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Rehabilitation and release of two owls after collision against barbed wire fence*

Reabilitação e soltura de duas corujas após colisão contra cerca de arame farpado

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Abstract

The increasing growth of the Brazilian population and the expansion of human activities has led to significant habitat loss for numerous wild species, increasing their vulnerability to accidents and anthropogenic impacts. This paper reports clinical cases involving two owl species, *Tyto furcata* and *Athene cunicularia*, that collided with barbed wire fences in rural areas of the Reconcavo Baiano region. The injured animals were rescued and transported to the State Wildlife Rehabilitating (CETAS) in Cruz das Almas, Bahia, operated by the Institute of Environment and Water Resources (INEMA), for physical examination, diagnosis, treatment, and clinical monitoring during their rehabilitation process. The protocols adopted in these cases may serve as a reference for reintroduction or population reinforcement initiatives for other threatened raptor species, particularly in regions lacking adequate infrastructure for advanced diagnostic procedures. During the rehabilitation phase, weight fluctuations were observed in both owls. Nevertheless, both species exhibited satisfactory clinical progress and were successfully released into the wild with body condition scores appropriate for their species after 28 days (*A. cunicularia*) and 30 days (*T. furcata*).

Keywords: bird, trauma, wildlife, anthropogenic impacts.

Resumo

O crescente aumento da população brasileira e a expansão das atividades humanas resultaram em uma perda significativa de habitats naturais de muitas espécies silvestres, aumentando a sua vulnerabilidade aos acidentes e impactos antrópicos. Este estudo apresenta os casos clínicos de duas espécies de corujas, T. *furcata* e *A. cunicularia*, que colidiram com cercas de arame farpado na zona rural do Recôncavo Baiano. Os animais feridos foram resgatados e encaminhados para o Centro Estadual de Triagem de Animais Silvestres (CETAS) de Cruz das Almas, Bahia, gerido pelo Instituto do Meio Ambiente e Recursos Hídricos, INEMA, para a realização da avaliação física, diagnóstico, tratamento e monitoramento clínico durante o processo de reabilitação. Os protocolos adotados nesses casos podem servir para iniciativas de reintrodução, ou revigoramento populacional de outras espécies de rapinantes ameaçadas de extinção, especialmente em regiões que carecem de infraestrutura adequada para exames complementares de diagnósticos avançados. Durante a fase de recuperação, foram observadas oscilações do peso em ambas as corujas. No entanto, ambas as espécies apresentaram progressos clínicos satisfatórios e foram liberadas para a soltura na natureza com escores corporais apropriados para a espécie após 28 dias (*A. cunicularia)* e 30 dias (*T.furcata).*

Palavras-chave: ave, trauma, vida livre, ambientes antrópicos.

Introduction

Owls are predatory birds belonging to the Strigiformes taxonomic order, one of the greatest predators of nature with a generalist diet. In this order, there are a variety of sizes of birds depending on the species, but all of them have large eyes, a distinctive facial disc, and exceptional vision, enable them to hunt effectively (Dantas, 2021). Additionally, owls are known for their silent fly, which allows them to approach prey undetected (Sick, 1997).

There are approximately 227 species of owls worldwide, of which 24 are classified as Vulnerable, 13 as Endangered, and three Critically Endangered. In Brazil, 30 owl species have been recorded with two of them listed as endangered (Dantas et al, 2021; Pacheco et al., 2021; Ministerio do Meio Ambiente, 2022; Birdlife International., 2024).Owls inhabit various biomes, with most species preferring forests. However, some species,

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such as the Barn Owl (*Tyto furcata*) and the Burrowing Owl (*Athene cunicularia*), are found in open areas like fields and Restinga and exhibit crepuscular/nocturnal and diurnal habits, respectively (Sick, 1997; Roda, 2006; Vieira and Teixeira, 2008; Joppert, 2014).

The barn owl (*Tyto furcata*) and burrowing owl (*Athene cunicularia*) possess highly developed vision, making them efficient predators (Joppert, 2014). However, their behavioral visual acuity and contrast sensitivity are limited, despite the excellent optical quality of the ocular media, as described for *Tyto furcata* (Harmening and Wagner, 2011). This factor may increase the likelihood of collisions with windows, nets, and wires in anthropized environments.

Traumatic accidents involving raptors are common in urban areas, often caused by collisions building windows, wind farms, airplanes or vehicles (Klem, 1990; Ferrer, et al., 1991; Joppert, 2014; Gagné et al., 2015; Kagan, 2016; Linnell and Washburn, 2018, Ahmed and Boro, 2019). In rural areas, transmission lines and barbed wire fences are frequent hazards for owls (Loss et al., 2014; Allen and Ramirez, 1990), leading to significant impacts on both urban and rural wildlife, as documented by the Wildlife Friendly Fencing Project. Despite the prevalence of such incidents in Brazil, there is a lack of scientific literature on the subject, and worldwide reports are sparse, likely underreported (Fontoura,2023).

This article reports the rescue, veterinary care, rehabilitation and release of two owls that were victims of traumatic accident with barbed wire.

CASE REPORT

CASE 1: *Athene cunicularia*

In December 2020, a burrowing owl was found stuck on a wire fence at UFRB's Experimental farm at Cruz das Almas, Bahia.

The owl was rescued by the university security guard who cut the fence and sent the animal to State Center for Triage of Wild Animal (CETAS). During the first attendance, the animal was alert, active, initial weight of 0,151kg, good corporal condition, was not dehydrated and the sex was not determined. A fragment of wire fence was attached to its belly region, with skin laceration and a discreet cut on abdominal muscle (Figure 1).

Figure 1: Ventral region injury caused by collision in barbed wire fence

The owl was treated primarily with meloxicam 0,2% (Elo-xicam®), 2mg/kg/IM, sedated with cetamin (Syntec®), 20mg/kg/IM, and midazolam (Dormonid®), 1mg/kg/IM, for removal of the wire fence fragment and surgical correction of muscle and skin. During the surgical process, the animal maintained its temperature between 36 and 39ºC.

The therapeutic protocol was performed with a broad spectrum antibiotic enrofloxacin 2,5%-Chemitril® 15mg/kg/IM/SID for five days, vitamin B complex Bionew® 0,5mg/kg/IM/SID for three days and anti-inflammatory therapy with meloxicam 0,2% Elo-xicam®, 1mg/kg/SID for three days. Wound dressing was performed using clorexidine 2% and saline solution and hydratation was done using Ringer Lactato solution 50ml/kg/SC/SID every 48h for three days.

Three weeks of treatment the burrowing owl presented necrosis on the surgical injury and a laceration on the leg origin of barbed wire, so it was treated as an open wound with policresulen gel, Albocresil®, (18 mg/g) and homeopathic ointment CMR® (*Bellis perennis* 7 CH; *Calendula officinalis* 7CH; *Myristica sebifera* 7CH. *Veículo qsq* 100 g), topical application, and one single injection of meloxicam was added at therapeutic protocol once a day until total healing of the lesions (Figure 2).

Figure 2: Healing of the ventral lesion in the clinical review moments before release

The owl was maintained in a covered cage during the treatment. After the injury was healed, in the fourth week, the owl was conditioned in an enclosure with six meters of length, 1,5 meters of width and 4 meters of height, so it could practice flying and hunting. Those behaviors were evaluated by a biologist of the ambiental organization.

Water was offered *ad libitum* and for food it was calculated 10% of its weight and offered raw lean beef or raw chicken, supplemented with Aminomix® or a mice (20-25g), three times a week for the first fourteen days. The diet was changed to once a day after detected loss of 28,47% of the initial weight. The animal was released in a wild animal release area (ASA-INEMA), in accordance with regulatory instruction 007/2022 of the agency, 28 days after the entrance weighing 0,152kg.

CASE 2: *Tyto furcata*

In January 2021 a barn owl (*Tyto furcata*) was found stuck by radio-ulnar zone on a wire fence, in a rural city, Sapeaçu – Bahia (Figure 3).

Figure 3: Barn owl trapped in a barbed wire fence

The animal was rescued by a veterinarian who was working near the accident site. It was sent to the state animal center, CETAS, where physical examination and medical care were done.

The owl was alert, active, had a weight of 0,400kg, was hydrated and in a good corporal condition. However, it had injuries, apteric areas and active bleeding at the medial zone of the left wing, in the radio-ulnar region (Figure 4).

Figure 4: Laceration to the left-wing skin

Cleaning and bandaging of the injury were made with clorexidine 2% (topic) and saline solution 0,9%, topic, until healing. Policresulen (Albocresil®) was applied to the site of the injury and, also for pain and inflammation, meloxicam 0,2% (Elo-xicam®), 1mg/kg/IM/SID for three days. For the first week, immobilization of the left wing (8 wing wrap) was important to protect the skin and to prevent self-mutilation after surgical repair of the wound with Nylon 5-0. Three weeks later, CMR® was administrated after cleaning and bandage of the injury, until healing (Figure 5).

Figure 5: Verification of the healing of the lesion moments before release

The barn owl was maintained in a covered with towel cage during the treatment and three days before release was transferred to a bigger enclosure with six meters of length, 1,5 meters of width and 4 meters high, so it could practice flying and hunting mice, behavior which a biologist evaluated properly. Water was offered *ad libitum* and diet calculated at 10% of its body weight. Diet consists of raw lean beef or raw chicken, supplemented with Aminomix® or a mice (20-25g) once days. The owl lost 25% of its initial body weight during rehabilitation and was released after 22 days of entrance in the animal center. The animal was released in a wild animal release area (ASA-INEMA), in accordance with regulatory instruction 007/2022 of the environmental agency, 30 days after the entrance.

Discussion

In less than two months, CETAS attended two cases of owls with injuries caused by collisions with barbed wire fences. Barbed wire fences are widely used throughout Brazil to delimit properties. However, alternatives that pose less risk to domestic and wild animals, as well as reducing the effects of environmental fragmentation, should be promoted. The Wildlife Friendly Fencing Project proposes alternatives such as virtuais fences, ha-ha walls, wildlife access points, gates, wildlife crossings, and stone walls, presenting a significant challenge to develop locally viable and bird-friendly fencing (Wildlife Friendly Fencing Project, 2024).

Various risk factors for collisions with different types of objects have been identified. For example, collision risks in wind farms are influenced by species characteristics, including sensory perception, behavior, and morphology (Marques, 2014). Factors such as landing and flight skills, altitude gain, flight speed, and diurnal activity patterns influence the susceptibility of young, migratory, or nomadic birds to accidents with fences and other man-made objects (Allen and Ramirez, 1990). An interesting observation is that collisions with fences over water are rare, suggesting that long-distance migratory species searching for water are more sensitive (Allen and Ramirez, 1990).

In the cases presented, skin and muscle lacerations were observed after the collision, along with a reduction in body mass during the first two weeks of treatment, despite a good appetite.

It is common for these animals to undergo fat and muscle metabolism alterations during hospitalization, due to trauma recovery, stress, malnutrition, complications from the accident (such as dehydration, temperature changes), and metabolic changes (Joppert, 2014).

The assessment of flight ability is an important tool, as birds depend on this skill for locomotion, escape, and hunting, which are essential for their survival in the wild. The biodynamics of flight in owls, especially the barn owl, allow for higher speed and quieter flight, increasing their effectiveness in prey capture (Couper and Bexton, 2012). According to Joppert (2014), accidents with barbed wire typically compromise the wings of these birds, especially the patagium and wing musculature, rendering them unable to fly. In this case report, only the barn owl presented a wing lesion, but it was superficial, and limb functions were preserved, not impairing flight ability and allowing for the bird's release.

The lesions on the barn owl's wing were initially protected with a bandage, as recommended by Joppert (2014), which helps protect the injury by shielding the loose tissue in the lacerations, thus promoting proper healing. Wound debridement was also necessary to prevent necrosis. According to Joppert (2014), if the treatment of the wound cannot involve complete closure, an alternative is to keep it moist with gauze or water-soluble lubricating gel to prevent further desiccation.

Enrofloxacin was administered once daily (SID). Although Carpenter (2018) recommends a dose between 10 and 15 mg/kg every 12 hours, Harrenstien (2000) demonstrated that a dose of 15 mg/kg can be administered every 24 hours, achieving a therapeutic plasma peak in hawks (*Buteo jamaicensis*) and horned owls (*Bubo virginianus*), which minimizes stress by reducing the need for physical restraint of the animal during medication administration. The doses of ketamine and midazolam were within the recommended range for burrowing owl anesthesia, as specified by Carpenter (2018). CRM ointment proved effective in treating the wounds, keeping them hydrated and promoting healing. It is widely used in the clinic where reported care took place. Policresulen, used after surgical wound necrosis, was integrated into the treatment due to its antiseptic, moisturizing, and hemostatic properties, aiding in the removal of necrotic tissue, cleaning, and stimulating wound healing.

Due to the limitations of complementary diagnostic tests for bacterial isolation and antibiogram analysis, enrofloxacin was chosen as the antibiotic. This broad-spectrum antibiotic, with effective distribution in skin and muscle, has safe dosages established through pharmacokinetic studies in raptors. Its selection was further justified as the injuries were caused by a sharp contaminated object. The lesions were extensive and deep in the burrowing owl (*Athene cunicularia*), while in the barn owl (*Tyto alba*), feathers were blood-contaminated, and the skin displayed dark discoloration.

Enrofloxacin was selected for its widespread use in wildlife medicine and its classification as a second-generation antibiotic, allowing for less frequent administration. In a patient without a history of antibiotic therapy, this choice also enabled therapeutic diagnosis through positive clinical progression and subsequent discharge of both owls.

High doses of meloxicam, ranging from 1 to 2 mg/kg, were used for their anti-inflammatory and analgesic effects in accordance with the dosages recommended for raptors in formularies. Pharmacokinetic and pain control studies conducted in various bird species (Cole et al., 2009; Desmarchelier et al., 2012; Lex et al., 2024). Desmarchelier et al. (2012) demonstrated that pain caused by orthopedic injuries in pigeons (*Columba livia*) could be managed with a dosage of 2 mg/kg PO BID, while 0.5 mg/kg PO was considered insufficient. Similarly, Cole et al. (2009) reported that a dosage of 1 mg/kg IM, administered twice daily, was effective in relieving pain in blue-fronted parrots (*Amazona aestiva*) with induced arthritis.

Lex et al. (2024) concluded that meloxicam administration in barred owls (*Strix varia*), even at doses ranging from 1 to 2 mg/kg IM, results in plasma concentrations below therapeutic levels within four hours, making it unlikely that the currently recommended dosing intervals of twice daily provide the desired analgesia. In the present study, meloxicam was administered every 24 hours, with the possibility of treatment adjustments during daily clinical monitoring, empirically deemed sufficient for pain management in cases of skin and muscle injury.

Throughout the treatment and the entire hospitalization period, no signs of pain such as apathy, respiratory discomfort, or loss of appetite were observed, making it unnecessary to reconsider the pain management protocol. This was likely due to the clinical condition being associated with mild pain. However, it was not possible to determine the exact pain intensity, as it was not assessed using a formal pain scale.

The reintroduction of wildlife was conducted using the "hard release" method due to the absence of Type 2 releases sites registered with INEMA, which would have allowed for post-release acclimatization and food supplementation. While microchipping enables individual identification, it does not support continuous monitoring. However, clinical records can be expanded if the individual is recaptured and treated at state CETAS facilities.

According to Pyott et al. (2023), the success of reintroduction or population reinforcement efforts can be significantly improved through adaptive management strategies informed by monitoring data. This underscores the need for complementary measures, such as the integration of advanced monitoring technologies and enhanced follow-up protocols, to optimize conservation outcomes.

Considering the anatomophysiological similarities and the general susceptibility of raptors to barbed wire collisions, as well as the common medications and doses successfully used for hawks, falcons, eagles, and owls in clinical practice, the treatment protocol used for the rehabilitation and release of the owls can serve as a reference for other raptors injured in a similar manner. Publications on rehabilitated birds are rare, but Holt (2008) demonstrated that long-eared owls with eye injuries were recaptured up to three years after release.

The release of two owls was conducted using the hard release method, appropriate for animals in good health and capable of independent survival. Each animal was placed in a plastic N2 transport box, which was promptly opened at the release site to minimize stress. Post-release monitoring was not performed; however, all individuals were microchipped, enabling future identification in case of reentry into the CETAS due to any adverse events.

Conclusion

After a treatment period of 28 to 30 days, the owls demonstrated positive clinical evolution, indicating the effectiveness of the therapeutic protocol. Upon confirming the recovery of flight and hunting behaviors characteristic of their species, they were released into designated Wildlife Release Areas (ASA), officially registered with the estadual environmental agency.

Continuous clinical monitoring and the individualized approach, combined with accessible techniques for stabilization and rehabilitation, were crucial for the recovery of the owls and their reintegration into the natural environment under appropriate conditions.

This study, therefore, highlights the feasibility and relevance of rescue and rehabilitation actions, even in areas with limited infrastructure, as an effective tool for the conservation of raptors and other wildlife species.

Conflict of interest

The authors declare that there is no conflict of interest.

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