites

The two release properties used were 2500 acres, where 73 kangaroos were released in five separate programs (Site #2) and 200 acres, where 14 kangaroos were released in one program of release (Site #1). Both properties had good grass cover, water, minor human activity, no wild dogs and fox control programs.

Figure 2: Pre-release enclosure



5.5 Monitoring program

The monitoring period varied for each translocated group (see Table 2). Released animals were monitored by sight recognition. The landowner at Site #1 monitored the released kangaroos by sight on a daily basis for the first three weeks and then weekly for a total of 45 weeks. This monitoring is ongoing. At Site #2 the monitoring was undertaken by one of the authors and varied for each group from 4 to 32 weeks. At Site #1 the landowner placed hard food outside the pre-release enclosure and was able to record visits and body condition of the released animals. At Site #2 the author visited at approximately the same time each day and called the animals. They were rewarded with hard food and their presence and body condition recorded. The animals would only approach if the author called and were wary if there were other vehicles or persons present.

5.6 Costs

There are fixed and variable costs associated with this release site – delayed release translocation program. The main fixed cost outlay is a one-off capital cost for enclosure construction and water supply at each site which from experience we estimate at around $3000 each (netting, posts, water supply, shelter). The cost per animal for this capital expenditure diminishes as more animals are released. Every phase of the translocation was carried out by the authors who were also the rehabilitators of the kangaroos, so there was no labour cost outlay. Experienced wildlife care volunteers can undertake this work under the guidance of an experienced translocator. A private vehicle was used as transport and while this necessitated a number of vehicle trips it was effective. Using a rate of $0.50 per km travel we estimate, based on an average of two animals transported in each vehicle trip, the total imputed transport cost for Site #1 (ie seven vehicle trips @ 200km round trip) at $700 (or $50 per animal). At Site #2, based on 36.5 vehicle trips @ 40km round trip, the total imputed transport cost was $730 (or $10 per animal). Medication costs for the treatments

described in section 5.1, based on dosage per animal, are estimated at around $850. Feed at the release sites was mostly naturally-growing grass although there was some supplementation (kangaroo pellets, lucerne hay) during dry conditions. Based on animal containment of between one and 20 weeks in the pre-release enclosure the feed costs are estimated at $720. It should be noted that this translocation project was during a period of ongoing dry weather so in better conditions these feed costs might be lower. Total costs for this translocation project of 87 kangaroos, inclusive of fixed and variable expenditure, are therefore estimated at approximately $9000 or $103 per translocated animal (fixed cost $69 and variable cost of $34 per animal). The per-animal cost of translocation is a function of site and enclosure usage over time and destination travel distance. The fixed capital cost of translocation could be reduced by using relocatable enclosures at different sites or by using the release site-immediate release method. With the latter method no release site enclosure or supplementary feed is required; however there would be an additional variable cost for monitoring if required.

6. Monitoring results

6.1 Site #1

Table 2 gives the characteristics of translocated kangaroos in each group. At Site #1, the furthest and smallest site, there was just one round of translocation and release of 14 kangaroos. The kangaroos in this translocation program had a weight range of 11 to 25 kgs, with four being 20kgs or more at the time of translocation. There were eight males and six females. The animals in this group were in the release site enclosure for one to eight weeks prior to release. The rehabilitation history of this group included seven orphans with no previous injury, two with a pelvic injury and nerve palsy, one with a tail fracture, one with a limb fracture, two with fence entanglement injuries including severe myopathy, lacerations and ischaemic damage and one with head and ear injuries and infection from fox attack. All the kangaroos in this group survived the 45-week monitoring period and five of the six females have had joeys. All but one of this group is known to have survived to this day (ie. 18 months post release). One female died after a long period of convalescence following a fox attack and subsequent myopathy and renal failure.

6.2 Site #2

At Site #2, the larger and nearest site, there were five rounds of translocation and release over two years, totalling 73 animals (as shown in Table 2). The first group comprised 14 kangaroos, with a weight of seven kgs to 14kgs at the time of translocation. There were eight males and six females and they were kept in the release site enclosure for eight to 12 weeks prior to release. Eight of this group were uninjured orphans while the rehabilitation history of the remaining six included the following injuries: one tail fracture and five with fence entanglement injuries. All in this group survived the translocation, pre-release and release process. Three females were observed at 52 weeks with joeys.

The second group of translocated kangaroos to Site #2 comprised 19, 13 of which were males and six females and the weight range was seven to 30 kgs. They were kept in the release site enclosure for eight to twenty weeks prior to release. In this group one animal died during pre-release and one post-release. Both sustained a penetrating eye injury,

myopathy and renal failure after severe spring thunderstorms caused fallen pine trees. The enclosure at Site #2 is set partly in a pine windbreak in open grassland. Both animals were taken back to the recovery centre and treated for their injuries and subsequent illness. All the other released kangaroos in this group survived the monitoring period. A total of 13 of this group were orphans with no pre-rehabilitation injury history, one had a pelvic injury, one had had ischaemic foot damage and myopathy from a fence entanglement, one had been shot and two had foot fractures.

The third group translocated to Site #2 comprised 14 kangaroos, seven males and seven females. The weight range at translocation was seven to 20kgs. Ten of this group were rehabilitated as uninjured orphans, one adult had a pelvic injury, another adult had a pelvic and tail fracture and dog attack injury, one kangaroo had a ligament injury and concussion and one had lacerations after fence entanglement. All have survived the translocation, pre-release and release phases over the monitoring period. This group were translocated and released in winter where, although grass cover and temperatures are less favourable, there is less risk of severe thunderstorms.

The fourth group translocated to Site #2 comprised five adult kangaroos which were rehabilitated together, of which three were male and two were female. All had recovered from significant injuries. The weight range of this group was 16kgs to 25kgs. The pre-rehabilitation injuries included two with pelvic injury, one with myopathy and two with lacerations and ischaemic damage due to fence entanglement. All coped well with the translocation and pre-release period. As expected these animals did not choose to return for food when called during the monitoring phase. Plenty of spring grass and a healthy fear of humans was preserved. Although able to be approached and given bottles of formula once moved into the pre-release enclosure they quickly became wild again and did not want to be approached too closely.

The fifth and last group in this series of kangaroo translocation to Site #2 totalled 21, comprising 12 females and nine males. The weight range was 12kgs to 25kgs. The group remained in the release site enclosure for two to 12 weeks. The pre-rehabilitation history of this group comprised 14 uninjured orphans, two with pelvic injury, one with a toe amputation, one had myopathy, one had lacerations and ischaemic damage due to fence entanglement, and two had fox or dog attack injuries. One kangaroo was retrieved during the pre-release period after severe spring thunderstorms and later died from myopathy and renal failure. All others in this group survived the monitoring period which was short due to the abundance of grass after heavy summer rain. Five of the kangaroos which came into care as juveniles or adults were wary of humans, even the author, and did not return for hard food when called. All others appeared to thrive. Further monitoring will be done at both sites.

7. Rehabilitating and releasing the injured kangaroo

Forty-one per cent of the translocated and released kangaroos had been rehabilitated from a range of injuries as shown in Table 1. We have found the injured kangaroo, if treated correctly and allowed sufficient rest in a safe and caring environment responds well to treatment and when fully recovered can be released successfully in a mob along with

uninjured orphan kangaroos. In particular, we have found that adult kangaroos with pelvic injury and nerve palsy and kangaroos with fence entanglement injuries recover well with treatment, rest and physiotherapy and/ or graduated exercise as they progress through the stages of regaining mobility (Austen 2008). Prior to our involvement in rehabilitating injured macropods pelvic injured animals were usually euthanased because they could not initially get up. Many of these cases are now brought to us for rehabilitation and do well with minimal intervention and sometimes can be released within a couple of months. Adult animals are always housed on straw inside during initial recovery from injury and their nutrition is often supplemented with bottles of formula.

Table 1 below shows the numbers of kangaroos in the translocation program that had been rehabilitated from injury. The most frequent problems were due to fence entanglement or were pelvic injury.

Table 1: Range of problem/ injury of translocated kangaroos

Problem/ Injury*	**Number**	**Per cent of translocated kangaroos**
Fence entanglement	14	16.1
Pelvic injury	9	10.3
Ischaemic injury	7	8.1
Lacerations	6	6.9
Dog or fox attack	5	5.8
Myopathy	5	5.8
Limb fracture	4	4.6
Ligament injury	4	4.6
Tail fracture	3	3.4
Nerve palsy	2	2.3
Toe amputation	1	1.1
Gun shot wound	1	1.1
Head injury	1	1.1
Uninjured orphans	51	58.6

* Some animals had multiple injuries (eg fence entanglement commonly causes lacerations, ischaemic damage and myopathy)

8. Rehabilitating and releasing the older kangaroo

A breakdown of the original weight of the 87 kangaroos on entry to the rehabilitation and translocation program indicates 5.7 percent were greater than 20kgs, 10.3 percent were 10 to 20kgs, 13.7 percent were 5kgs to under 10kgs and 70.3 percent were under 5kgs. The monitoring program showed that ‘at heel’ and larger kangaroos, despite their size and wildness, with the correct treatment and care cope well with rehabilitation, translocation and release and do not need to be discriminated against and killed when they are injured simply because of their size.

9. Criteria assessment

9.1 Efficiency criteria

The following table (Table 3) is compiled from regular observations over the monitoring period at each site, according to Croft's efficiency criteria as outlined in section 3.1

Table 3: Observations in meeting efficiency criteria

Efficiency criteria	Site #1	Site #2
1. Survival	All 14 survived the initial 45 week monitoring period. One female subsequently died after a fox attack.	70 of 73 survived. Three died of myopathy and renal failure after severe thunderstorms.
2. Breeding	All released surviving females have had joeys	Only the first group monitored for this criteria to date. Three of the six released females have been seen (after 52 weeks) and all have had joeys
3. Body condition	No reported abnormalities or under-nourishment. Very good condition.	No reported abnormalities or under-nourishment. Very good condition.
4. Cost and time outlay	Daily and then weekly monitoring observations by landowner. Cost of enclosure and supplementary feed and cost of medication and transportation to release site.	Daily and then weekly monitoring observations by one of the authors/ carers. Cost of enclosure and supplementary feed and cost of medication and transportation to release site
5. Impact on resident population	Minimal	Minimal
6. Impact on site	Positive in reducing grassland fire load	Positive in reducing grassland fire load

Table: 2. Characteristics of translocation and release of groups of wild and semi-wild Eastern Grey Kangaroos

Characteristics	**Site #1 Group 1**	**Site #2 Group 1**	**Site #2 Group 2**	**Site #2 Group 3**	**Site #2 Group 4**	**Site #2 Group 5**	**Total**
Number translocated (No.)	14	14	19	14	5	21	87
Reason rehabilitated (O=orphaned joey, I=injured joey, juvenile or adult)	O=6 I=8	O=8 I=6	O=13 I=6	O=10 I=4	O=0 I=5	O=14 I=7	O=51 I=36
Weight range at translocation (kgs)**	11-25	7-14	7-30	7-20	16-25	12-25	7-25
Number released and monitored (No.)	14	14	18	14	5	20	85
Date of release	1/09	4/08	4/09	6/09	10/09	1/10	
Gender	6 female, 8 male	6 female, 8 male	6 female, 13 male	7 female, 7 male	2 female, 3 male	12 female, 9 male	38 female 49 male
Length of monitoring (sightings days/weeks)	45 weeks of day and night monitoring	4 weeks of day monitoring*	40 weeks of night monitoring	32 weeks of night monitoring	nil	4 weeks of night monitoring	

*Release monitoring of Group 1 was undertaken during daylight and was not effective. Three females with joeys from this group were observed at the commencement of night monitoring for Group two at about 52 weeks post-release and were subsequently monitored

**Release weight minimum was 11kgs

The overall efficiency assessment suggests the translocation and release went well, with only three losses from 87 (97% survival) during the monitoring period, a beneficial impact on the landscape and no negative impacts on existing populations.

9.2.1 Welfare criteria

The following table (Table 4) is compiled from regular observations at each site according to Nussbaum's welfare capability criteria as outlined in section 3.2. An assessment against the ten criteria is a subjective judgement made by the experienced carers as to what they have observed at each sighting.

Table 4: Observations in meeting animal welfare capability criteria

Animal welfare criteria	**Site Observations**
1. Life	✓
2. Bodily health	✓
3. Bodily integrity	✓
4. Senses, imagination and thought	✓
5. Emotions	✓
6. Practical reason	✓
7. Affiliation	✓
8. Other species	✓
9. Play	✓
10. Control over environment	✓

The overall subjective assessment against the animal welfare capability criteria is that all criteria have been met, suggesting that the translocation and release program is successful from a welfare perspective. As discussed in section 3.2, the application of quantitative measures of the animal capability criteria is something that requires more research.

10. Animal justice

The question of justice for animals goes beyond simply being compassionate about animal suffering, extending to ascribing blame to those who treat animals in ways that cause suffering in the sense that their entitlement to their basic capabilities is compromised

> "When I say that the mistreatment of animals is unjust, I mean to say not only is it wrong *of us* to treat them in that way, but also that they have a right, a moral entitlement, not to be treated in that way. It is unfair *to them."* (Nussbaum 2002, p.485).

Those institutions that do not make the effort to use harm minimisation methods, such as translocation, for assisting kangaroos whose habitat has become compromised in contained urban, peri-urban and semi-rural areas could justifiably be charged with acting in ways that are unjust.

11. Conclusions

From the kangaroo translocation program described in this paper we can draw three general conclusions.

First, institutions that argue kangaroo translocation is ineffective, not humane, and expensive for welfare purposes have relied on evidence that is insubstantial, poorly assessed and generally focused only on conservation goals. We have considered the efficiency and welfare aspects of the translocation of 87 semi-wild and wild juvenile and adult kangaroos, and based on our results advocate that institutions reconsider kangaroo translocation as a key non-lethal, low-cost, high success rate animal welfare management tool. Experienced kangaroo rehabilitators and translocators are an important requirement. Over an almost 12-month monitoring period (still ongoing), we found:

- The survival rate to be around 97%
- Criteria of conservation efficiency and animal welfare are being met
- With the use of knowledgeable volunteers, costs and time outlay are small
- No difficulty in accessing private lands for release purposes.

A failure to adopt translocation, or other minimal harm, alternatives to killing when kangaroo habitat is compromised by human development plans is manifestly unjust.

The second conclusion from this work is that kangaroos rehabilitated after serious injuries (pelvic injury, ischaemic injury, severe wounds, myopathy, tail and limb fractures, nerve injury, etc) can be treated and then, when fully recovered and ready, successfully released through translocation. .

The third conclusion from this ongoing project with kangaroos is that juveniles and adults brought into care with injury, cope well with treatment and rehabilitation and when ready can be successfully released though translocation.

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