



AS I SEE IT

Challenges and opportunities of primate rehabilitation — gibbons as a case study

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ABSTRACT: The trade in illegally captured wildlife is an ongoing, and in many cases increasing, threat to conservation. Primates in particular make appealing pets when young but are frequently rejected or abandoned upon reaching sexual maturity. The trade in gibbons, for example, is a lucrative market, with infant gibbons worth between US\$10 and 500 on the international black market. This represents a large sum of money for the average family, even allowing for the cost of a bullet and gun. Trade in highly endangered primates continues despite the existence of legislation against hunting throughout most primate ranges. The situation is further exacerbated by logging and the permanent conversion of forests to plantations which results in the loss and fragmentation of habitat. Despite this rather bleak outlook, conservation NGOs working with local communities are having an effect. The merits and challenges of rehabilitation and reintroduction of primates are discussed using gibbons as a case study. Data collected at the Kalaweit Gibbon Rehabilitation Project, Central Kalimantan, Indonesia, are used to highlight the many considerations behind a successful rehabilitation and reintroduction project, the importance of detailed behavioural data and the keys to success. Finally, the 'rehabilitation debate' is discussed, i.e. are rehabilitation and reintroduction projects good tools for habitat protection and the conservation of a species?

KEY WORDS: Rehabilitation · Reintroduction · Primate · Conservation · Gibbon · *Hylobates* · Rehabilitation debate

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DEFINING REHABILITATION AND REINTRODUCTION

The American National Wildlife Rehabilitation Association (NWRA) defines wildlife rehabilitation as 'the treatment and temporary care of injured, diseased and displaced indigenous wildlife, and the subsequent return of healthy viable animals to appropriate habitats in the wild' (Atkinson 1997, p. 355). Hannah (1989, p. 24) defined rehabilitation as 'training inadequate individuals in skills which allow them to survive with greater independence'.

Explorations for proper release locations must be carried out, and monitoring of the reintroduction process for feedback for management action has to be conducted; this is the crux of this study on rehabilitation of gibbons. The principal objectives of a reintroduction project are to establish a viable, free-ranging

population in the wild of a species that has become globally or locally extinct in the wild (Kleiman et al. 1991). At the beginning, the operational costs of a reintroduction programme are exceptionally high so, in part to silence the critics of reintroduction, it is necessary to determine if these programmes are economically and morally viable in the effort to conserve endangered species, i.e. can gibbons make the necessary social, physiological, behavioural and physical changes which will allow them to lead an independent life in their natural habitat?

The IUCN Reintroduction Specialist Group defines reintroductions as 'an attempt to establish a species in an area which was once part of its historical range, but from which it has been extirpated or become extinct' (Baker 2000, p. IV). This definition does not specify the source of the reintroduced animals. 'Rehabilitation and reintroduction' (R&R) refers to the use of wild-born,

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captive-raised animals to re-establish a population in the respective species' historical range but where the species has become locally extinct due to human pressures. The most obvious criterion for determining the success of a reintroduction is if the programme results in a self-sustaining population of animals (Griffith et al. 1989). There is also the view that if reintroduction results in a broader and more effective conservation of the habitat, then the programme is a success, even if all the reintroduced animals die soon after release (Kleiman 1989). The real answer must lie somewhere in the middle. A sustainable population is vital, but the animals must have a suitable place to live. Other questions to consider are how many animals is it acceptable to lose in order to establish a sustainable population, and how do we make such a difficult decision?

R&R programmes can theoretically be applied to any endangered species, but the ease with which an animal can be rehabilitated will ultimately depend on how much the animal is required to learn in the rehabilitation centre. For monkeys and apes (who spend an extended period learning from their parents in the wild), the rehabilitation time, and hence cost, will be considerably higher than for other species that do not have such a long learning curve.

There has been very little definitive research regarding the ability of a species to adapt to new habitats (Kleiman 1996, Cheyne et al. 2008a). Reintroduced animals must be monitored long term and studies must involve comparisons with wild individuals from the same species in order to determine the success of the reintroduction.

GLOBAL OUTLOOK ON R&R PROJECTS

The majority of the world's primates live in Third World countries, i.e. those countries which are experiencing the most rapid human population increases and, hence, exerting huge pressures on their natural resources. Despite this rather bleak situation, unexpected opportunities may arise (possibly due to the greater likelihood of the public identifying with, and so providing financial support for, familiar and flagship species) for establishing semi-natural habitats that can be used for reintroduction, as has occurred for example in the USA in the case of masked bob-white quails, peregrine falcons and a variety of insects, fishes, amphibians and reptiles (Campbell 1980). With this in mind, the best course of action seems to be to try to reintroduce as many endangered species as economically possible, as well as focusing on the more popular birds and mammals. Only about 50% of reintroduction projects have released threatened or endangered species or sub-species (Beck et al. 1994). This suggests

that the potential for R&R has yet to be realised, despite some encouraging success stories. The immediate conservation of primates becomes increasingly urgent as suitable habitat and the numbers of primates diminish every day.

Whether the endeavours of previous rehabilitation efforts have improved, or failed to have any impact on, the plight of primates is still an open and hotly debated topic. Despite this, the importance of reintroductions and rehabilitation programmes cannot be overlooked (Chivers 1991, Cheyne & Brulé 2004, Cheyne et al. 2008a), in terms of community and international education, increased awareness and as refuges for abandoned animals. If the animals were not brought to rehabilitation centres, they would face uncertain futures in unsuitable conditions.

WHY THE SCIENTIFIC STUDY OF R&R?

Many primates (and other animals) released from previous projects have been released based on subjective impression and not objective scientific data (DeVeer & van den Bos 2000, Fischer & Lindenmayer 2000, Cheyne 2004, Cheyne et al. 2008a). Until this issue is addressed and R&R is carried out under scientifically proven guidelines, many released animals will continue to perish, having contributed nothing to the overall survival potential of the species.

Fischer & Lindenmayer (2000) in a unique study assessed 87 animal relocations around the world and found that 19 were successful, 22 failed and 46 had unknown outcomes. They used only reintroductions designed to conserve a species, i.e. predominantly repopulation of areas where the species had gone locally extinct (e.g. as a result of hunting or habitat destruction). Problems with R&R (and some involving data issues) include: (1) lack of clear guidelines to define success; (2) no post-release monitoring; (3) no understanding of the animals' behaviour and socio-ecological needs; and (4) no proper rehabilitation from captivity. However, even accounting for these problems, the lack of success is astounding: 80% of all projects failed or had unknown outcomes.

Additional reasons for lack of success in primate reintroductions include the failure to survey the release site for food availability or habitat suitability (Cheyne et al. 2006). The main causes of death in released gibbons have been starvation, hunting, disease and aggressive territorial disputes (Bennett 1992). These problems can be avoided through adequate medical screening before the release, suitable provisioning of food for the gibbons after release and long-term post-release monitoring, including pre-release training and provisioning after reintroduction (Cheyne

et al. 2005). There is a greater than 90% chance that the released primates will die from the above causes, if the project is inadequately planned and supervised (Bennett 1992). Post-release monitoring is vital to ensure that the primates are adapting, and to counter any problems that arise and to collect data on the release process. The IUCN/SSC Re-introduction Specialist Group: Guidelines for Nonhuman Primate Re-introductions (IUCN/SSC 2002) lists post-release monitoring as one of the essential steps in any rehabilitation process. Wild primates can be relocated (i.e. moved for their safety) by us learning their ranging patterns and following them to where they were seen to bed down for the night. Calling can also be used to estimate where the primate groups are (Brockelman & Srikosamatara 1993, Cheyne et al. 2008b). Since the primates will be semi-habituated, it is hoped that after a short space of time, their home ranges and daily travel routes will be known, thus making it easier to follow and observe them than if they were fully wild. Post-release monitoring can also be aided by fitting radio-collars (Campbell & Sussman 1994, Honess & Macdonald 2003). Without adequate post-release monitoring, R&R projects have no way of determining scientifically if the rehabilitation process is adequately preparing the gibbons for a life in the wild. Post-release monitoring requires the collection of data on the gibbons' behaviour, ranging, ecology, socialisation and on the released primates' interactions with other animals in the release area. The importance of daily post-release monitoring, involving observations of the primates for the full active period, cannot be over-emphasised.

GIBBON REHABILITATION, APPLICABLE TO MANY OTHER PRIMATE SPECIES

While the behaviours and social structure of gibbons preclude them from being used as a direct model for other primate R&R programmes, the following lessons should be noted and can be applied to other primates. A variety of problems face gibbon rehabilitation: some of the gibbons will have spent their lives in tiny cages, drugged and chained, while others will have been relatively well treated and may experience difficulty adapting to life without their human family (Cheyne 2006). Tame gibbons form less stable pair bonds, and their behaviour towards conspecifics is unpredictable (Eudey 1992). An understanding of the types of stereotyped behaviour that captive gibbons can exhibit is essential if we are to improve husbandry techniques that remove the causes and symptoms of poor welfare and the resulting central nervous system dysfunctions associated with stereotypy (Cheyne 2006). Research

must differentiate between gibbons that are orphaned when young, and those that have been kept for a time as pets, as their rehabilitation and care needs will be very different. The failure to account for the different life histories of the captive-raised gibbons has been an oversight in the past (authors' pers. obs.). Non-human primates in the wild have extensive parental care with long periods of infant and juvenile dependency (Yeager 1997). During this time, the youngsters learn many social, behavioural and sexual responses, e.g. how to call and communicate with others, how to manipulate and handle food and how to avoid predators. Grouping juvenile gibbons is useful for socialisation and to identify compatible individuals; however, only bonded pairs—and not groups of juveniles—should be released. The other option is to place an older (>4 yr) individual with an adult companion. This substitute parent idea has worked between 2 white-handed gibbons *Hylobates lar* males (author's pers. obs.), but it remains unclear whether this would work for all animals or whether these 2 were unique in their ability to co-exist despite not being related. Information on the ability of these males to form a pair bond with a female is unavailable. The possibility of an adult gibbon teaching a youngster is far more desirable than having a human teach the gibbon the necessary survival skills. However, there is a potential drawback: If the adult and juvenile are not compatible, the juvenile may develop a fear of conspecifics, leading to problems when forming a pair bond.

The increase in the numbers of gibbons being brought to rehabilitation centres has resulted in the emphasis shifting from rehabilitation to simply trying to find humane housing for the newcomers. As a result, there has been less focus on the rehabilitation aspect, and until this is addressed, the centres will continue to fill up with animals that face an indeterminate period in a cage. Some of these gibbons will have spent much of their life being free to roam (albeit in a human environment), and may not adapt well to being caged. If we can determine that an animal is ready for potential reintroduction, we have an obligation to attempt to give this animal a chance at freedom.

Another problem is that while a gibbon pair may have duetted and copulated in captivity, this is no indication that the association will continue once they are released. The pairs may split and re-form, 1 individual may disappear or one may fall ill or not adapt well and have to be brought back to the centre. The ultimate cause of failure must be attributed to a lack of information about the species, the release area and the individual's response to the release area. The animals should be studied and monitored over the long term to determine their reactions to the new environment and to account for any deaths/disappearances. If the released animals

do not live long enough to breed, then their conservation value is negligible (Cayford & Percival 1992). Although there are many documented programmes for rehabilitation of primates (Wynhoff et al. 2000, Tutin et al. 2001, Farmer & Jamart 2002, Cheyne 2005, Goossens et al. 2005, Farmer et al. 2006, Cheyne & Chanee 2008, Cheyne et al. 2008a), each species presents a unique challenge for successful rehabilitation/reintroduction.

Problems facing gibbons in R&R projects can be summarised as follows:

- Developmentally-stunted social skills
- Possible stereotypic behaviour
- Malnourished and/or unable to brachiate properly
- Unable to sing/learn the duet, the species-specific morning singing bout where the male and female sing sex-specific songs.

Importance of a good release site

Areas being considered for release of gibbons must be surveyed prior to the release taking place. For reintroductions to be successful, long-term habitat assessment is vital, both pre- and post-release. Important data to be collected include forest productivity over at least 12 mo prior to release, presence of food competitors and presence of specialist trees; e.g. *Dipterocarp* abundance has been shown to influence gibbon density (Mather 1992, Cheyne 2004, Cheyne et al. 2006). Abundance of figs *Ficus* spp. has also been correlated with gibbon abundance (Mather 1992), but recent data question this and suggest that the importance of figs in gibbon diet is habitat-specific (Cheyne et al. 2006, Cheyne 2008, Hamard 2008). Additionally, all threats to the habitat should be mitigated, with agreements in place that no more hunting of wildlife, logging or habitat conversion will take place in the release site.

Reintroduction science

To make sense of data from the rehabilitation process, viable hypotheses must be tested. Accurate data can provide detailed information about how the rehabilitation process is affecting the primates' behaviour both pre- and post-release. The hypotheses which should be considered include the following: (1) primates show rapid skill acquisition and adaptation through the rehabilitation process; and (2) the behavioural repertoire of reintroduced captive-raised primates and wild-raised primates is the same.

Within these hypotheses, specific aims should be formulated for each species based on the behaviour and biology of wild conspecifics. These will be discussed in the following in terms of gibbon rehabilitation.

Aims of good husbandry practice

As stereotypic behaviour has a psychological basis, it may be detrimental to completely stop the stereotypic (Mason 1991) since the detrimental behaviour is often a replacement for a normal behaviour which has developed in captivity i.e. an abnormal response to a likely abnormal situation. Despite this, the animal may have become dependent on that behaviour for comfort/reassurance, so stopping the animal from performing the behaviour without introducing other stimuli may be harmful. However, changing the size of housing significantly reduces stereotypic behaviour, as does changing the gibbons' social situation, e.g. providing a companion. Small changes that give the gibbon control over its environment can help reduce stereotypic behaviour. Providing an escape area in the cage (e.g. sleeping box) to which the gibbon can retreat when stressed can also help (Cheyne 2000).

Social, behavioural, and diet adjustments

The following social adjustments can be made (Cheyne et al. 2008a):

- Gibbons are paired or socialised with juvenile conspecifics to facilitate integration and separation from/dependence on humans.
- Cages are not in visual range to remove stress caused by seeing conspecifics in their 'territory'.
- Gibbons can hear other members of same species to learn how to sing and duet.

Behavioural adjustments include:

- Cages are high and designed to encourage gibbons to stay off the ground.
- Cages are built into the forest to familiarise gibbons with trees, insects, etc.
- Supports in the cage are changed frequently to provide stimulation and improve environmental enrichment.
- Substrates are not all rigid to encourage balance and muscle development.

The following diet and foraging adjustments should be made (Cheyne et al. 2008a):

- Gibbons are given a very varied diet, as they would have in the wild.
- Gibbons can forage around their cage.
- Food is not cut and gibbons must learn to manipulate it.

Based upon the above considerations, it is possible to draw up a list of behavioural criteria that can be used as a guide to determine when individuals/pairs/groups are ready to be released.

Criteria for pair reintroduction

The following list is based on observed wild behaviours: gibbons average (\pm SD) $29 \pm 0.94\%$ of their time resting (range 28–31%), $29 \pm 1.78\%$ feeding (27–31%), $29 \pm 1.92\%$ travelling (26–32%), $9 \pm 1.07\%$ singing (7–10%) and $4 \pm 0.57\%$ in social activities (2–8%) (Cheyne 2004, Cheyne et al. 2008a, in press). In order to be considered for reintroduction, the pairs should demonstrate the following behaviours:

- Stay at the top of the cage ($>70\%$ of the time)
- Positive pair association, i.e. the pair engages in grooming and playing and exhibits little aggressive behaviour towards each other
- Duetting at the correct time of day (04:00 to 09:00 h)
- Copulating
- Brachiation as main form of travel
- No severe stereotypic behaviour

Keys to successful R&R projects

To ensure that R&R projects have the greatest chance of success, project supervisors should ensure that the following criteria are met:

- Trained staff have carried out habitat surveys.
- Trained staff have carried out behavioural monitoring of gibbons both pre- and post-release.
- All data are analysed by researchers, and the findings are shared.
- Regular meetings are held to ensure that all problems are dealt with swiftly.

THE REHABILITATION DEBATE – IS REHABILITATION GOOD CONSERVATION PRACTICE?

There has been much debate surrounding the effectiveness of R&R projects since the idea was first proposed (Rijksen 1974, Rijksen & Rijksen-Graatsma 1979, Soave 1982, Bennett 1992, Karesh 1995, Agoramorthy 1997, Ware 2001). This 'rehabilitation debate' has often stemmed from a lack of information and has been exacerbated by the lack of published information about R&R project methods and results. Some of the common criticisms of R&R projects are addressed and counter-arguments offered in Table 1.

IUCN BEST PRACTICE GUIDELINES 2007

The IUCN Reintroduction Specialist Groups have produced various publications wherein expertise is gathered to offer suggestions on R&R projects (IUCN 1998, 2000, IUCN/SSC 2000, 2002). Despite this, many R&R projects (old and new) are ignoring these guidelines, the key points of which are summarised below:

- Animals should never be released into an area with an extant population.
- Individuals younger than 2 years old should never be released.
- Ideally, only adults should be released.
- Animals without medical checks should never be released.

Table 1. Some common criticisms of rehabilitation and reintroduction (R&R) projects and proposed counter-arguments

Criticism	Counter-arguments
R&R projects take money that should go to protecting wild animals and their habitat.	<ul style="list-style-type: none"> • Sources of funds are often not the same (welfare vs. research grants) • R&R projects can help protect habitat as release sites.
R&R projects have no proven record of success and thus make a negligible contribution to conservation.	<ul style="list-style-type: none"> • Scientific research and publication of successes and failures are needed. • With constant monitoring and adaptation, reintroduction can work (e.g. golden lion tamarins: Kierulff & de Oliveria 1996, Kierulff et al. 2002; chimpanzees: Farmer & Jamart 2002, Goossens et al. 2005, Farmer et al. 2006; gorillas: Mahé 2006, King & Courage 2007)
R&R projects do nothing to protect wild populations.	<ul style="list-style-type: none"> • Projects need release sites that must be protected and that hold wild animals (though not the released animals). • Projects can work with local communities to set up protected reserves with wild populations (A. B. Chanee pers. comm.).
R&R projects do nothing for environmental education.	Projects have very close working relationships with local people and can be very effective in education, e.g. via school visits, radio and TV programmes (e.g. Orangutan Diaries, BBC).

- Socio-ecological and behavioural data on wild animals should be available.
- Post-release monitoring must be in place with trained staff. Behavioural data are required for comparison with the released animals to determine adaptation.

PROBLEMS WITH THE THEORY

Some or all of the above points are still being ignored by some R&R projects. The IUCN Guidelines are simply that: guidelines. So should the IUCN take a more active role in reintroductions? Additionally, how are offending projects penalised without jeopardising the welfare of the animals? If a project is reported for bad practice, it may lose its funding and it will be the animals that suffer through lack of food and welfare. Perhaps the best policy would be a 'name and shame' strategy, whereby offending organisations and projects are exposed and made to account for their failure to follow IUCN best practice. There has been much-lauded progress in Africa with the Pan African Sanctuary Alliance (PASA) in unifying and promoting sanctuary standards, and building capacity of the programmes including those undertaking reintroduction. These are only suggestions, and the final and best solution is beyond the scope of this paper.

CONCLUSIONS

Tropical forests continue to disappear at a phenomenal rate, and the illegal pet trade continues with no sign of abating any time soon. The numbers of primates kept in captivity will only increase as their forest homes are opened up for plantations, logging concessions and access. Rehabilitation can work in conjunction with habitat protection in terms of protecting areas for reintroduction and establishing rehabilitation camps in areas where there are already wild primates. Rehabilitation and reintroduction is becoming the only viable option to save the thousands of pet primates all over the world, but the low profile of some of these species worldwide (e.g. gibbons) remains an obstacle to gaining recognition for the problems facing some species.

Any strategy to save primates and their habitat must involve an integrated approach that will include:

- Rehabilitating and reintroducing primates (taken from captivity and the illegal pet trade) in a humane environment with expert care and careful planning
- Discouraging local people from keeping primates as pets
- Alerting foreigners to the fact that keeping and trading in (most) primates is illegal
- Promoting primates as flagship conservation species for their habitat
- Providing conservation education for locals and foreigners about the role of primates in the rainforest and the threat that humans pose to primates
 - Direct behavioural monitoring both pre- and post-release; failure is guaranteed without this
 - Ensuring that projects sign up to a strict code of conduct based on IUCN Guidelines
 - Ensuring that wild primate projects work together with rehabilitation projects
 - Ensuring that R&R projects publish their methods, findings and results, even if there have been failures; otherwise the mistakes will be repeated.

The concluding message is not that R&R projects should replace conservation of wild populations and protection of wild habitat. Rather, if carried out with careful planning and consultation, R&R projects are able to contribute to species conservation and environmental education and to mitigating the pet trade in conjunction with wild primate and habitat conservation.

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