

Neotropical otter population strengthening in the wild

Reforço populacional de lontra neotropical na natureza

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ABSTRACT

This work aims to contribute to the definition of a protocol for the safe release of *Lontra longicaudis* in the wild. It is used information from the database of the Animal Refuge Conservationist Breeding Center of the Instituto Ekko Brasil/Projeto Lontra. A proposed enclosure is presented, containing a minimum area of 60 m², for an individual, with a tank occupying at least 40% of the enclosure, with a depth of 1,5 m, a feeding area of 2 m², in addition to research actions, social mobilization, environmental education, and public policies. The research seeks to create a protocol adapted to the conditions of the *Lontra longicaudis* species, developed for the southern region of Brazil. It can serve as a subsidy for the definition of a protocol for this purpose for the neotropical otter. Such a protocol, associated with the eight otter birth successes at the Conservationist Animal Refuge, all reaching adulthood, can serve as an important support for the need to reintroduce otters into places where the species has gone extinct.

Keywords: *Lontra longicaudis*, reintroduction, release protocol, neotropical otter.

Resumo: Este trabalho visa contribuir para a definição de um protocolo para a soltura segura de *Lontra longicaudis* na natureza. São utilizadas informações do banco de dados do Centro de Criação e Conservação Refúgio Animal do Instituto Ekko Brasil/Projeto Lontra. É apresentada uma proposta de recinto, contendo área mínima de 60 m², para um indivíduo, com tanque ocupando pelo menos 40% do recinto, profundidade de 1,5 m, área de alimentação de 2 m², além da pesquisa-ações, mobilização social, educação ambiental, e políticas públicas. A pesquisa busca criar um protocolo adaptado às condições da espécie *Lontra longicaudis*, desenvolvido para a região sul do Brasil. Pode servir de subsídio para a definição de um protocolo para os demais estados brasileiros. Tal protocolo, associado aos oito sucessos de nascimento de lontras no Refúgio Animal, todos chegando à idade adulta, pode servir como um importante suporte para a necessidade de reintrodução de lontras em locais onde a espécie foi extinta.

Palavras-chave: *Lontra longicaudis*, reintrodução, protocolo de soltura, lontra neotropical.

1 INTRODUCTION

The release of an otter into the natural environment is part of a complex process that includes rescue, recovery, training, release, and monitoring. This process follows two different paths, one for the adult and one for the puppy. The adult represents the fastest process, requiring the animal to be returned to nature as quickly as possible so that it does not get used to captivity and human beings. Concerning the puppy, this process is longer, going through several phases until the final adaptation to free life. In both cases, it is necessary to define a project that includes time schedule, communication, and risk management.

To date, the Animal Refuge of the Instituto Ekko Brasil (IEB)/Projeto Lontra, located at Lagoa do Peri, Santa Catarina Island, south of Brazil, is the only place in the world with successful births of the *Lontra longicaudis* species (Figure 1). The Animal Refugee already has the fourth generation of adults born in captivity. From 2016 to 2019 there were 10 births, 5 successfully, with those born reaching adulthood. Unfortunately, this reality contrasts with the growing number of

otters killed by being run over, beaten by people, and attacked by dogs. In 2018, four dead otters were registered by the IEB, for sure an underestimated number.

Figure 1. Location of the study area.



The increase in the number of dead adult and offspring otters, the successful births of otters in captivity at the Animal Refuge, parallel to the decrease in the population of the species in the wild (Carvalho Junior et al., 2021), led to the definition of a release proposal. This proposal follows the policy guidelines elaborated by the IUCN Species Survival Commission Expert Group and is directly aligned with three of the Sustainable Development Goals (SDGs) defined by the United Nations (UN), the SDG 14 Life in Water, SDG 15 Life on Earth, and SDG 17 Partnerships.

In Brazil, animal release data are scarce and sparse. Goiás (Center of Brazil), for example, apprehended 13.691 animals from 1997 to 2005. It is estimated that around 12 million wild animals are removed from the natural environment per year (WWF, 1995). Most are released without any follow-up, and the rest are sent to zoos and breeding sites. Data on the release of otters in Brazil do not exist, but in the United States, from 1976 to 1998, about 4 thousand otters (*Lontra canadensis*) were reintroduced (Raesly, 2001). Release projects used radio transmitters to monitor the released animal. Release sites were defined based on habitat condition, food availability, water quality, land use, and presence of public land.

The main purpose of the release or reinforcement of the population of otters is to ensure a viable and free-living population. Therefore, individuals must be reintroduced into the species'

habitat, thus requiring long-term management. This management has the principle of guaranteeing the long-term survival of the species *Lontra longicaudis* in the natural system; ensure the presence of the otter as a key species (in the ecological or cultural sense) in the ecosystem; assist in the maintenance of the system's natural biodiversity; provide long-term benefits to the local economy; and promote conservation awareness.

2 RESEARCH METHODOLOGY

The choice of location represents a crucial decision. The IEB/Projeto Lontra has been studying the otter in Lagoa do Peri for 36 years. Lagoa do Peri is considered a hot spot for the species, due to its hydrological and geophysical characteristics, as well as its location. The Lagoa do Peri is in the species' home range and has the advantage of still having wild otters.

Even so, individuals to be released must first undergo a detailed physical and health analysis. This is important to prevent the spread of disease, social disorder, and the introduction of alien genes. In the present case, this risk is minimal, as the individuals live in the Refúgio Animal from an early age, orphans, and with full control of their health status. Furthermore, most come from the same home range, with a high probability of being part of the same subpopulation. Regardless, a quarantine time is of fundamental importance, reducing the occurrence of unnecessary risks.

Another factor that played a role in the selection of the location is that the release area provides a guarantee of long-term protection. This is a protected area where the IEB has its base. The lagoon has adequate habitat availability, where the species' habitat and landscape requirements are satisfied and likely to be sustainable for the foreseeable future. The area has a carrying capacity of one individual per linear km, within an 11 km perimeter of the lake, sufficient to support a population of up to 11 individuals and support a viable and self-sustainable population in the long term (Carvalho Junior, 2016).

Over 36 years of studies, a negative trend in the otter population in Lagoa do Peri and other surrounding areas was identified (Carvalho Junior et al., 2021). All areas show a decrease in the intensity of the presence of the species. This reduction may be linked to diseases transmitted by dogs and cats, pollution, poisoning, being run over on roads without the passage of fauna, loss of habitat, retaliation by fishermen and aquaculture farmers, and unfavorable effects resulting from a mistaken management plan of the protected areas.

These results illustrate the need for a series of actions, such as research, social mobilization, environmental education, and public policies. Within this context, the Animal Refuge takes on a fundamental role in the studies and release of recovered orphaned otters. The Refuge, over the last 10 years, demonstrates that it has adequate release stock availability. Most of the animals in captivity

are of wild origin, except for otters born on the site. Therefore, they are genetically related to the original native stock and show ecological characteristics (morphology, physiology, behavior, habitat preference) like those of the original subpopulation. This stock is constantly renewed, with new orphans arriving regularly. Therefore, the removal of individuals for release does not endanger the captive population or the population of wild origin.

So far, the Refuge is the only breeding site in the world that successfully spawned the neotropical otter in captivity. Therefore, a proportional number of males and females is kept in the breeding so that the captive population is sustainable. The animal to be released will be carefully selected, considering gender and behavior.

The Otter Project Breeding stock is maintained on a regular and predictable basis, from 3 to 7 otters. The captive stock, used for population reinforcement, is managed demographically and genetically, according to the principles of contemporary conservation biology. Surpluses will be released into the natural environment, meeting the specifications of the project protocol. It is noteworthy that individuals are not removed from a wild population, thus preventing negative effects of translocation in the donor population.

The release of captive stock of orphaned otters born in the Animal Refuge depends on their preparation and learning for survival in the wild. It is necessary that they can acquire the necessary information to allow them to survive in nature, through training in a captive environment. The probability of survival in the wild, of an individual raised in captivity, should approximate that of a wild counterpart. Parallel to this, care must be taken to ensure that released otters do not pose a danger to locals and tourists who visit the lake.

SOCIOECONOMIC AND LEGAL REQUIREMENTS

Releases are generally long-term projects that require a commitment to long-term financial and political support. An assessment of the reaction of local people to the proposal is made to ensure the long-term protection of the otter population in Lagoa do Peri. This is of particular importance given the fact that the cause of population size decline is related to habitat change and lack of connectivity between ecosystems used by the species. Therefore, the proposal must be fully understood, accepted and supported by the local and surrounding community.

The safety of the otter population at the site is threatened by the presence of dogs, which can attack otters and transmit diseases. Therefore, adequate measures must be taken to minimize them. If these measures are inadequate, the release project should be abandoned, and alternative release areas selected. Thus, Instituto Ekko Brasil is committed to placing signs along the release area

warning people about the danger of the presence of dogs in the lake. However, a joint inspection action by the agency responsible for managing the lake will be necessary.

It should be noted that the neotropical otter poses no risk to the population. There is no record of an otter attack on man, on the contrary, the species is defenseless to attacks arising from retaliation by fishermen and aquaculture farmers. Concerning Lagoa do Peri, the otter is more concentrated in the southern part of the lagoon, where seven burrows used by them are located. The northern portion, due to the intense movement of visitors, promoted by the Natural Monument Headquarters, ended up driving the species away from the place. The natural is for the otter to move away from man—that is why it is rarely seen in the wild. Regardless, it is important to implement a “fence” for protection with ropes and buoys, defining a release area of around 5 thousand m². Within this area, several signs must be installed informing the public about the actions taken.

The Animal Refuge is authorized by IBAMA (Brazilian Institute of the Environment), according to Normative Instruction No. 7, of April 30, 2015. It is defined as Conservationist Wildlife Breeding, by CONAMA Resolution (National Environmental Council) 489/2018, art. 4^o, V. The release of wild fauna specimens is provided for in Art. 6^o, II, of the Normative Instruction of IBAMA No. 179, of June 25, 2008, regarding Population Reinforcement. Art. 7, VIII and IX determine the need for the existence of a release methodology, with recommended frequency and techniques, in addition to a post-release monitoring methodology for the species, population and community, type of marking, sampling effort and schedule of execution.

Art. 7, X requires a description of the infrastructure for the quarantine stages, preparation for the release and acclimatization program, and a descriptive memorial of the facilities that are part of the release program. Article 12 of the same ordinance establishes that the results of the post-release monitoring must be forwarded to the competent body in the form of reports, according to the methodology approved in the project.

For the release, a proposed enclosure is presented, containing a minimum area of 60 m², for an individual, with a tank occupying at least 40% of the enclosure, with a depth of 1,5 m, a safety space of 2 m² to isolate the animal when necessary to access the enclosure. The largest room with grass substrate or other undergrowth on resistant material compatible with the existing shelters in Lagoa do Peri. These requirements also comply with IBAMA Normative Instruction No. 7, of April 30, 2015.

PLANNING, PREPARATION AND RELEASE STAGES

Now, the only species to be released in the Peri Lake System is the *Lontra longicaudis*, so this proposal is valid and exclusive for the neotropical otter. Although the Animal Refuge has, in captivity, specimens of *Eira barbara* (tayra) and *Galictis cuja* (small ferret), these need more research and a specific release project. Given the complexity of the release and monitoring process, in addition to maintaining the health of the population in captivity, Ekko Brasil Institute plans to release one to three individuals per year.

Short-term and long-term success indicators will be represented by the hatching of otters in captivity, number of orphans recovered and released, number born in captivity and released, wild adults recovered and released, and the estimated lifespan of otters in the wild. Monitoring the intensity of otters at the site will be another important indicator, which has been developed for over 20 years. The estimated duration of the project is 3 years, in the context of the agreed goals and objectives, after which it should be reviewed and decided on whether to continue or not.

The first phase of the project, the construction of the enclosure, acquisition of equipment, and access to the release area, will be carried out through fundraising from companies and public notices. Maintenance and monitoring costs will be covered with the Instituto Ekko Brasil's own resources, from the Ecovolunteer Program, visitation fees and partnerships.

USE OF TECHNOLOGY IN THE CONSERVATION OF THE NEOTROPICAL OTTER

Post-launch monitoring uses telemetry equipment. Telemetry is a location and monitoring system through transmitters and receivers of VHF/UHF signals or via satellite, used to monitor wildlife of any kind, locate animals, cargo, people, vehicles, and objects, among other applications. There are several transmitters to be used according to the specific needs of each project. The best known of this system are the collars, backpacks, or even devices attached to the animal's body, as is the case with manatees, sea turtles, and whales.

Regarding the otter, this type of transmitter, external, is not the most suitable. Almost all work carried out with otters use internal implants (Hernandez-Divers et al., 2001; Néill et al., 2008; Soto-Azat et al., 2011). Attempts with external transmitters have not yielded good results (Marmontel et al., 2011). Neill et al. (2008), concludes that the radio transmitters implanted in *Lutra lutra* were superior to external transmitters both for the quality of the data and for the comfort and safety of the animals.

The present work will make use of two types of receivers, a passive and an active one. Two passive receivers will be installed in the channel that connects the lake to the sea. These two receptors will determine the direction of movement of the animal, whether entering or leaving the

system. As for monitoring in the lake, the active receiver will be used, considering the dimension and peculiarities of the lake. In this case, two types of antennae will be used for the active search, the omnidirectional and the unidirectional. The unidirectional is intended to indicate whether the animal is in the detection radius around the sampling point, while the unidirectional serves to determine the direction of the animal from the sampling point. The marking of animals will be subcutaneous, less invasive for animals. Preliminary tests will be done before release to assess the animal's behavior and acceptance.

3 RESULTS AND DISCUSSION

The pre and post-release monitoring program for each release must include methodological testing with scientifically collected data. Based on previous experience, data that do not follow a normal distribution is expected. Therefore, non-parametric statistical tests must be applied. Likewise, tests such as Kruskal-Wallis should be applied to the entire dataset produced to investigate whether there is any significant difference between the conditions tested. As for differences, tests such as Wilcoxon can be applied to find out which conditions are significantly different from others. Finally, a polynomial regression model, with a Holm fit, for example, can be used to find out if there is any difference in the presence of otters over the years. During all statistical analyses, differences will be considered significant with p less than 0,05.

Therefore, it is important that the program's main objective is to monitor the health and survival of the released individuals in the field. Monitoring can determine the need for some intervention if the situation proves unfavorable to individuals in the wild. To minimize risks, health protocols related to the release area must be defined and applied to captive otters for later release. Thus, the aim is to ensure that the stock is free of infectious or contagious parasites and pathogens before release, and that the stock is not exposed to vectors of disease agents that may be present at the release site, and to which it may not have acquired immunity.

For this purpose, vaccines must be applied before release, during the preparation phase, to allow sufficient time for the development of the necessary immunity. Otters should be tested to detect the most common pathologies that affect domestic animals in the region of release, such as distemper, parvovirus, leptospirosis, and giardia. After this prior examination, the animals must be vaccinated for these pathologies. To eliminate endoparasites, preventing contamination of the environment, deworming must be done 33, 18 and 3 days before release.

Blood tests are also needed to verify that captive otters have no diseases that could contaminate the wild population. Captivity training is important so that individuals can obtain food, using natural prey that already occur in the release environment. Captive feeding is essential. This

must be provided without visual contact with the keeper, preventing the approach of the otter with humans. This is accomplished through the fish-pipe. The keeper, positioned outside the enclosure and out of sight of the otter, directs the fish directly into the otter pool. This technique has been successfully used in the Otter Project for over 10 years and is part of the environmental enrichment program for otters in captivity.

Environmental enrichment represents a series of mental and physical activities, with exercises that strengthen the animal's muscles for long journeys. Occasionally, the menu must be modified, including meat from birds and mammals, with marine species present in the otter's home range. However, the basis of the diet must respect previous studies on otter feeding on site (Carvalho Junior et al., 2010).

All otters need to be microchipped (numbered) and equipped with GPS transmitters for monitoring. In this proposal, there is no transport stress because the animals will be released in the same place, without the need for capture, using connecting pipes between the recovery and release enclosures. In this way, all individuals to be released will already be acclimated to the location. This acclimatization includes behavioral training, hunting, and feeding, considering the composition of the local wild group, population size, and following internationally known standards of release and techniques.

Parallel to the release, it is important that the program includes the development of a conservation education project to support long-term release actions, with continued professional training for the technical team involved, public relations through the media and social network, as well as the involvement, whenever possible, of local people in the program. Below is an image of the proposed release area and adaptation of the otter to the natural environment (Figure 2). The area consists of a terrestrial trail with educational signs so as not to harm or restrict the movement of people along the lake.

Figure 2. Intervention proposal for the adaptation and release of otters.



Below are displayed the images of the project of the enclosure to be built (Figure 3).

Figure 3. Images of the project of the enclosure for releasing otters in the Lagoa do Peri system.





4 CONCLUSION

The release of otters cannot be seen in an amateurish or impulsive way, especially when it comes to puppies and adults who have gone through a long recovery time. It is a process that includes preparation, training, monitoring, environmental education, and social mobilization. This work seeks to create a protocol adapted to the conditions of the *Lontra longicaudis* species, developed for the southern region of Brazil. It is very likely that adjustments should be made according to species, region, and legal conditions.

It should be noted that release is always a very long, complex, and expensive process. The theoretical basis of the proposal considers the need for approaches with community involvement and participation in the sustainable conservation of natural resources. Through social mobilization and environmental education actions, the project seeks to support the improvement of the quality of life, the need to conserve and, if necessary, restore parts of the ecosystem.

Knowledge of the natural history of the *Lontra longicaudis* is crucial to the release scheme. An understanding of the effect that released otters will have on the ecosystem is important in determining the success of the release. Released individuals must be monitored under various sets of conditions, to specify the ideal number and composition of animals to be released per year, in addition to the number of years needed to ensure the healthy presence of the otter population in Lagoa do Peri.

Through this monitoring, it will be possible to analyze the viability of the otter population in the place. It will also help identify significant environmental and population variables and assess potential interactions, which would guide long-term population management.

As there is still no program for releasing otters in the natural environment in Brazil, this work can serve as a subsidy for the definition of a protocol for this purpose for the neotropical otter. Such a protocol, associated with the eight otter birth successes at the Conservationist Animal Refuge, all reaching adulthood, can serve as an important support for the need to reintroduce otters into places where the species has gone extinct.

Proposals like this should be in line with international movements such as the IUCN Species Survival Commission Expert Group and the UN Sustainable Development Goals (SDGs), in particular SDG 14 — Life in Water, SDG 15 — Life on Earth, and SDG 17 — Partnerships. Although the solution proposed here represents a regional issue, it should not be ignored that the problem also has a planetary bias, for example, climate change, deforestation, and the decline in biodiversity.

The main objective of this study is to contribute to the continuity of viable populations of the *Lontra longicaudis* species in the wild. Therefore, the reintroduction of individuals into the natural environment requires long-term planning. This planning includes monitoring, which can help identify significant environmental and population variables, in addition to evaluating the potential interactions of reintroduced animals, serving as a subsidy for long-term population management.

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