

## Orangutan Rehabilitation Center in Gunung Leuser National Park (TNGL) Bahorok, Langkat Regency, North Sumatra Province in 1973-2015

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### ABSTRACT

Orangutans are endemic great apes in Indonesia and Malaysia, now limited to parts of Kalimantan and Sumatra. Their population continues to decline due to poaching, illegal trade, and deforestation, causing them to be classified as critically endangered by the IUCN. This research aims to describe the establishment and development of the Bahorok Orangutan Rehabilitation Center. The method used is historical research comprising heuristic, verification, interpretation, and historiography combined with a conservation ecology approach and field observations. Findings show the center was founded in 1973 by Swiss zoologists Regina Frey and Monica Borner to reintroduce confiscated orangutans into the wild. The center contributed to orangutan conservation, public awareness, and the protection of Gunung Leuser National Park. Although its function as a rehabilitation site ceased due to tourism pressures, it played a vital role in conservation and transformed Bahorok into a global ecotourism destination.

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## INTRODUCTION

The issue of wildlife conservation is one of the important issues in environmental studies, not only in Indonesia, but also a global concern. Indonesia as a megabiodiversity country has many endemic species that are endangered, including orangutans (*Pongo abelii* and *Pongo pygmaeus*), which are only found in Sumatra and Kalimantan. Orangutan populations continue to decline due to deforestation, poaching, and illegal trade that threaten the preservation of tropical forest ecosystems as their natural habitat (Payne J, 2008).

According to data quoted from Singleton, in 2020 there were only about 7,500 Sumatran orangutans left, a drastic decrease from 13,000 individuals in 1995 (Singleton et al, 2020). This reinforces the statement *Science Advance* (2024) that since the 1970s Orangutans have become icons of an endangered species (Science Advance, 2024). Conservation efforts continue to be intensified, one of which is through the establishment of rehabilitation centers as a tangible form of rescue and release of orangutans into their natural habitat. In this context, conservation ecological theory becomes a relevant approach to explain conservation efforts that focus not only on species, but also on habitat sustainability and ecological interactions as a whole. This theory emphasizes the importance of maintaining biodiversity, healthy ecosystems, and the sustainability of life support systems through integration between biological sciences, environmental policy, and community participation (Primack, 2014). Orangutan rehabilitation is part of an *in-situ* conservation strategy that seeks to restore ecological balance due to human intervention.

Gunung Leuser National Park (TNGL), located on the border of North Sumatra and Aceh, is one of the important locations for the conservation and reintroduction of orangutans. Since its establishment, this area has had high ecological value with an extraordinary wealth of flora and fauna. As stated by Pandji Yudistira (2016), Mount Leuser is one of the first five national parks in Indonesia to be designated for its conservation value (Kusumasumantri, 2016). The history of this area began with the recommendation of FC Van Heurn in the 1930s which was followed by the *Tapaktuan Declaration* by indigenous peoples as a form of local wisdom in protecting nature (Department of Forestry, 1995). The Orangutan Rehabilitation Centre in Bahorok (Bukit Lawang) was founded in 1973 by two Swiss zoologists, Regina Frey and Monica Borner. This center is a pilot for orangutan rehabilitation in Indonesia and is one of the scientific and humanitarian-based conservation measures. However, in its journey, the center faces challenges, such as uncontrolled negative impacts of tourism, food by tourists, the spread of diseases, and social conflicts between orangutans (Kopp, 2018).

Ecological factors such as vegetation structure also greatly influence the success of conservation. Anita Zaitunah (2021) emphasized the importance of natural vegetation in supporting the life of orangutans (Zaitunah, 2021) which was also strengthened by the study of Junaidi Payne (2008) and *The Orangutan: Its Biology and Conservation* (1982), that habitat sustainability is the main foundation of conservation (Rijksen, 1982). Historically, this study was inspired by Matthew Joseph Minarchek's (2019) dissertation *Militarized Ecologies*, which

highlights the relationship between science, politics, and ecology in the formation of the Leuser region in the colonial era (Minarchek, 2019). On the other hand, Robert Cribb (2014) in *Wild Man from Borneo* provides an anthropological understanding of the perception and cultural relationship between humans and orangutans in Borneo, which enriches the comparative perspective in this study (Cribb R, 2014).

Therefore, this study seeks to fill the research gap by conducting a historical analysis of the establishment and development of the Bahorok Orangutan Rehabilitation Center from 1973 to 2015, while also evaluating the relevance of conservation ecology theory in shaping sustainable orangutan conservation practices in Indonesia. Through a combined historical and ecological lens, this study aims to contribute both scientifically and strategically to the advancement of wildlife conservation in Indonesia, particularly in the context of balancing species survival, ecosystem protection, and human influence. Thus, this study seeks to examine historically the establishment and development of the Orangutan Rehabilitation Center in Bahorok from 1973 to 2015, as well as examine the relevance of conservation ecology approaches in supporting conservation efforts for Indonesia's endemic species. Through a historical and ecological approach, this study is expected to make a scientific and strategic contribution in strengthening wildlife conservation in Indonesia in a sustainable manner.

## THEORETICAL REVIEW

This research is grounded in the theoretical framework of Conservation Ecology, which serves as the primary lens to understand the complex interplay between species, ecosystems, and human activities. According to Primack (2014), conservation ecology is a branch of science that not only studies the biological aspects of species and their habitats, but also examines the influence of environmental changes – such as deforestation, habitat fragmentation, and climate disruption – on species survival. This approach is particularly relevant in the context of orangutan conservation, as it allows researchers to analyze both ecological threats and conservation responses holistically.

Building upon conservation ecology, this study also incorporates biodiversity conservation theory. As explained by Hunter (2002), biodiversity is the foundation of ecosystem services such as water regulation, soil fertility, pollination, and climate stability. The loss of keystone species like orangutans can disrupt these services and compromise overall ecosystem health. Therefore, preserving orangutans is not only important from an ethical and ecological perspective, but also essential for maintaining the integrity of tropical rainforest ecosystems. To strengthen the analytical foundation, this study integrates three interrelated conceptual domains:

1. Orangutan Rehabilitation as a Conservation Strategy Orangutan rehabilitation centers, such as the one in Bahorok, are a concrete form of in-situ conservation aimed at rescuing, treating, and releasing orangutans into the wild. Literature from Kopp (2018) and Zaitunah (2021) highlights key operational components of rehabilitation efforts, including medical treatment, behavioral assessments,

habitat acclimatization, and post-release monitoring. However, these centers also face challenges such as disease transmission, social conflicts among orangutans, and difficulties in rewilding individuals who have had prolonged contact with humans.

2. **Human Activities and Their Environmental Impact**  
Research on the dual role of human intervention is important in understanding orangutan conservation. On one hand, ecotourism and community-based conservation initiatives can raise awareness and funding (Science Advance, 2024); on the other, unregulated tourism and encroachment can lead to habitat degradation and stress in orangutan populations (Payne, 2008). This duality necessitates a nuanced approach to evaluating the effectiveness and ethics of conservation practices involving humans.
3. **Conservation Policies and Governance**  
Policy literature underscores the importance of strong legal frameworks in conservation success. National and international regulations, including CITES, forest protection laws, and national park management policies, directly impact the enforcement and sustainability of orangutan conservation (Primack, 2014). Yet, governance challenges such as weak law enforcement, corruption, and lack of local engagement often undermine these efforts. Studies such as Minarchek (2019) and Cribb (2014) further reveal how historical, political, and cultural factors influence environmental policy implementation and perception.

Furthermore, this research also draws comparative insights from global conservation efforts and theoretical models. For example, experiential learning theories (Kolb, 1984) and community-based conservation models inform how education and participation can foster more sustainable and inclusive conservation practices. By incorporating historical perspectives, as seen in Minarchek's (2019) work on militarized ecologies and Cribb's (2014) anthropological perspective on orangutan-human relations, the study situates local conservation efforts within broader socio-political contexts. This expanded literature review highlights that orangutan conservation, particularly through rehabilitation centers, is a multidimensional issue that intersects ecology, policy, human behavior, and institutional history. Although many studies have addressed orangutan biology or forest threats individually, there is a notable gap in interdisciplinary research that combines historical, ecological, and policy-oriented analysis—especially in the context of specific sites like Bahorok. This research seeks to bridge that gap by offering an integrated analysis rooted in conservation ecology and enriched by empirical historical documentation and field observation.

### ***Conservation Ecology***

This research uses the conservation ecology approach as the main theoretical foundation. According to Primack (2014), conservation ecology is a branch of science that studies the interactions between species, ecosystems, and their environment, as well as the impact of environmental changes on the ability of species to survive. This approach provides a framework for understanding the impact of deforestation, poaching, and habitat fragmentation on Sumatran

orangutan populations, as well as the effectiveness of conservation strategies such as rehabilitation and ecotourism.

In addition, biodiversity conservation theory is also used to explain the importance of preserving various species and their habitats to maintain ecosystem stability. Hunter (2002) emphasizes that biodiversity provides important ecosystem services such as water cycling, pollination, and climate balance, which contribute to the survival of humans and other species.

In this context, the conceptual framework of the research is built through three main components: (1) the Orangutan Rehabilitation Centre, covering facilities, monitoring methods, and challenges in the process of release back into its natural habitat; (2) The Impact of Human Activities on the Environment, which includes the positive and negative effects of human intervention, including the role of rehabilitation; and (3) Policies and Regulations, which highlight conservation legal instruments and policies and evaluate their effectiveness in protecting orangutans and supporting the management of conservation areas. With this approach, the research seeks to analyze holistically the conservation dynamics of Sumatran orangutans in Bahorok in relation to the environment, policies, and society.

## METHODOLOGY

This research uses the historical method, which is a scientific approach that aims to trace, reconstruct, and analyze past events in a systematic and critical manner. This method aims to produce a valid and scientifically accountable historical narrative. The main stages in the historical method include heuristics, source criticism, interpretation, and historiography (Kuntowijoyo, 2005).

The first stage is heuristic, which is the process of gathering sources relevant to the research topic. The researcher conducted an archival study by visiting the National Park Management Section (SPTN) of Region V Bahorok to obtain documents related to the identity and number of rehabilitated orangutans. The researcher also searched digital archives through *Delpher.nl* websites, KITLV, and other online sources to obtain colonial documents such as *staatsblad*, newspapers, and travel reports. In addition, literature studies were conducted at the University of North Sumatra Library, Tengku Lukman Sinar Library, and Bukit Lawang Trust Library to obtain literature such as books, journals, scientific articles, and related newspapers. Field research is also carried out through direct observation and interviews with related parties (Kuntowijoyo, 2005).

The second stage, source criticism, includes external criticism to test authenticity (authenticity) and internal criticism to assess the credibility (truth of the content) of the source. The third stage is interpretation, which is the interpretation of sources that have been criticized through the process of analysis and synthesis to formulate historical facts. Finally, the historiography stage is the narrative and scientific writing of history, describing the dynamics of the establishment and development of the Bahorok Orangutan Rehabilitation Center for the period 1973–2015 chronologically and thematically.

## RESULTS

### ***Background of the Establishment of the Orangutan Rehabilitation Center in Bahorok***

Since the 18th century, orangutans have been an object of scientific interest and entertainment, especially in Europe and America. Explorers like Wallace and Hornaday hunted and collected orangutans to be researched and exhibited at zoos. The live orangutan trade increased rapidly in the early 20th century, driven by high demand from collectors, zoos, and zoological laboratories. However, the low survival rate in captivity causes the need for new individuals to continue to increase. In Sumatra, cases such as the shipment of an orangutan named "Sultan" from the port of Belawan to Amsterdam in 1913 show how this trade network involved local elites, such as the Sultan of Serdang, and colonial institutions such as the Deli Experiment Station. The Leuser area became one of the main sources, prompting conservation efforts by Van Heurn in 1925 due to concerns about extinction due to overexploitation.



Source: Minarchek (2019)

**Figure 1. "Sultan" poster at the Artists' Zoo in Amsterdam**

Between 1911–1935, L.P. de Bussy sent hundreds of Sumatran animals, including orangutans, to the director of the Artist Zoo, Coenraad Kerbert. One of the most famous is a male orangutan named "Sultan" who arrived in Amsterdam in 1913 and became an icon until he died of typhus in 1914. Its popularity sparked great interest in the Orangutan trade from Sumatra to Europe. In the following days, J.F. van Geuns became a major figure in the wildlife trade, including orangutans, to various cities around the world. He worked with animal traffickers such as C.A. Perin and Hermann Ruhe, sending dozens of orangutans to zoos, museums, and circuses. The price per head reached thousands of guilders or German marks.



Source: Minnarchek (2019)

**Figure 2. Orangutan Sales Receipt by C.A Perin - Amsterdam**

In 1927, van Geuns even sent 44 orangutans to France via Marseille. This systematic trade took place at the same time as the expansion of colonial plantations, making endemic animals such as orangutans a high-value exotic commodity in the international market.

In 1928, Sir Hesketh Bell visited a zoo in Cannes and was surprised to see dozens of orangutans from Sumatra. He protested the trade in a letter to *The Times*, likening the practice to slavery. Bell revealed that orangutans are captured en masse by cutting down their habitat trees, killing their mothers to retrieve their young, then being locked in cramped cages and sent to Europe. This process led to many deaths—only 40% survived the journey. At that time, the high demand from zoos and collectors led to massive exports from Sumatra, especially the north. The shipping trip was carried out through the port of Belawan, then through Sabang, Mukalla, Jeddah, Suez Canal to Amsterdam.

The trade in orangutan wildlife from Sumatra to Europe in the early 20th century sparked pros and cons in various colonial newspapers, including *The Times* and *Deli Courant*. Figures such as Sir Hesketh Bell protested against the cruel practice of capturing and transporting orangutans that resembled slavery, and called for the protection of the primates because of their similarities to humans.





Source: *Delper.nl*

**Figure 3. Newspaper Deli Courant 28 August 1928 edition**

Instead, criticism emerged from the August 28, 1928 edition of the Deli Courant which called Bell's statement "childish" and defended the wildlife trade in the interests of science. The widespread public reaction to this case has also sparked the birth of an international nature conservation movement. Organizations such as the *Society for the Promotion of Nature Monuments* (1904), as well as the founding of the *Nederlandse Commissie voor Internationale Natuurbescherming* (NCIN) in 1925, demonstrated global concern for the exploitation of wildlife. NCIN is taking advantage of the orangutan trade crisis to advocate for the establishment of wildlife sanctuaries and wildlife policy reform in the Dutch East Indies.

The case of the orangutan trade reflects colonial exploitation that views endangered animals as commodities. This practice occurred at the same time as the birth of global awareness of the importance of nature conservation. The arrival of large numbers of orangutans in Europe prompted colonial policies related to species protection, port surveillance, and tightening environmental regulations. To this day, orangutans remain an important symbol of the global conservation struggle due to a long and complex history of exploitation.

The lowland tropical forests of the Leuser Ecosystem, including the Gunung Leuser National Park (TNGL), are important habitats for Orangutans. However, the region is under tremendous pressure due to illegal logging, agricultural expansion, and commercial plantations such as oil palm, rubber, coffee, and cocoa. High-value timber such as those from the Dipterocarpaceae family is targeted for exploitation, driving deforestation that exacerbates habitat fragmentation, disrupts ecological functions, and accelerates the loss of environmental services.

A recent analysis from the National Forest Service and the Wildlife Conservation Society-Indonesia Program (WCS-IP) shows that between 2000 and 2017, the TNGL area and its buffer areas lost 42,463 ha of forest cover (4.18%). The most significant changes were the conversion of forests to shrubs (74.92%),



mixed shrub agriculture (17.78%), and plantations (2.19%). Within the TNGL itself, deforestation reached 26,012 ha (2.9%), with an increasing Indonesia until 2011 before declining slightly. The expansion of dryland agriculture in TNGL increased dramatically by 606.2% in 17 years.

These findings reinforce the concerns expressed in the *Population and Habitat Viability Analysis* (1993) report, that habitat loss is a major threat to the survival of orangutans. Moreover, orangutans are a species with a slow reproductive rate and are very sensitive to habitat disturbances. Areas such as Batang Toru and the Sekundur Wildlife Sanctuary in Langkat are now concrete examples of ecological degradation that drives conflicts between animals and humans.

With 70% of North Sumatra's oil palm land controlled by conglomerates and national policies that facilitate the expansion of agro-industry, including through IMF pressure, the loss of orangutan habitat is not only due to ecological processes, but also global economic politics. Empirical data from TNGL proves that the pressure on tropical forests continues, and without serious intervention, orangutans' conservation will be further threatened.

#### ***Development of Orangutan Rehabilitation Center in Bahorok in 1973-2015***

Orangutan rehabilitation is a process of physical, mental, and behavioral recovery for animals rescued from poaching, illegal trade, and maintenance as pets. The majority of rehabilitated individuals are orphans due to their mothers being killed by poachers. Since the 1960s, this process has been carried out in various rehabilitation centers in Sumatra and Indonesia. One of the earliest and most important stations is the Ketambe Orangutan Rehabilitation Station in Southeast Aceh, established in 1971 with the support of WWF, the Government of Indonesia, and the Dutch Mount Leuser Committee.



Source: H.D. Rijksen & Ans, G. Rijksen-Graatsma, "Orangutan Rescue Work in North Sumatra" Published Online by Cambridge University Press. August 1973.

**Figure 4. Captivity of Ketambe Rehabilitation Center**

One of the developments of the initial project was the establishment of the Bahorok Orangutan Rehabilitation Center in 1973 in the Gunung Leuser National Park (TNGL) area, North Sumatra. The center was initiated by Regina Frey and Monica Borner, and supported by the Frankfurt Zoological Society (FZS) and WWF. The main goal is to gradually return confiscated orangutans to the wild through quarantine, health surveillance, and the reshaping of wild instincts.



*Source: SPTN region V Bahorok*

**Figure 5. Bahorok Orangutan Rehabilitation Center**



*Source: Author's Personal Collection*

**Figure 6. FZS and WWF donation plaques**

However, as time went by, various challenges arose. Field studies show that female orangutans have a fixed roaming area and are reluctant to move even if the habitat is damaged. When habitats are cut down, they persist, and the addition of new individuals to the region can lead to food competition, malnutrition, and even death. Even domestic feeding like the one done in Bahorok does not solve the problem, but can actually change the natural behavior of the animals.

Meanwhile, male orangutans do tend to move more widely, but the increase in the male population in one region triggers conflicts over mates. On the other hand, forests in Sumatra have approached or exceeded their natural carrying capacity, so the addition of rehabilitation individuals actually worsens the

condition and raises the risk of transmission of infectious diseases from humans to wild populations. On that basis, the old rehabilitation practices in Bukit Lawang were then criticized and considered risky to the remaining wild population.

Another problem arises from the practice of interactive tourism that is too close to Orangutans. The observation distance is only about 7–10 meters. In some cases, orangutans are even trained to get close to a specific location, in order to become an attraction for tourists (See Figure 4). Some of them became aggressive due to the habit of being given food by visitors. This habit, unknowingly, trains orangutans to attack in exchange for food, leading to conflicts between humans and animals.



Source: Robert Siburian, "Ecotourism-Based Management of Gunung Leuser National Park in the Bukit Lawang Section", *Journal of Society and Culture*, Vol. 8 No. 1, 2006.

**Figure 7. Captivity of the Bahorok Orangutan Rehabilitation Center**

Cases of attacks, bites, and even killings of orangutans by tourists have been recorded, showing the weakness of the education and visitor management system. Without adequate hazard warnings and emergency response medical facilities, these interactions threaten the welfare of animals and visitors. Therefore, the conservation approach now emphasizes restrictions on direct interaction, tourist education, and strict monitoring of all tourism activities involving Orangutans, for the sustainability of TNGL conservation and the safety of all parties.

## DISCUSSION

### *Background of the Establishment of the Orangutan Rehabilitation Center in Bahorok*

This research positions the **Bahorok Orangutan Rehabilitation Center** not only as a technical effort to save animals, but as an ecological intervention that has far-reaching implications for biodiversity dynamics, human-animal relations, and conservation governance in Sumatra's tropical forest areas. Using a conservation ecology approach (Primack, 2014), this study examines how the interaction

between species, habitat, and environmental pressures plays a role in determining the success or failure of orangutan rehabilitation strategies.

The long history of the Orangutan trade from Sumatra to Europe in the 19th and 20th centuries is a crucial backdrop for the establishment of rehabilitation centers. Since the 1913 shipment of the "Sultan" to the Amsterdam Artists' Zoo by local elites and colonial traders, the Orangutan has become a symbol of exoticism and exploitation (see Figures 1 and 2). This practice took place at the same time as the expansion of colonial plantations, making orangutans a high-value commodity. Criticism from figures such as Sir Hesketh Bell – who equated the practice of transporting orangutans with slavery – was a turning point in the birth of international awareness of the importance of wildlife conservation.

From a conservation ecology perspective, this period suggests that global socio-economic and cultural changes can encourage or hinder the protection of species. When the wildlife trade peaks, pressure on wild populations increases, accelerating habitat fragmentation and disrupting ecological relationships within tropical forest landscapes. The loss of orangutan habitat in the Leuser Ecosystem area, including the National Forest, is a major threat to the survival of this species. An analysis of forest cover showed a loss of 42,463 ha of forest between 2000–2017, with massive conversion to shrubs and dryland agriculture. This deforestation disrupts the ecological functions of forests as a support for ecosystem services such as water cycling, pollination, and carbon sequestration—functions that Hunter (2002) calls the foundation of biodiversity stability.

For orangutans, who have fixed roaming areas and slow reproduction, this fragmentation disrupts natural behavior, increases conflicts with humans, and decreases adaptive capacity. In this context, the ecological approach of conservation views rehabilitation not as simply the release of individuals into the wild, but as part of the restoration of the structure and function of the ecosystem as a whole. Founded in 1973 by Regina Frey and Monica Borner, the Bahorok Orangutan Rehabilitation Center is a response to the high levels of poaching and animal trafficking. The centre uses a feeding, quarantine and wild instinct training approach through the Feeding Platform (see Figure 4). Theoretically, this model is in accordance with the principle of in-situ conservation promoted by Primack (2014), namely strengthening the adaptability of animals before returning to their natural habitat.

However, practice in the field shows complexity. Many orangutans are too docile because of their experience living with humans, making it difficult to survive in nature. Close contact with humans also increases the risk of transmitting zoonotic diseases such as tuberculosis and hepatitis. In 1995, the rehabilitation program was officially closed and replaced by a research function. This indicates that without strict restrictions and conservation ecology-based management, rehabilitation efforts can turn into a threat to wild populations. After the closure of the rehabilitation, Bukit Lawang developed as an ecotourism center. Orangutan trekking and feeding activities are a tourist attraction (see Figures 3 and 4). However, this gives birth to a conservation dilemma. The distance between visitors is only 7–10 meters, training the orangutans to get close to humans and trigger aggressive behavior. Several incidents of bites and attacks have occurred. From a

conservation ecology perspective, this disrupts the process of wildlife desocialization and creates a dependence on human intervention.

An ideal rehabilitation center should be away from wild populations to prevent hybridization and the spread of pathogens. This is affirmed in IUCN guidelines and supported by Indonesia's conservation policies, including the Orangutan Conservation Strategy and Action Plan 2007–2017. However, weak supervision, limited staff, and economic pressure from the tourism sector have made the implementation of this policy not optimal.

Indonesia's regulatory framework for conservation has evolved, from the protection of species in 1931 to the establishment of national parks and the ratification of international conventions. However, as shown in this study, structural challenges such as land conflicts of interest, agro-industrial pressures, and weak law enforcement make conservation success highly dependent on multi-stakeholder collaboration and local capacity building. A conservation ecology approach that emphasizes the interconnection between species, ecosystems, and humans provides strategic direction for future conservation: reducing external pressures on habitats, limiting direct human-animal interactions, improving conservation education, and strengthening the ecological function of the landscape as a support system for wildlife, including orangutans.

#### *Development of Orangutan Rehabilitation Center in Bahorok in 1973-2015*

The Bahorok Orangutan Rehabilitation Center, which was established in 1973, was the first form of ecology-based conservation intervention in North Sumatra. Established as a continuation of the Ketambe Orangutan rehabilitation project, the station aims to recover the physical and behavioural of confiscated orangutans before they are released back into the wild. This approach is in line with the basic principles of **conservation ecology** which, according to Primack (2014), focuses on understanding the interactions of species, the environment, and the impact of anthropogenic pressures on wildlife survival.

The rehabilitation process at Bahorok—including quarantine, wild instinct training, and release—is based on efforts to restore the ecological functions of individual orangutans in tropical forest ecosystems. However, this approach faces major challenges when contextualized in a landscape that is experiencing degradation and fragmentation. Field studies show that Sumatra's forest area has approached or exceeded its ecological carrying capacity, leading to intra-species (inter-orangutan) conflicts, food competition, and the risk of human-to-animal disease spread. In conservation ecology theory, this condition suggests that rehabilitation cannot focus solely on the recovery of the individual, but must consider the capacity of the ecologists to accept new individuals on a sustainable basis. When ecological pressures such as forest cover loss, poaching, and land clearing increase, the success of releases will also decrease dramatically.

Over time, conservation practices in Bahorok shifted to wildlife-based ecotourism. Although economically it provides an alternative income for the surrounding community and can increase public awareness of conservation, this practice creates a dependence on animals to humans. Images showing orangutans approaching visitors and even becoming aggressive as a result of feeding prove a



deviation from natural behavior. According to Primack (2014), disturbances to wild behavior like this change the dynamics of species and can damage natural relationships in ecosystems. Meanwhile, Hunter (2002) emphasizes that biodiversity can only be maintained if ecosystem services function optimally – which is disrupted when wildlife undergoes indirect domestication due to intensive human interaction.

This condition is not only harmful to animals (who have lost their wild instincts), but also to humans, as evidenced by the cases of Orangutan bites and attacks on visitors. This underscores the importance of limiting direct interaction, fostering tourists, and management based on conservation ethical principles. The study also found that although rehabilitation facilities and programs have been developed, many released individuals fail to survive due to the weak ecological readiness of release sites as well as a lack of long-term monitoring. The risk of malnutrition, disease infection, and spatial conflict with wild populations worsens the survival rate of post-rehabilitation orangutans. In modern conservation theory, as Primack (2014) emphasizes, conservation success depends on the integration between science, policy, and local community participation. Rehabilitation cannot be considered a single solution, but must be accompanied by habitat protection, environmental education, and conservation governance reform.

Criticism of the old practice in Bahorok reinforces the urgency of a holistic approach: rehabilitation should be carried out in a place separate from wild populations to avoid genetic and epidemiological contamination, and accompanied by zoning of the area and the enforcement of strict ecotourism regulations. An evaluation of Bahorok's experience over four decades provides important lessons in the framework of conservation policy in Indonesia. Existing conservation regulations, such as the Decree of the Minister of Forestry and the Decree of the Director General of PHKA on wildlife rehabilitation procedures, need to be enforced consistently. In addition, the establishment of strategic partnerships between governments, international NGOs, and indigenous/local peoples should be a key pillar in the sustainable development of conservation areas. In the context of conservation ecology and biodiversity theory, the Bahorok Rehabilitation Center reflects the dynamics of animal conservation complexes in unstable landscapes. In the future, conservation strategies must involve mapping ecological carrying capacity, developing a rehabilitation model based on closed conservation zones, and reformulating ecotourism systems to truly support long-term conservation, not just momentary economic interests.

## **CONCLUSIONS AND RECOMMENDATIONS**

The Orangutan Rehabilitation Centre in Bahorok has played a strategic role in Indonesia's wildlife conservation history, particularly in addressing the impacts of poaching, illegal trade, and deforestation. Established in 1973 as a response to the drastic decline of orangutan populations – exacerbated by colonial-era wildlife trade – the center functioned as a vital in-situ conservation initiative aimed at reintroducing confiscated and orphaned orangutans into their natural habitat. Through cooperation between the Indonesian government, WWF, and the Dutch Gunung Leuser Committee, the center became a model for orangutan

rehabilitation efforts in Southeast Asia. However, the evolution of conservation science and shifting management paradigms led to changes in strategy. By 1995, the rehabilitation program was officially closed, and its role transitioned toward ecosystem-based approaches, including the establishment of the Sumatran Orangutan Observation Station (SPOS) and the development of ecotourism programs. This shift reflects a broader trend in conservation—from focusing solely on individual species rescue to emphasizing ecosystem preservation, community engagement, and sustainable environmental education.

Recommendations from this study include the need to, strengthen policy frameworks that support integrated conservation strategies combining species protection, habitat restoration, and local community participation. Enhance ecotourism practices to ensure they remain sustainable, educational, and non-exploitative, minimizing human impact on orangutan behavior and habitat. Invest in long-term population monitoring programs that are transparent, data-driven, and accessible to both researchers and policy-makers.

Further studies are needed to, examine the socio-economic impact of ecotourism on local communities in the Bahorok region and its role in shaping conservation behavior. Analyze the genetic and behavioral outcomes of orangutans released from rehabilitation centers compared to wild populations. Investigate the long-term institutional history of conservation programs in Indonesia to better understand the political and cultural forces that influence conservation success or failure. By combining historical insights with ecological analysis, this research emphasizes the importance of adaptive and holistic strategies in wildlife conservation, and encourages future efforts that are both scientifically grounded and socially inclusive.

## **FURTHER STUDY**

Future research could explore the long-term ecological impacts of the rehabilitation program on the orangutan population and surrounding biodiversity. A comparative study between rehabilitated and wild-born orangutans in terms of adaptation, behavior, and survival rates would provide deeper insights into the effectiveness of the program. Moreover, socio-economic studies on the role of local communities and eco-tourism in supporting conservation efforts would enrich the understanding of sustainable wildlife management. Finally, integrating spatial analysis and modern tracking technologies could offer valuable data on post-release monitoring and habitat use over time.

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