

Animal welfare considerations in primate rehabilitation: an assessment of three vervet monkey (*Chlorocebus aethiops*) releases in KwaZulu-Natal, South Africa

AJ Guy*, OML Stone and D Curnoe

School of Biological Earth and Environmental Sciences, University of New South Wales, Sydney, NSW, Australia 2052

* Contact for correspondence and requests for reprints: amanda.guy@hotmail.com

Abstract

This study evaluates the methods utilised to release and monitor three troops of rehabilitated vervet monkeys (*Chlorocebus aethiops*) in South Africa. In all cases, monitoring was poor and conducted over a short time-frame disallowing release outcomes to be fully assessed. Wild troops were present at two of the three locations, casting doubt upon sightings of released monkeys and indicating that the release sites chosen were unsuitable and presented disease risks to the wild vervets. Eighty-three percent of monkeys were unaccounted for at the end of monitoring. Any future releases should make use of radio or GPS collars to track the monkeys, have a planned monitoring schedule covering a period of at least one year, collect detailed data on behaviour, demographics and ecology and should follow the IUCN Guidelines for Non-Human Primate Re-introductions.

Keywords: animal welfare, *Chlorocebus aethiops*, primate, rehabilitation, release, South Africa

Introduction

Injured and orphaned primates often result from conflict with humans (Henzi 1979; Brennan *et al* 1985; Saj *et al* 2001), particularly in urban areas where extensive development has forced them into close proximity. Hundreds of injured and/or orphaned vervet monkeys (*Chlorocebus aethiops*) come into care each year throughout South Africa and this has instigated the development of at least 20 centres that rehabilitate primates (Wimberger *et al* 2010a). Such centres strive to return displaced primates to the wild, with the aim of improving their welfare.

Previous studies of vervet monkey rehabilitation and release (Wimberger *et al* 2010b; Guy *et al* 2011, 2012) suggest that survival is low and post-release monitoring of these individuals is difficult. The current study has provided the opportunity to add a further three releases to the assessment of vervet monkey rehabilitation, with particular focus on methods of release and post-release monitoring and animal welfare concerns.

Materials and methods

Data for this study were collected by the Centre for the Rehabilitation of Wildlife (CROW) in KwaZulu-Natal (KZN), South Africa. The data were collated by Ezemvelo KZN Wildlife (EKZWN) and subsequently analysed by the present authors.

EKZWN did not play a role in the work (either the release itself or our assessment of it). They provided data to us for the purpose of obtaining an independent, objective assess-

ment so as to provide a scientific basis upon which to consider policies and practices. For this reason, so as not to compromise independence, EKZWN has not been involved in any way in the preparation of this paper.

Due to the limited nature of the data provided, details of housing and diet cannot be presented here. CROW is a registered rehabilitation centre and has permits to conduct rehabilitation and release issued by EKZWN. Rehabilitation and release in KZN follow the Norms and Standards for the Management of Primates in KwaZulu-Natal (Ezemvelo KZN Wildlife 2008).

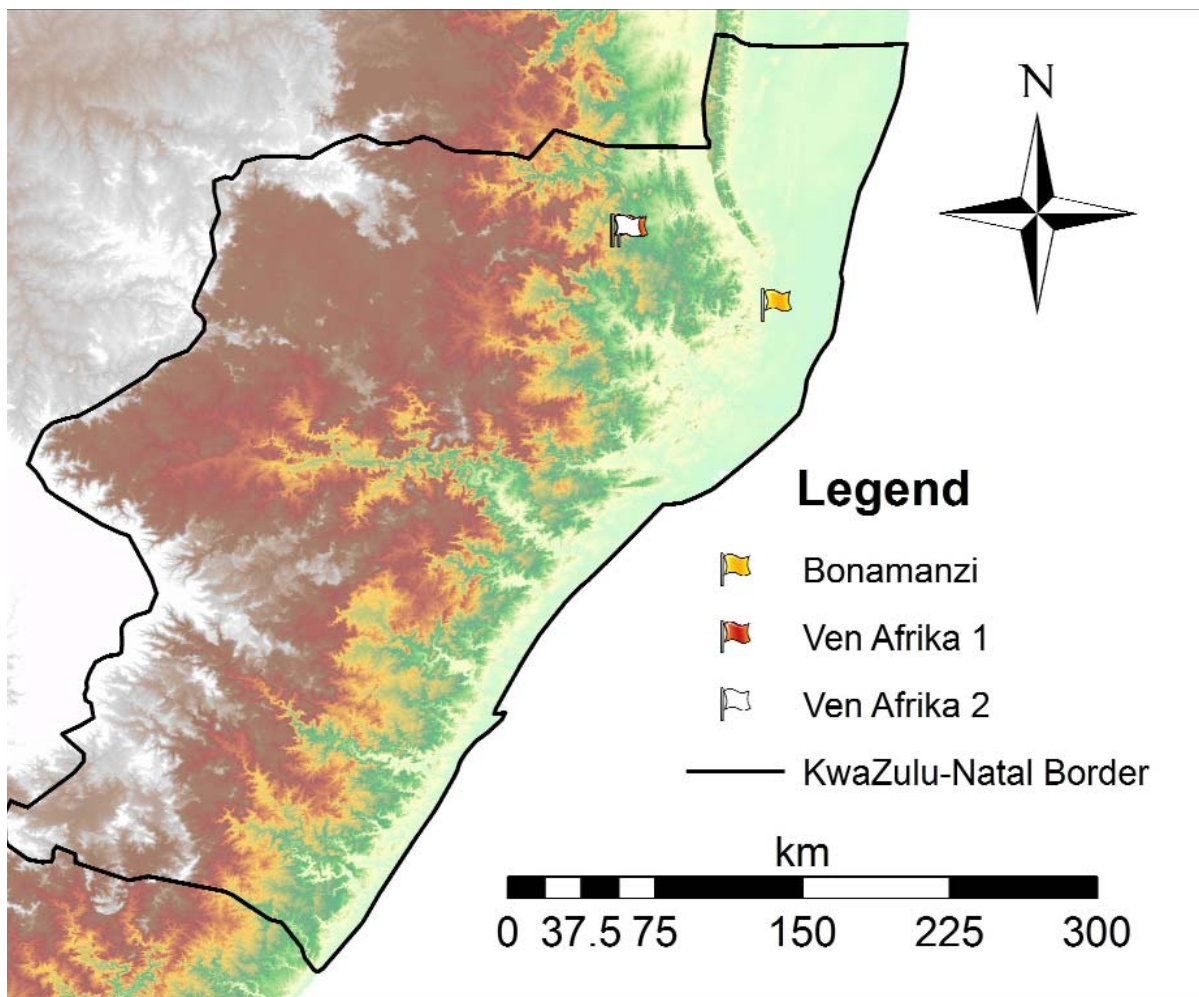
Study animals

The study animals comprise three troops of vervet monkeys housed at CROW. The first troop, referred to herein as 'Ven Afrika 1', consisted of 39 animals including 31 adults and juveniles and eight infants. The second troop, 'Ven Afrika 2', consisted of 18 animals (16 adults, two infants). CROW did not provide details of gender proportions. The third troop, 'Bonamanzi' consisted of 19 animals, the ages of which were not supplied by CROW. The 'Bonamanzi' troop had patches shaved into their fur for identification. The methods used were not described.

Release and post-release monitoring

The release dates were 14 February, 2009 for 'Ven Afrika 1', 17 February, 2009 for 'Ven Afrika 2' and 30 October, 2009 for 'Bonamanzi' troop. 'Ven Afrika 1' and 'Ven Afrika 2' were released at the co-ordinates $-27.693933^{\circ}\text{S}$,

Figure 1



Release site locations within KwaZulu-Natal, South Africa.

31.6347°E and -27.695117°S, 31.60555°E, respectively. These sites were 2.9 km apart. The closest (approximately 23 km) town was Nongoma. 'Bonamanzi' troop was released at -28.034667°S, 32.293567°E (Figure 1). This site was approximately 75 km from the other release sites but was just 2.2 km from the edge of the nearest human settlement (Hluhluwe) and 1.5 km from the nearest major road.

A soft-release protocol, where released primates spend a period of time acclimatising to the site and are provided with supplemental food (Cheyne *et al* 2012) was utilised. 'Ven Afrika 1' and 'Bonamanzi' troops were allowed to acclimatise in their enclosures for three days, while 'Ven Afrika 2' was kept for six days. The monkeys were supported post-release with supplementary feeding: 'Ven Afrika 1' twice per day until one month post-release, once per day for a further three weeks, then once every three to four days until the end of monitoring three months post-release. 'Ven Afrika 2', identical to 'Ven Afrika 1' until one month post-release when provisioning stopped due to food being eaten by wild vervet

monkeys. 'Bonamanzi' troop was fed once per day for six weeks, then every two to three days for an additional two weeks, at which point feeding was stopped due to wild vervet monkey troops eating the food.

Post-release monitoring was conducted for three months intensively (every day for two months, every three to four days for one month), and for an additional two months intermittently (single-day monitoring by another rehabilitation centre — the Wild Animal Trauma Centre and Haven at three and a half, four and five months for the 'Ven Afrika' troops, phone calls to the landowner for updates at four and five months post-release for 'Bonamanzi'). After this point, monitoring of the 'Ven Afrika' troops was no longer possible. Data collected included the number of monkeys seen, the geographical co-ordinates of their location, occasional basic notes on behaviour and visual assessment of their condition. No formal data-collection methods were used and the notes provided were extremely brief.

Results

Sightings, mortalities and survival

Confirmed survival rates based on the number of animals last seen at the end of monitoring were low ('Ven Afrika 1' 10%, 'Ven Afrika 2' 39%, 'Bonamanzi' 10.5%). In addition, the presence of wild monkeys at two of the sites ('Ven Afrika 2' and 'Bonamanzi') casts doubt upon some sightings. At least 19 of the 'Ven Afrika 1' troop (including the eight infants) were not seen post-release. The young infant from 'Bonamanzi' troop was observed one week post-release but was not seen again despite sightings of the mother.

Condition, breeding and behaviour

All monkeys were reported to be in good condition. There were no formal assessments, records simply stated that the animals 'appeared healthy'. Some minor injuries were observed to three males, one within each troop.

An infant was born to a female in 'Bonamanzi' troop one day prior to release, but had disappeared by two weeks post-release (15 days old). The current authors presume that it had died.

Although the 'Ven Afrika 1' troop was feeding from natural sources by one month post-release, they appeared to be dependent on supplemental feeding. They were often observed waiting for food at the release site and a juvenile male when found alone, accepted food offered by the observer and allowed physical contact. Monitors recorded that not all of the supplemental food was consumed. Dependence on supplemental feeding reduced by approximately five weeks, post-release.

Monkeys from 'Ven Afrika 2' and 'Bonamanzi' were also observed feeding from natural sources.

Aggression was observed between the four large males in 'Bonamanzi' troop in the release cage and as a result CROW decided to release earlier than planned.

Monitoring tools

The geographical co-ordinates recorded for sightings were clustered closely around the release sites for the troops. The provision of food at the release site was used to facilitate visual monitoring. Feeding was stopped early for both 'Ven Afrika 2' and 'Bonamanzi' troops as wild monkeys were eating the food provided.

Discussion

Poor post-release monitoring practices significantly limited the assessment of outcomes for these releases. The results suggest that monitoring was ineffective. In particular, geographical co-ordinates were highly clustered around the release sites, indicating that the monkeys were not followed or tracked post-release. Data collection was not carried out in a systematic or scientific way. The 'Bonamanzi' troop did have shaved patches of fur to aid in identification of the troop, but given that it appears that no effort was made to search for them anywhere other than the feeding station, this strategy was not effectively utilised.

The present authors suggest the use of improved monitoring strategies and a longer period of post-release monitoring

(IUCN recommends at least one year [Beck *et al* 2007]). Specifically, the use of radio or GPS collars to track released animals is essential (Wimberger *et al* 2010b; Guy *et al* 2011, 2012;). There needs to be a defined monitoring schedule and criteria for success need to be established from the beginning of the project. Ear-tags may be a more useful long-term monitoring tool (Wimberger *et al* 2010b).

Troop movements and home ranges should also be assessed, and could assist in selecting release sites that are sufficiently removed from humans and conspecifics (Wimberger *et al* 2010b; Guy *et al* 2011, 2012).

Few animals were observed post-release and based on these sightings, estimated survival rates were low. Sightings were also confounded by the presence of wild vervet monkey troops. Due to severe shortcomings in data collection (short-term monitoring and extremely limited movement from the feeding stations), 83% of the monkeys released were unaccounted for.

A significant welfare concern was the transport of a late-stage pregnant female, resulting in a birth occurring in the release enclosure and a day-old infant being released. The laboratory animal science association recommends that animals not be transported in the last fifth of gestation so as to limit the risks of abortion or parturition during transport (Swallow *et al* 2005). Vervet monkeys would need to be moved before day 132 of their gestation period (total gestation = 165 days [Dunbar & Barrett 2000]) to comply with this recommendation. The female in the 'Bonamanzi' troop was moved at about day 163.

Also of concern was the aggression among large males from 'Bonamanzi' troop in the release enclosure. Reducing enclosure size (as occurred in moving the troop from CROW to the release enclosure) has been shown to cause increased aggression which can be long-lasting (Clarke & Mayeaux 1992). A larger release enclosure may solve this problem.

Habituation, specifically taking food from humans, was a problem. This is likely related to the background of individual monkeys (eg ex pets), but due to lack of records this cannot be confirmed. The same problem was observed by Wimberger *et al* (2010b). Monkeys in the 'Ven Afrika' troops were observed waiting for food, yet after feeding food remained. This suggests that they were fed enough to satisfy their requirements. As a result, the troops may not have been motivated to forage for themselves. Although supplemental feeding can be an effective temporary measure to assist newly released animals to obtain adequate nutrition until they can explore natural food resources (eg Tooze & Baker 2008; Wimberger *et al* 2010b), dependence can occur (eg Britt *et al* 2008).

As far as the present authors are aware, pre-release medical testing was not carried out. Due to a lack of response from CROW to questions relating to this release, this could not be confirmed. Animals that have not undergone pre-release medical testing present a threat to wild conspecifics at the release site due to the risk of disease transmission (Viggers *et al* 1993; Cunningham 1996; Baker 2002). Medical screening of animals to be released (as required by the IUCN [Baker 2002], and by EKZNW [Ezemvelo KZN Wildlife 2008]) along with a

thorough assessment of the release site, including the presence of any resident troops (as suggested by Wimberger *et al* [2010b]) is recommended for all future releases.

The release sites chosen were inappropriate due to the presence of wild troops, known to interact aggressively with released vervet monkeys (Wimberger *et al* 2010b), and their proximity to each other. Released vervets have been known to travel up to 2.3 km from their release site (Guy *et al* 2011). The two 'Ven Afrika' troops were released just 2.9 km from each other so it is likely that their home ranges would have overlapped, possibly as soon as two days post-release. The carrying capacity of the site does not appear to have been considered in this release. The release site for 'Bonamanzi' was within one to two days range of a major road and human settlement. Roads are a threat to vervet monkeys as motor vehicle accidents are a major cause of injury and death. Forty-one percent of vervet monkey rescues by the Monkey Helpline in 2010 were due to motor vehicle accidents (Smit 2010). Future release sites should be assessed for their proximity to each other and to human activities. The present authors recommend a minimum distance of 3 km unless natural barriers such as large rivers (King *et al* 2006) are present. It is also important to consider the availability of food and water resources and their seasonal variation (Baker 2002). Releases should be timed to maximise availability of resources, ideally at the beginning of the wet season (Wimberger *et al* 2010b).

The aim of vervet monkey rehabilitation is to return the large number of displaced vervets to the wild with the intention of improving their welfare. Unfortunately, the methods used here have meant that this outcome has not been achieved. As vervet monkeys are a common species, benefits of release to the wild population would likely be limited. In the absence of additional data such as carrying capacity, existing troop numbers and detailed vegetation data for the release sites, we were unable to investigate impacts of release on the wild population.

Despite unknown conservation or welfare benefits, rehabilitation of such species will continue to occur as the rehabilitation centres involved are very dedicated to the pursuit of this aim. The most responsible recommendation we can make is to improve methods so as to maximise animal welfare and minimise any risks to free-living populations. Specifically, we strongly recommend that all future vervet releases should be conducted in accordance with the IUCN Guidelines for Non-Human Primate Re-introductions (Baker 2002).

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