Revista Brasileira de Ornitologia, 21(2), 136-140
June 2013

SHORT-COMMUNICATION

Successful translocation of a nestling Ornate Hawk-Eagle (*Spizaetus ornatus*) in southern Brazil

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Received on 13 April 2013. Accepted on 4 June 2013.

ABSTRACT: The translocation of individuals or populations is a management strategy that is widely used in conservation, especially for rare or threatened species. In September 2005, an Ornate Hawk-eagle (*Spizaetus ornatus*) nest with a nestling was found near the newly-constructed Barra Grande dam, on the Pelotas River, in northern Rio Grande do Sul. The nest was 1.20 m above the water surface and at risk of be submerged, and both the nestling and its nest were transported to a safe location 380 m away from the original location and 30 m above the high water level of the reservoir. After translocation the nestling was monitored for 60 days, until fledging. Translocation was considered successful due to the acceptance of the translocated nestling by the adults, inferred by the observation of parental care and nest defense after translocation. The *in situ* management that we report may be a useful alternative for *ex situ* management, at least in specific cases. It also must warn us of the need to have a raptor monitoring and rescue program during the construction of hydroelectric plants.

KEY-WORDS: Atlantic Rain Forest, Management, Raptors, Rio Grande do Sul.

The IUCN (1998) definition of translocation is a "deliberate or mediated movement of wild individuals or populations from one part of their range to another." It is a widely-used management technique, especially for conservation purposes, though the objective may vary (Wolf *et al.*1998, Fischer & Lindenmayer 2000, Saenz *et al.* 2002, Beck *et al.* 2007, Ruffel *et al.* 2009). In some cases translocation has successfully led to the re-establishment of populations of threatened, endangered or rare species (Griffith *et al.* 1989, Nicoll *et al.* 2004). Despite these successes, most translocation attempts fail. Habitat quality, the position of the release site in relation to the historical distributional range (core *versus* periphery), the type of release technique (hard *versus* soft release), the number of individuals released, the origin (wild or captive) and age of individuals, predation and the presence of potential competitors can all influence the results of translocation (Wolf *et al.* 1998, Campbell-Thompson *et al.* 2012, Sheean *et al.* 2012). In many cases in which translocations failed, outcomes cannot be evaluated effectively because of a lack of objectivity or a short period of analysis (Miller *et al.* 1999, Fischer & Lindenmayer 2000). Nevertheless, in some cases, this management approach can be the best option for a species, when appropriate planning has been carried out (Marini & Marinho-Filho 2006).

The Ornate Hawk-eagle *Spizaetus ornatus* (Daudin, 1801) has a large distribution, occurring from México to Argentina (Ferguson-Less & Christie 2001). Although present throughout virtually all of Brazil, it is rare outside the Amazon basin (Sick 1997). It is neither nationally nor globally threatened (MMA 2003, IUCN 2008), but the Ornate Hawk-eagle has become scarce in the Atlantic Rain Forest biome. It is regionally threatened in the states of Minas Gerais (Machado *et al.* 1998), São Paulo (São Paulo 1998), Rio de Janeiro (Bergallo *et al.* 2000), Espírito Santo (Espírito Santo 2002) and Paraná (Mikich & Bérnils 2004). In the state of Rio Grande do Sul, the species had been considered probably extinct (Marques *et al.* 2002), although a population was found recently in the northeastern portion of the state (Mendonça-Lima *et al.* 2006).

Here we report on the translocation of a nestling Ornate Hawk-eagle with its nest in Rio Grande do Sul, southern Brazil. The data presented here derive from the Monitoring and Rescue of Fauna and Flora Project activities during the construction of the Barra Grande Hydroelectric Power Station (HPS), carried out by

Bourscheid S. A. – Engenharia e Meio Ambiente. The Barra Grande HPS is located in the Pelotas River basin, in the boundary between the states of Rio Grande do Sul and Santa Catarina, Brazil. This region is inside the Atlantic Rain Forest biome, within a region where river hillsides support seasonal semideciduous forest, and upland areas consist of Araucaria moist forest and native grasslands (Marcuzzo *et al.* 1998). The region has been intensively modified by human activities, and natural areas have been almost completely replaced by croplands, exotic pastures and monocultures of exotic trees (e.g. *Pinus* spp.). However, remnants of pristine and old growth secondary forest still can be found, especially in some valleys of the Pelotas River and nearby rivers and streams.

On September 22th 2005, an active Ornate Hawk-eagle nest was found on the margin of the Barra Grande HPS reservoir, in the municipality of Esmeralda, Rio Grande do Sul (27°56'55"S; 51°1'59"W). In the nest there was a nestling around two months old (Joenck *et al.* in press). At that time, the reservoir was not completely filled (around 20 m below the maximum fill level), and the nest was only 1.20 m above the water surface. The water level was advancing 1m/day on average, so the nest was at immediate risk of being submerged and the nestling was at risk of drowning. Due to the urgency of the situation, we chose to immediately translocate the nestling with the nest to a safer place, which seemed to be the most reasonable way to try to ensure the survival of the chick without the need for *ex situ* captive-rearing.

On September 23th, we selected the release site, a açoita-cavalo tree (*Luehea divaricata,* Tiliacea) about 35 m high, 380 m from the original site and 30 m above the maximum fill level of the reservoir. On the next day the translocation was accomplished. The translocation began at dawn with three motor-boats and a team with ten members (three biologists, one veterinarian and six assistants) allocated exclusively for the translocation. First the release site was prepared to receive the nest and then the nest and nestling were removed (at 10:00 AM). It was a large, heavy nest, so we removed the top of the nest and transferred it to an artificial structure, previously prepared for the purpose, to help with transportation and settling on the new site (Figure 1). During the process of translocation and settling of the nest, a veterinarian who specialized in wildlife was present at all times to take care of the nestling. At 12:03 PM, the nestling appeared to enter a state of neurogenic shock and showed signs of entering cardiorespiratory arrest, and the veterinarian administered an intramuscular dose of 0.5 ml Dexamethasone (1 mg/kg) to prevent arrest. We performed the translocation and release as quickly as possible to reduce stress on the nestling and the adults. The nestling was banded (ring CEMAVE, X05651) and a blood sample was taken for sex identification (a female). After four hours, the nestling was released on the nest and was under observation for approximately 30 minutes to assess its health conditions (Figure 2).

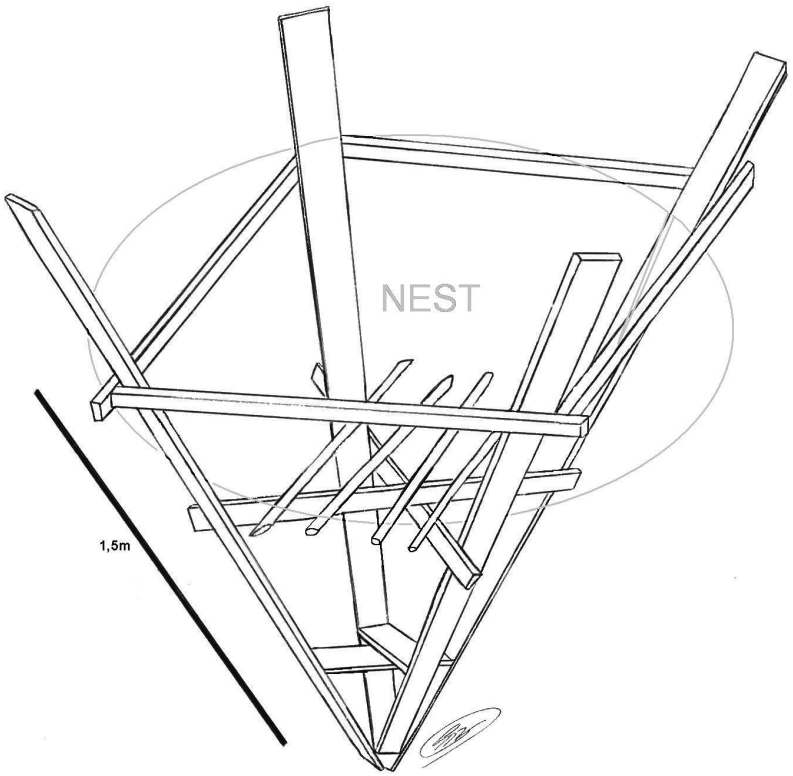

FIGURE.1. Support structures for helping transport the nest and nestling of the Ornate Hawk-Eagle (Drawing by C. M. J.).

FIGURE 2. Nest and nestling of the Ornate Hawk-Eagle (*Spizaetus ornatus*), translocated in the state of Rio Grande do Sul, Brazil.

After release, the site was not visited for 48 hours to prevent any additional human-induced stress to the nestling, to ease the adaptation of the nestling, and to help with the adult's acceptance of the new site. The nestling was healthy and had been fed recently and, although there was a small risk that nestling would be underfed during that 48 h, we thought it necessary to allow the birds to acclimate.

To assess the effectiveness of translocation (survival of the nestling, adults' acceptance of the new site, continuity of parental care), on September 26th 2005, we started monitoring the nestling from an observation point 380 m from the new location. On the first five days, assumed to be critical for the adult's acceptance of the nest new location, the site was monitored daily. This period was considered crucial for the nestling's survival, as it would allow us to remove the nestling to an appropriate rehabilitation unit if the parents rejected it. In the remaining period – about 60 days – observations were done occasionally, totaling four days of monitoring spaced about one or two weeks apart.

During the monitoring, we observed the adults bringing food to the nestling and protecting the nest location against others birds. In the first day, an adult expelled a king vulture (*Sarcoramphus papa*) that approached the nest. The observed nestling-adult interactions were limited to calling and food delivery, but during all periods of monitoring, at least one adult was observed close to the nest. In the period in which the juvenile was monitored, it was observed feeding itself, preening and undertaking flying exercises. On the 13th day after translocation, we observed the first departures of the juvenile from the nest, on a reconnaissance flight of the surroundings. On the 34th day after the translocation, the juvenile was observed resting 50 m from the tree where the nest was. On the 47th day the juvenile still was near the nest, approximately 70 m away. On the 59th day after the translocation, which coincided with the end of the Monitoring and Rescue of Fauna and Flora Project at the Barra Grande HPS, we made a final visit to the nest site, but we did not observe the juvenile.

The case described here has singularities that were crucial for the success of the translocation. Our main objective was to keep the nestling alive until fledging, an outcome that was successfully achieved. Although a long monitoring period after fledging would be ideal to confirm the survival of the individual, several logistical and financial constraints made it not possible. One important point that contributed to the success of the translocation was the proximity of the original and release

sites, both of which were inside the Ornate Hawk-eagle adults' territory. Habitat quality of the release site is an important element for the success of translocation (Wolf *et al.* 1998). We therefore chose a location close to the original nest site, keeping the environmental qualities similar. Observations in the following years confirmed that the adults maintained a breeding territory in the same area, though they used a different site for nesting, near the release site (F. Z. *pers. obs*.). The high energetic investment in each offspring (Ornate Hawk-eagles typically fledge one juvenile every two years, Whitacre *et al.* 2012) is another factor that may have fundamental importance for the adults' acceptance of the relocated nestling.

We chose *in situ* rather than *ex situ* management because it has lower anthropogenic impact, it is less expensive, and it could increase the probability of juvenile survival. Translocation procedures (including the capture, transportation and release) that involve captivity could be more harmful to the animal's welfare, causing stress to the individual (Massei *et al.* 2010). The *in situ* management helped reduce the time the nestling was in captivity. In addition to lowering the stress levels as a result of reduced exposure to humans, keeping the individual in its natural habitat allowed it to adopt natural behaviors and increased the probability of successful integration into the habitat (Greenwood 1996, Bell & Merton 2002).

Captive-bred raptors have lower probability of survival than wild-reared raptors (Brown *et al.* 2006, Evans *et al.* 2009, but see Evans *et al.* 1999, Nicoll *et al.* 2004). Releasing the nestling after raising it in captivity could therefore be impractical or impossible. A juvenile that has not received any parental care may not have had an opportunity to learn how to fly, hunt and to recognize potential prey, predators and competitors. These reduced opportunities could greatly reduce the probability of survival of a captive-reared juvenile, especially in species with long period of parental care (Sunde 2008, Campbell-Thompson *et al.* 2012), like the Ornate Hawk-eagle (where parental care is longer than a year; Klein *et al.* 1988, Whitacre *et al.* 2012).

Also, translocations are very expensive and often fail to solve the problem (Massei *et al.* 2010, Fortúbel & Simonetti 2011). The cost varies depending on the organism. For carnivores, translocating one individual costs about US$ 3,756 ± 357 (mean ± SD) (Fontúrbel & Simonetti 2011), while for birds it is about US$ 4,473 ± 1,711 (range = US$ 1,960 to US$ 6,613) (Miller & Mullette 1985, Martínez-Abraín *et al.* 2011, Baker *et al.* 2012). We did not calculate exactly how much was spent on the translocation, but the cost of building and maintaining a rehabilitation center was estimated at about US$ 165,000 (N. J. E. Silveira *in litt.*). Actually, most of the costs (employee salaries, taxes and equipment, such as boats and cars) applied in the translocation also would be necessary in *ex situ* management and we understand that the main cost is indeed for maintain the rescued animals in quarantine until their release. Thus we agree with Martínez-Abraín *et al*. (2011), that most of the cost is typically related to the duration that the individual is maintained in captivity. Also, the *in situ* translocation was cheaper than a capture-captivity-release approach, which should include a hacking procedure, with a long period of supplying food until the juvenile starts to hunt independently (Campbell-Thompson *et al*. 2012).

This translocation of an Ornate Hawk-eagle nestling demonstrates the effectiveness of keeping an individual at risk of death *in loco*. Despite this, we emphasize the importance of careful operational planning to consider all risks, consequences and possible alternative actions. As suggested by Fischer & Lindenmayer (2000), it is also important that the purposes of the operation are well-determined and that a later tracking protocol is defined so as to evaluate the relocation efficacy. It does not matter that efforts (personal and financial) are expended for translocation if the outcome is not appropriately assessed.

Finally, constructions of dams, especially ones that flood large areas, have many implications for biodiversity, and it is important to make decisions to minimize the impacts on fauna and flora. Cases like the one related here, of nests being submerged in hydroeletric power stations reservoirs, surely are not uncommon, so a careful and well-designed monitoring program during the reservoir filling is critical to avoid such events. We hope that our experience with this Ornate Hawk-eagle nest helps others to make the best decisions to keep species found in similar situations safe.

ACKNOWLEDGEMENTS

We thank all colleagues from Bourscheid S. A. Engenharia e Meio Ambiente for support and friendship during the whole work of monitoring and rescuing fauna and flora in Barra Grande HPS, especially those who helped during the translocation. We also thank BAESA/COBG for permission to publish this data. We express gratitude to the Brazilian Institute for the Environment and Natural Renewable Resources (IBAMA) and Mônica Koch for support and translocation permission and to Ana Paula Brandt, who found the nest and immediately asked for ornithologists C. M. J. and F. Z.'s help. We also appreciate Jan Karel, F. Mähler Jr., José Fernando Pacheco, Alexander Lees, Edwin Campbell-Thompson and one anonymous referee for their valuable comments that improved the first draft of the manuscript. We appreciate the improvements in English usage made by Rebecca Cramer through the Association of Field Ornithologists' program of editorial assistance. We dedicate this article to the biologist Carlos Daniel Peixoto, our colleague and dear friend, who died during the performance of fauna monitoring tasks.

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Associate Editor: Alexander C. Lees