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Linking Ecotourism Visit Categories with Conservation Challenges: A Scoping Systematic Literature Review of Sepilok Orangutan Rehabilitation Centre, Malaysia, and Komodo Island, Indonesia

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ABSTRACT

Ecotourism is essential for protecting natural areas and engaging local communities in tourism, helping ensure that tourism development does not damage the environment or lead to conflicts with local communities. Despite its positive impacts, ecotourism faces unique challenges, particularly in areas with endangered species and sensitive habitats. As global biodiversity decreases, managing conservation efforts in popular tourist destinations becomes increasingly complex. This study employs a Scoping Systematic Literature Review (SSLR) to explore the current state of endangered species globally, with a specific focus on the pressures and challenges facing habitats in high-tourism locations such as Sepilok Orangutan Rehabilitation Centre (Malaysia) and Komodo Island (Indonesia). To ensure comprehensive coverage of relevant research, a systematic search was conducted across multiple databases, including Web of Science, Google Scholar, JSTOR, Emerald Insight, and ScienceDirect. The review found that pressures on Bornean orangutans at Sepilok are primarily ecological and socio-cultural, including habitat loss, land conversion, and visitor impacts. On Komodo Island, resource depletion and pressures from the tourism sector were identified as major threats. Across both sites, ecological challenges remain the most persistent concern. Furthermore, the review highlights the linkage between six categories of tourist visits; hedonic, interactive, novelty, comfort, stimulation, and personal safety; and conservation challenges in both destinations. Based on these findings, strategies were formulated to balance tourism benefits with the need to protect endangered species and habitats, offering lessons that may inform sustainable ecotourism management in other biodiversity-rich regions.

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1.0 INTRODUCTION

Ecotourism offers travellers the opportunity to experience nature while promoting sustainable practices that protect the environment (Hamidi et al., 2023). Ecotourism combines tourist attractions with eco-friendly initiatives that aim to conserve natural resources (Hasana et al., 2022). Visitors can enjoy exploring wildlife and natural landscapes while also learning about the importance of environmental conservation. In addition to generating economic benefits by attracting tourists, ecotourism has positive social and environmental impacts (Esparza-Huamanchumo et al., 2024). Ecotourism plays a vital role in protecting natural areas and involving local communities in tourism projects, ensuring that tourism growth does not damage the environment or create conflict with local people (Esparza-Huamanchumo et al., 2024; Hamidi et al., 2023; Sodikov, 2023). However, despite its many benefits, ecotourism presents unique challenges, especially in areas that are home to endangered species and habitats. As global biodiversity continues to decline, conservation in popular tourist destinations is becoming increasingly difficult. For example, habitats like the Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia are both dedicated to preserving endangered species and their environments. Although they rely on tourism to support their conservation efforts, the increase in visitor numbers can sometimes put additional pressure on these fragile ecosystems (Notohamijoyo et al., 2021). The influx of tourists, while necessary to generate revenue and raise awareness, can disturb wildlife, damage habitats, and overwhelm conservation efforts, making it increasingly difficult to find a balance between tourism and environmental protection (Haryanto et al., 2024; Jayasekara et al., 2024). How can ecotourism visit categories be linked to conservation challenges at Sepilok Orangutan Rehabilitation Centre, Malaysia, and Komodo Island, Indonesia, to develop strategies that balance tourism benefits with the protection of endangered species and habitats?

To ensure ecotourism remains sustainable, several key elements need to be addressed (Ritonga et al., 2024). Protecting core natural areas, ensuring local communities benefit from tourism, and promoting responsible behaviour among tourists and operators are all essential to the long-term success of ecotourism (Xu et al., 2023). It is also important to understand what motivates tourists. Many visitors seek unique experiences, comfort, and safety when they travel (Kropinova et al., 2023). Recognising these desires can help ecotourism operators create more enjoyable and meaningful experiences for visitors while maintaining their commitment to conservation (Abylkassimova et al., 2024). Understanding these factors is essential to developing ecotourism practices that support both the economy and the environment (Waluyo & Guritno, 2023). This study aims to explore the current state of endangered species globally, with a focus on the pressures and challenges facing these habitats, particularly in high-tourism locations such as Sepilok and Komodo Island. Further studying the tourist experience in six categories, such as hedonic, interactive, novelty, comfort, stimulation, and personal safety, seeks to identify strategies that can reduce the negative impacts of tourism on these ecotourism destinations while maximising benefits for conservation and visitors. This study was expected to develop strategies that balance the benefits of tourism with the need to protect endangered species and habitats based on the relationship between tourist experience and conservation challenges. The main objective of this study is to ensure that tourism continues to serve as a tool to raise awareness and support long-term conservation efforts, which benefit the environment and local communities.

2.0 LITERATURE REVIEW

2.1 Ecotourism

Ecotourism has emerged as a significant travel concept, primarily focused on visiting areas relatively untouched by human development (Hamidi et al., 2023). This type of tourism aims not only to explore and enjoy the pristine natural environment (Hasana et al., 2022) but also to appreciate the diverse flora, fauna, and cultural practices inherent in these areas (Esparza-Huamanchumo et al., 2024). The essence of ecotourism lies in the balance that was sought to be maintained between the recreational benefits of tourism and the essential need for ecological preservation (Sodikovich, 2023). The fundamental goal of ecotourism

is to ensure that tourism activities are managed in a manner that minimises environmental impacts while supporting the well-being of local communities (Tan, 2021). Ecotourism seeks to create a symbiotic relationship where tourism contributes to the conservation of natural habitats and biodiversity while providing socio-economic benefits to the population. It can be achieved through focusing on practices that encourage environmental stewardship, promote sustainable resource use, and foster respect for local cultures (Cheung & Li, 2019; Mukul et al., 2022).

One of the most notable successes of ecotourism is seen in Costa Rica, where the country has effectively utilised its rich biodiversity to promote sustainable tourism (Bertocchi & Visentin, 2019). The development of national parks and protected areas has not only attracted international tourists but has also generated significant income and employment for local communities (Pan et al., 2018).

This approach has helped conserve critical habitats and has become a model for integrating conservation with economic development. On the other hand, there are examples where ecotourism has failed to live up to its promise. For example, in parts of Madagascar, ecotourism initiatives have had unintended negative consequences (Camatti et al., 2020). Although intended to protect unique ecosystems, the influx of tourists has resulted in habitat degradation and increased pollution (Skarakis et al., 2023). In addition, the intended benefits to local communities have sometimes been unevenly distributed, with some areas experiencing economic disparities and cultural disruption (Buongiorno & Intini, 2021). These examples underscore the complexity of implementing successful ecotourism strategies. The success of such initiatives depends on careful planning and management, ensuring that tourism activities align with conservation goals and genuinely benefit local people (Martínez-Cabrera & López-Del-Pino, 2021). Conversely, failure often results from inadequate planning, lack of local involvement, or a misalignment between tourism practices and ecological conservation goals (Spiliopoulou et al., 2021). Thus, while ecotourism has great potential as a tool for conservation and community development, its implementation requires a careful approach to achieving the dual goals of conserving the natural environment and improving local livelihoods (Pásková et al., 2021).

2.2 Ecotourism pressures

Ecotourism, while touted for its potential to generate economic growth and drive conservation efforts, presents a complex set of pressures that can significantly threaten endangered habitats (Camatti et al., 2020). This duality becomes particularly evident when examining the complex dynamics between human activity and ecological integrity. As tourism increases in frequency and scale, the consequences for fragile ecosystems often go beyond immediate environmental concerns, manifesting in a range of ecological pressures that can exacerbate the vulnerability of already endangered species. For example, the influx of visitors into ecologically sensitive areas can lead to habitat fragmentation, whereby the natural landscape is divided into smaller, isolated patches (Cheung & Li, 2019). This fragmentation not only disrupts wildlife movement but also impacts the overall biodiversity of the area, making it more difficult for species to find food, mates, and safe habitat (Zejda & Zelenka, 2019).

In Malaysia, the pressures imposed by ecotourism are particularly pronounced, given the country's rich biodiversity and the presence of several endangered species (Othman & Rosli, 2023). For example, in areas such as Borneo, increased ecotourism has resulted in increased human-wildlife interactions that can lead to conflicts, such as encounters between tourists and orangutans (Latip et al., 2023). These interactions can not only harm the animals involved but can also alter their natural behaviour, pushing them further into fragmented habitats. In addition, developing tourism infrastructure, such as roads, hotels, and recreational facilities, further exacerbates these pressures. While such developments are intended to enhance the tourist experience, they often come at the expense of critical habitats and fragmented ecosystems. This disruption can hinder ecological processes essential to species survival and hinder effective conservation efforts.

2.3 Sustainable Ecotourism

Tourism development should aim to be sustainable in three main areas, which include economic, social, and environmental. The main challenge for ecotourism is to build on its tourism potential and enhance the quality of experiences without destroying the environment that makes it attractive in the first place (Bertocchi et al., 2020). This balance is crucial, as the landscapes, wildlife, and ecosystems are what attract tourists, but are also the most vulnerable to overuse and exploitation. Ecotourism must be carefully planned and managed so as not to damage the natural areas on which it depends (Boluk et al., 2019; Capocchi et al., 2019). This involves setting appropriate limits on the number of visitors and the locations where tourism activities take place. By controlling the level of tourist interaction with the environment, natural habitats and ecosystems can be protected from degradation, ensuring that they remain intact for future generations (Mihalic, 2020).

Many experts argue that tourism and environmental conservation can, and should, go hand in hand (Juutinen et al., 2022). One way to do this is to ensure that a portion of the revenue generated from tourism is reinvested in conserving natural resources, as well as raising awareness among tourists about the importance of protecting these environments (Persada et al., 2023). Tourists can also be given opportunities to actively participate in conservation efforts, such as volunteering for scientific research or supporting local conservation projects (Sianipar & Suryawan, 2024). Involving local communities is another important aspect of sustainable ecotourism. Local communities can provide services and products to tourists, ensuring that they benefit economically from tourism in their area. Offering guided tours, cultural performances, or traditional crafts can help them share and preserve their cultural heritage. Encouraging responsible behaviour among tourists, through codes of conduct and guidelines, also plays an important role in maintaining a sustainable balance between tourism and environmental conservation (Osei et al., 2020).

2.4 Six Categories of Ecotourism Visits

Ecotourism refers to travel experiences that focus on visiting natural environments, often involving wildlife and ecosystems, while promoting conservation and sustainability. The goal of ecotourism is to enable travellers to explore and appreciate these natural environments while minimising their impact on the environment, supporting local communities, and fostering an understanding of the importance of environmental protection (Mohd-Asri et al., 2021). The six categories outlined in the table below are essential to the success and sustainability of ecotourism (Mohd-Asri et al., 2021). Each category represents a different aspect of the travel experience that is essential to making the visit memorable, interesting, and responsible:

Table 1. Six main categories of ecotourism visit

Category	Elements
Hedonic	Memorable and enjoyable experience in terms of wildlife and natural habitat
Interactive	Chance to meet and communicate with other people, such as guests with the lodge staff, and guides with group members
Novelty	Bring new and unique experiences
Comfort	Experiencing physical relaxation in the natural environment
Stimulation	Learning a precious education through understanding the natural environment
Personal safety	Ensuring personal safety related to boat safety

Source: Mohd-Asri et al., 2021

Table 1 outlines six main categories adapted from Mohd-Asri et al. (2021) that shape the tourist experience during an ecotourism visit. Mohd-Asri et al. (2021) explained that these categories encompass aspects that make the visit meaningful and enjoyable. First, the hedonic aspect relates to the joy and excitement that tourists derive from memorable encounters with wildlife and natural habitats. This aspect emphasises the emotional thrill of witnessing nature in its natural form. The interactive category highlights the tourist's involvement in activities such as wildlife observation, interacting with knowledgeable guides,

and fostering positive communication between staff and other guests, making the experience more personal and fulfilling. The novelty category focuses on providing tourists with new, unique, and different experiences, such as seeing wildlife for the first time in its natural environment, something that can be described as a once-in-a-lifetime opportunity. These new perspectives and rare encounters with nature play a significant role in shaping the tourist experience. Comfort, on the other hand, focuses on the physical and emotional relaxation that tourists experience in nature, whether it is enjoying the tranquillity of a lodge or finding peace in the natural environment. Stimulation is about gaining knowledge and insight from an experienced guide, helping tourists appreciate and understand the environment as more than just a beautiful backdrop (Jayaraman et al., 2010). This educational aspect enriches the trip by offering tourists a deeper learning experience. Finally, personal safety addresses the importance of ensuring that tourists feel safe during activities, such as boating or river cruises, with guides and seafarers taking care to maintain safety standards throughout the trip. This combination of emotional, physical, and intellectual experiences contributes to the overall satisfaction and sustainability of ecotourism.

2.5 Lessons Learned from Successful Ecotourism

Successful ecotourism provides valuable lessons that can guide the development of sustainable tourism practices around the world. One key takeaway from successful ecotourism is the importance of balancing conservation and tourism (Pandong et al., 2019). In Malaysia, for example, ecotourism has flourished in places like Sabah and Sarawak, where efforts to protect endangered wildlife, such as orangutans and proboscis monkeys, have gone hand in hand with tourism (Sherman et al., 2020). The success of these areas shows that tourists are drawn to unique natural environments where their visits directly support conservation efforts (Sherman et al., 2020). Malaysian ecotourism has created a model where tourism revenues contribute to protecting wildlife habitats through engaging visitors in activities like wildlife viewing and educating them about conservation. Another lesson is the need to engage local communities. In places like Mulu National Park, the local Penan and Berawan communities are actively involved in ecotourism activities, engaging visitors in activities like wildlife viewing and educating them about conservation (Samal & Dash, 2024). They work as guides, run eco-lodges, and sell local crafts, ensuring that the economic benefits of ecotourism reach local communities. This approach not only improves livelihoods but also encourages community management of natural resources. When local communities benefit from tourism, they are more likely to support conservation efforts, creating a sustainable cycle that allows both people and nature to thrive.

3.0 METHODOLOGY

3.1 Scoping Review

A scoping review is a type of systematic literature review used to map key concepts, types of evidence, and gaps in a particular field of research (Pedrosa et al., 2022). In recent years, this method has gained widespread recognition across disciplines for its capacity to assess large, complex, and heterogeneous bodies of literature, especially in emerging fields where traditional reviews may be too narrow in scope (Tang & Xu, 2023). In this study, a scoping review was conducted to guide future research at Sepilok Orang Utan Rehabilitation Centre in Malaysia, with an emphasis on conservation, sustainability, and socio-economic impacts on local communities. The review was designed to investigate various aspects of ecotourism, including its effects on land use, community well-being, and visitor satisfaction, while identifying gaps in the existing literature on these topics. The main objectives of the review were to assess the global status of endangered species, pressures on endangered habitats, ecological challenges of habitat conservation, implications, and recommendations for lessons learned from ecotourism. In addition, this study seeks to evaluate the relationship between six categories (hedonic, interactive, novelty, comfort, stimulation, and personal safety) of tourist visits to Orangutan Island, Malaysia, and Komodo Island, Indonesia, and strategies to overcome stress and challenges in Sepilok Orang Utan Rehabilitation Centre in Malaysia and Komodo Island, Indonesia. A scoping review was chosen because it allowed for the

exploration of a range of literature that may not have been systematically reviewed before, particularly in the areas where orangutan ecotourism, conservation sites, local community impacts, and sustainability intersect. For further information, please refer to the figure below about the Sepilok orangutan rehabilitation maps (Figure 1) and the flow diagram of the selection of the sources of evidence (Figure 2).

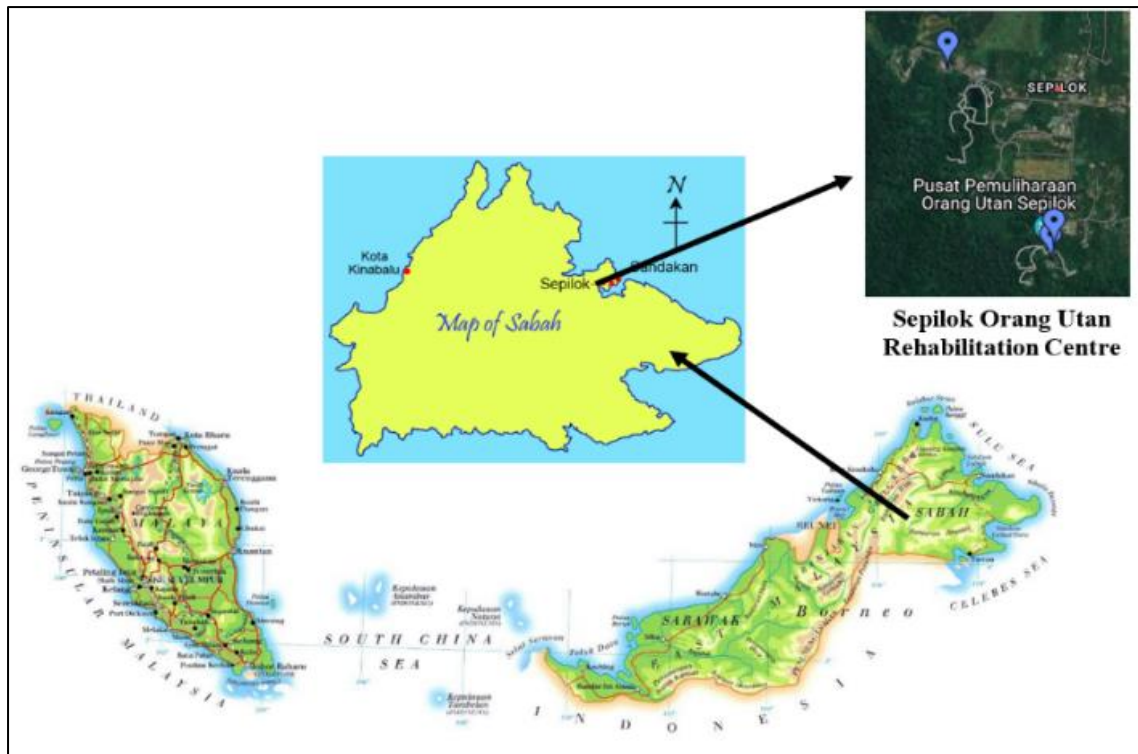


Fig. 1. Maps of Sepilok Orangutan Rehabilitation Centre

3.2 Database Selection

The selection of databases and coverage for this scoping review was carefully considered to ensure comprehensive coverage of relevant research (Churruarín et al., 2021). Web of Science, Google Scholar, JSTOR, Emerald Insight, and Science Direct databases were initially searched to identify literature on the environmental and socio-economic impacts of orangutan ecotourism. However, to tailor the review more specifically to conservation and ecotourism, additional specialist databases were also used. These included Conservation Evidence, ProQuest, and Scopus, which provide important interdisciplinary insights for understanding ecological and socio-economic factors. Furthermore, databases from specific conservation organisations, such as IUCN, WWF, and Rainforest Alliance, were consulted for data on region-specific conservation efforts related to orangutans. To ensure that the review captured local perspectives, databases from Sumatra and Kalimantan were also included, as these regions host the largest orangutan populations.

3.3 Inclusion and Exclusion Criteria

To streamline the review focus, a refined set of exclusion criteria was applied to quickly eliminate articles that did not meet the study objectives (Dsouza et al., 2024; Marasinghe et al., 2020). Articles that failed to address the role of tourism in biodiversity conservation, particularly in orangutan habitats, were excluded. Additionally, studies that did not consider human-wildlife conflict a widespread problem in orangutan-inhabited areas were also excluded. Articles that ignored the socio-economic impacts of ecotourism on local communities, such as whether the benefits of ecotourism reached these communities,

were also excluded. Furthermore, studies that did not address sustainability or conservation outcomes were deemed irrelevant to the review objectives. To maintain a focus on current developments, articles published before 2010 were excluded, as the researchers aimed to capture contemporary trends in orangutan conservation and ecotourism.

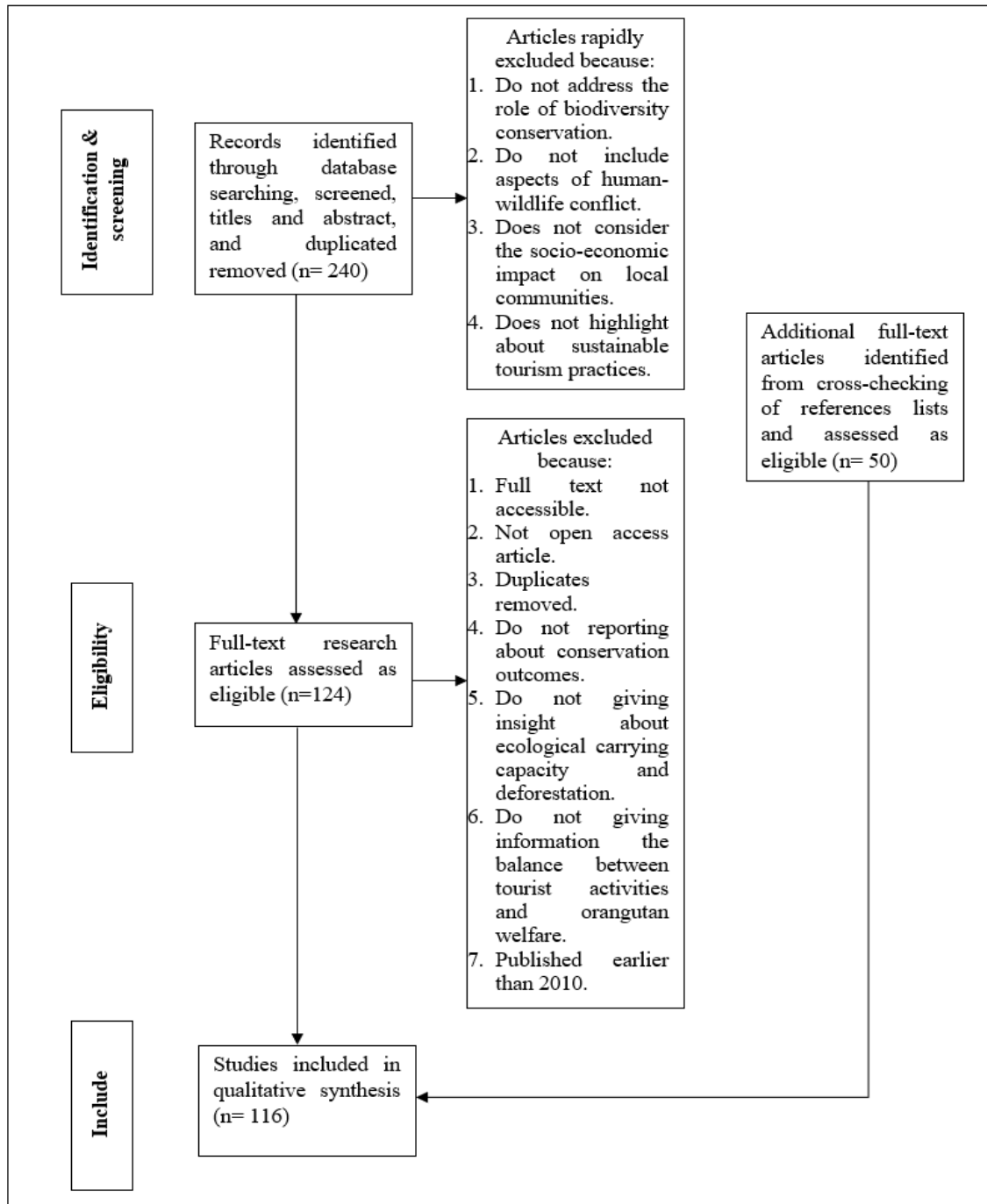


Fig. 2. Flow Diagram of the Selection of the Sources of Evidence

The inclusion criteria for this review were expanded to ensure the relevance of selected studies to the research objectives of orangutan ecotourism. Studies were only included if they focused on the impacts of ecotourism on orangutan conservation, such as efforts to reduce deforestation or prevent poaching. Articles that discussed the ecological carrying capacity of orangutan habitat and the potential impacts of tourism on orangutan populations were prioritised. Additionally, studies highlighting sustainable tourism practices, such as low-impact tourism, visitor restrictions, and promotion of habitat conservation, were included to provide insight into how ecotourism can support orangutan conservation. Only studies published in English that offered unique research findings and were available in full-text format were included in the final analysis. Since orangutans are native to Sumatra and Borneo, this review specifically sought studies that discussed ecotourism projects in these areas. Furthermore, research on government and local community involvement in orangutan conservation policies was included to assess how policies influence conservation efforts and community development. The balance between tourism activities and orangutan welfare was also a key focus, as sustainable ecotourism relies on protecting endangered species while still accommodating tourism. Finally, to ensure a comprehensive review, selected articles were cross-checked with additional sources. These included reports from NGOs such as IUCN, WWF, and local conservation groups, as well as government documents discussing ecotourism policies in Indonesia and Malaysia. Community-led research was also included to gain insight into how local communities perceive and participate in orangutan conservation efforts.

4.0 RESULTS

4.1 Global status of endangered Species

Global status of Bornean Orangutans at Sepilok Orangutan Rehabilitation Centre in Malaysia

Orangutans, the great and charismatic apes native to Asia, once roamed a vast territory from the Himalayan foothills to the Sunda Islands, including Sumatra, Borneo, and Java, covering an estimated 150 million hectares (Sherman et al., 2020). However, in the 17th century, European explorers observed that their range had been significantly reduced, and orangutans were now confined to the islands of Borneo and Sumatra (Pandong et al., 2019). Today, their geographic range has shrunk drastically, with populations found on only a small portion of these islands. Recent scientific advances have identified distinct species and subspecies of orangutans, with Bornean orangutans classified into three subspecies and Sumatran orangutans hosting two recognised species (Sherman et al., 2020). In recent decades, the plight of Bornean orangutans has become increasingly concerning. A study of habitat suitability showed a dramatic loss of their core habitat of up to 24% between the 1950s and 2010, with predictions suggesting a loss of up to 74% by 2080 (Mohd-Asri et al., 2021; Othman & Mohd Rosli, 2023). The main drivers of this habitat loss include logging, fires, and plantation expansion (Sutthacheep et al., 2024). Borneo has lost most of its forest area, exacerbating the challenges faced by orangutans. Habitat fragmentation and low rates of orangutan reproduction have further exacerbated their decline. Smaller populations are particularly vulnerable, and human activities such as industrial agriculture and poaching have seriously impacted their survival. As a result, Bornean orangutans have been classified as critically endangered, reflecting the urgent need for effective conservation measures (Zeng et al., 2022).

In Malaysia, particularly in the ecotourism context of Sabah and Sarawak, the situation is equally dire (Esparza-Huamanchumo et al., 2024; Xu et al., 2023). Conservation efforts aimed at protecting orangutans and their habitat have faced significant challenges (Baloch et al., 2023). While the Sarawak Government has pledged to combat illegal logging and implement a zero-casualty policy for orangutans, effective conservation requires strong collaboration between government agencies, conservation organisations, research institutions, local communities, and the private sector. Despite these efforts, the continued decline in orangutan populations underscores the need for a more accountable and transparent approach to conservation (Shaliza et al., 2023). The ultimate goal is to halt the loss of this iconic ape and its habitat

through comprehensive and coordinated action, ensuring that the ecological balance and conservation of this endangered species are maintained.

Global status of Komodo Island, Indonesia

Komodo Island, located in the East Nusa Tenggara Province of Indonesia, is known globally as the habitat of the Komodo dragon, a species that has become an iconic symbol of endangered wildlife (Sianipar et al., 2024). Named after the Komodo dragon after its discovery in 1910, the island is home to fewer than 4,000 of these magnificent creatures (Reuleaux et al., 2020). To protect this endangered species, a conservation area was established in 1980, now known as Komodo National Park. The protected area covers a total of 173,300 hectares, including both land and marine zones (Sianipar & Suryawan, 2024). The park includes several small islands, each of which contributes to its ecological and tourism significance. Komodo National Park is divided into several zones, including a core area for strict protection, a forest zone, and various tourism and traditional use zones. The zoning is intended to balance conservation efforts with sustainable tourism, although there are still undesignated zones dedicated to community business potential, which can play a significant role in supporting local development and tourism. As Indonesia's tourism industry continues to grow rapidly, tourism is increasingly recognised for its economic benefits (Vatria et al., 2019), including job creation and infrastructure development, as well as its role in cultural understanding.

Ecotourism is a key component of the industry, combining environmental conservation with sustainable tourism practices (Harrison et al., 2020). The concept aims to protect natural resources and biodiversity while providing economic and social benefits to local communities. Ecotourism in Komodo National Park attracts over 50,000 visitors annually, the majority of whom are international tourists (Hamidi et al., 2023). Despite its global appeal, the high volume of tourism has put significant pressure on the park's ecosystem. Increased human activity has impacted on the Komodo dragon population, leading to concerns about declining numbers and the need for better conservation measures (Hamid et al., 2021). The park's tourism potential is renowned globally, but the challenges associated with managing such high visitor activity are significant. The balance between attracting tourists and preserving the Komodo dragon's natural habitat is a delicate one. The decline in Komodo dragon populations, coupled with tourism pressure, underscores the need for careful management and conservation strategies to ensure the long-term survival of both species and the ecological health of the park.

4.2 Existing Pressure in Endangered Habitats

Pressure on Bornean Orangutans, Malaysia

The survival of large mammals in Southeast Asia, especially in countries like Indonesia, is seriously threatened by two main factors such as habitat loss and overhunting (Sherman et al., 2020). These issues are particularly concerning because Southeast Asia is known for its high levels of species endemism, meaning many of the species found here are unique to the region. Unfortunately, the region is also experiencing high levels of biodiversity loss and deforestation (Pandong et al., 2019). These destructive activities have led to the extinction of several key species in the wild, including the Javan rhinoceros in Vietnam in 2010 and the Bornean rhinoceros in 2015 (Sherman et al., 2020). Based on the research of Sherman et al. (2020), this trend continues to threaten other species, such as the Sumatran and Tapanuli orangutans, whose populations are rapidly declining due to habitat loss, primarily from logging. If current trends continue, these species could face extinction within the next 50 to 100 years. On the other hand, there are some positive conservation efforts underway. A 2016 Population Viability Analysis (PVA) of orangutan populations in West Kalimantan and Sarawak indicated that certain habitat areas are large enough to support healthy orangutan populations in terms of demographic and genetic diversity (Malik et al., 2023). However, the Bornean orangutan subspecies, specifically *P. p. pygmaeus*, remains threatened, with an estimated population of only around 3,500 individuals (Wu, 2023). Recognising and addressing immediate threats to

the species, such as habitat destruction and poaching, is critical to long-term conservation strategies aimed at sustaining orangutan populations in and around Sarawak.

Habitat Loss

Logging roads have had a significant impact on wildlife by increasing overhunting, increasing market demand for animals, and undermining the sustainability of harvested populations. Borneo has the highest density of logging roads (Hasan et al., 2023), well above the island's average. The expansion of these roads began in the late 1970s as logging production surged, peaking in 1991, before declining in subsequent decades (Ahmad et al., 2024). By 2010, more than 82,000 km of major logging roads had been constructed in Sarawak alone (Akmaniza et al., 2022; Sundram & Abdul Gani, 2022). In some areas, such as Sabah, sustainable logging practices, such as reduced impact logging (RIL), have helped wildlife such as orangutans adapt. However, in areas where heavy extraction methods have been used, the consequences have been severe, leading to habitat destruction and the displacement of orangutans into unsuitable environments. In Sarawak and Sabah, the situation reflects this problem of habitat loss. Logging and road expansion have fragmented the natural habitat of orangutans, forcing them into smaller, more isolated areas that lack adequate food and shelter. Despite conservation efforts to manage these impacts, the continued loss of suitable habitat threatens the survival of the species. Pressures from logging, infrastructure development, and human encroachment have placed enormous stress on the fragile ecosystem balance that is critical to the long-term survival of orangutans (Mohd-Asri et al., 2021).

Land Conversion

In Sarawak and Sabah, the expansion of logging operations has significantly changed the landscape, particularly through the growth of oil palm plantations and forestry. Research results from Mihalic (2020) show that in 1980, Sarawak had only 23,000 hectares of land planted with oil palm. By 2017, this had increased to 1.56 million hectares, making Sarawak the largest oil palm-producing state in Malaysia. The state's contribution to the national oil palm area is significant, accounting for 26.8% of the total, followed by Sabah and Peninsular Malaysia. This boom in oil palm cultivation has been a major driver of revenue, with Malaysia's palm oil export revenue reaching an estimated MYR77.85 billion (~USD19 billion) in 2017, a significant increase from the previous year (Ahmad et al., 2024; Persada et al., 2023; Skarakis et al., 2023).

Industrial forestry plantations also play a significant role in Sarawak's economy. Over the past three decades, the state has focused on the cultivation of acacia, a fast-growing species that is well-suited to poor and degraded soils. Othman & Rosli (2023) stated that in 2018, Sarawak established the largest area of plantation forestry in Malaysia, primarily acacia, covering 403,017 hectares. This expansion has contributed significantly to the state's economy, with acacia exports worth MYR203 million (~USD49.6 million) in 2017. The high volume of timber produced highlights the importance of these plantations in Sarawak's forestry sector. The impact of this large-scale land conversion on orangutan habitat in Sarawak remains unclear. The great apes' home ranges are often surrounded by plantations and forests cleared of timber. While surveys are underway to assess the survival of orangutans in these altered areas, similar situations in neighbouring states provide some insight. In Sabah, orangutans have adapted to a variety of human-altered landscapes, but plantations are generally unsuitable for sustaining viable populations (Mohd-Asri et al., 2021). Similarly, in East Kalimantan, orangutans have been observed in plantations amidst degraded areas, although their long-term survival under these conditions is uncertain. This context highlights the challenges orangutans face in areas experiencing extensive land-use change, similar to that seen on Orang Utan Island, Malaysia, where large-scale plantation development also threatens their habitat (Armanto et al., 2023; Syakina et al., 2024a, 2024b).

Visitor Impact

The Sepilok Orangutan Rehabilitation Centre in Malaysia, renowned for its pioneering rehabilitation efforts, is also facing increasing pressure from the tourism sector. As a prime destination for wildlife enthusiasts, the centre attracts many visitors who want to witness the rehabilitation of endangered orangutans. While tourism generates vital funds and raises awareness of the importance of orangutan conservation, it poses significant challenges to Sepilok's fragile environment. Increased human presence can disturb orangutans, as noise and tourist activity can stress the animals and disrupt their rehabilitation progress and natural behaviour, potentially affecting their wellbeing and recovery (Sabaruddin et al., 2023). In addition, infrastructure developed to support tourism, such as visitor trails, observation decks, and facilities, can cause habitat disturbance (Matsuzawa, 2019). The expansion of these structures can reduce the space available for orangutans in rehabilitation, fragment their habitat, and hinder their movement and social interactions. This can make it more difficult for them to reintegrate into the wild, as their social structure and breeding behaviour can be affected. In addition, improper management of tourism waste can result in pollution, which affects the rehabilitation centre's ecosystem and attracts other wildlife that can interfere with orangutan recovery. To address these issues, Sepilok has implemented strict visitor guidelines, enhanced habitat management strategies, and encouraged sustainable tourism practices. Sepilok seeks to balance tourism with its mission by educating visitors on how to minimise their impact and respect the centre's conservation goals. This approach ensures that the centre can continue its important work in orangutan conservation while providing meaningful and educational experiences for visitors.

4.3 Pressure on Komodo Island, Indonesia

Resources Depletion

Resource depletion on Komodo Island, Indonesia, is putting significant pressure on the island's environment and its iconic wildlife. The island is home to the endangered Komodo dragon, and over the years, increased tourism, deforestation, and overfishing have led to the degradation of its natural resources. One of the main contributors to resource depletion is unregulated tourism, which puts a strain on the local ecosystem (Fatina et al., 2023). The increasing number of visitors has led to greater demand for water, energy, and waste management services, which often exceed the island's capacity to manage sustainably. This increased pressure on the natural landscape threatens the island's biodiversity, including the Komodo dragon's fragile habitat. Overfishing in the surrounding waters is another significant issue (Osei et al., 2020). As demand for seafood increases, local fish stocks are depleting, impacting the island's marine ecosystem and the livelihoods of the island's fishing communities. The depletion of marine resources is disrupting the balance of the ecosystem, affecting coral reefs and marine biodiversity, which are vital to the island's natural beauty and the health of its tourism industry (Sianipar et al., 2024). Unsustainable fishing practices, such as the use of blast fishing or cyanide, further degrade marine habitats, causing long-term damage that is difficult to reverse.

These pressures on Komodo Island's resources are interconnected, creating a complex web of environmental challenges. Overuse of terrestrial and marine resources is driving habitat loss, species extinction, and ecosystem imbalance. If left unchecked, this depletion not only threatens local wildlife, such as the Komodo dragon, but also damages the island's tourism appeal, a major source of income for the local economy. Addressing these pressures requires sustainable management practices that prioritise conservation while balancing the needs of local communities and the tourism industry.

Tourist Influx

In 2023, the tourism sector in West Manggarai Regency, East Nusa Tenggara, Indonesia, experienced a drastic increase in the number of visitors, rising to 423,870 from 170,354 in 2022 (Sianipar & Suryawan, 2024). This significant surge highlights the growing popularity of the area and successful promotional efforts. The influx included 184,698 domestic tourists and 239,149 international visitors, indicating the

area's attractiveness to both local and foreign tourists (Reuleaux et al., 2020). Most of this influx was directed to the Komodo National Park Office, which is famous for its unique wildlife and stunning scenery. The increase in tourist arrivals in 2023 not only exceeded this year's target of 296,000 but also surpassed pre-pandemic figures, indicating a strong recovery and growth in the tourism sector. This statement is also found in Sianipar and Suryawan's (2024) research. This remarkable increase can be attributed to strategic planning and the introduction of new tourist attractions, such as the Ngalor Kalo Agrotourism area in Siru Village, Lembor. This effort is part of a broader strategy to make Labuan Bajo a major tourist destination, supported by local regulations aimed at boosting regional tourism development.

In their research, Reuleaux et al. (2020) explained that trends over the years have shown significant tourism growth, with a staggering 501.4% increase in visitors from 2010 to 2019, just before the pandemic hit. While international tourism suffered a severe downturn during the pandemic due to travel restrictions, domestic tourism was less affected. Post-pandemic recovery is well underway, with tourist arrivals expected to increase by 770.3% from 2010 levels by 2023, driven by the release of pent-up travel demand and the easing of travel restrictions. Popular destinations such as Komodo Island continue to attract large numbers of tourists, both domestic and international. This influx of tourists has put significant pressure on Komodo Island. The increasing number of visitors has put pressure on the island's infrastructure and natural resources. As tourist numbers increase, effective management is needed to balance tourism development with conservation efforts. Linear regression analysis shows a positive trend in visitor numbers, especially for international visitors, but with greater variability in total visitor numbers. This variability may reflect the broader impact of global events, economic conditions, and other factors that influence tourism. The pressure on Komodo Island underscores the importance of sustainable tourism practices to preserve its unique environment and ensure that tourism benefits are maximised while minimising negative impacts.

Adaptation of Local Communities to The Tourist Sector

The increase in the number of domestic and international tourists to West Manggarai Regency from 2010 to 2023, as shown in the linear regression analysis shown by the research results (Sianipar et al., 2024), can be closely linked to the unique sustainable tourism practices observed in Pasir Panjang Village on Rinca Island, Labuan Bajo. This increase in tourism, especially among international visitors, is partly driven by the unique eco-friendly experiences available in the area. The presence of Komodo dragons, an ancient and protected species, significantly enhances the appeal of the area (Reuleaux et al., 2020). In addition, the vibrant local life, including children swimming in the sea, locals selling Komodo-themed souvenirs, and managing guest houses, highlights the harmonious relationship between the community and the tourism industry. The community's commitment to preserving the Komodo dragons and their habitat adds to the appeal of the area, offering tourists not only beautiful scenery but also meaningful stories about conservation and local culture. Sianipar and Suryawan (2024) also stated the same.

This sustainable tourism model, where locals and Rangers educate visitors about interacting responsibly with the environment, is in line with the growing interest in ecotourism (Yusoh et al., 2023). Tourists are increasingly seeking authentic experiences that allow for cultural exchange while minimising environmental impact. The Rangers' role in protecting the Komodo dragons and tourists is an example of a form of tourism that is both immersive and responsible. This approach meets the growing demand for environmentally friendly travel options and strengthens the region's reputation as a sustainable and high-quality destination. The adaptation of local communities to the tourism sector on Komodo Island is a significant pressure on the region. While this adaptation has contributed to the popularity and growth of tourism in the region, it has also put pressure on local resources and the delicate balance of the ecosystem. The daily activities of local communities, designed to support and benefit from tourism, are intertwined with efforts to conserve the Komodo dragons and their habitat. This dual focus on tourism and conservation illustrates the pressures the island faces as it navigates the challenges of balancing economic benefits with environmental preservation.

4.4 Ecological Challenges of Habitat Conservation

Conservation Challenges at Sepilok Orangutan Rehabilitation Centre in Malaysia

Conservation efforts at Sepilok Orangutan Rehabilitation Centre in Malaysia face significant challenges as they attempt to protect and rehabilitate abandoned and orphaned orangutans. One of the most significant obstacles is the ongoing loss of orangutans' natural habitat due to deforestation and human activities such as logging, oil palm plantations, and agricultural expansion. These activities have destroyed large tracts of the forest, forcing orangutans out of their homes and into conflict with humans. As a result, the number of orangutans in need of protection has increased, putting significant pressure on the island's conservation resources. This result is also stated in Matsuzawa, (2019) research results.

Despite being designated as a sanctuary, Sepilok Orangutan Rehabilitation Centre in Malaysia faces difficulties in sustaining long-term rehabilitation efforts due to limited resources. Orangutans require large, complex ecosystems to mimic their natural environment, allowing them to develop the skills necessary to survive in the wild (Sherman et al., 2020). However, creating this expansive environment in the confined confines of a sanctuary is an ongoing challenge. Conservationists are tasked with not only providing basic care but also ensuring that these animals maintain their instincts, which is difficult to do in such a controlled environment (Mohd-Asri et al., 2021). In addition, a lack of adequate financial resources and logistical support hinders the full potential of conservation programmes. The costs of maintaining appropriate living conditions, veterinary care, and specialised rehabilitation programmes are high, while funding is often inconsistent. These financial constraints limit the capacity of sanctuaries to accommodate the growing number of orangutans and provide them with the quality of care they need. The combination of habitat loss, the complexity of maintaining a natural environment, and limited financial resources creates a series of challenges that continue to hamper conservation efforts at Sepilok Orang Utan Rehabilitation Centre in Malaysia.

a. Limited Space for Rehabilitation (Overcrowding and Dependency on Sanctuary)

One of the most pressing conservation challenges at Sepilok Orangutan Rehabilitation Centre in Malaysia is the limited space available for rehabilitation, which results in overcrowding within sanctuaries. As more orangutans are rescued from deforestation and other threats, these centres quickly become overburdened, struggling to provide adequate space and resources for everyone. Overcrowding severely hampers the natural behaviours of the orangutans, as their innate need for roaming, climbing, and foraging cannot be fully met in these confined environments. This disruption to their instincts not only affects their physical well-being but also stunts their psychological development, leading to increased stress and reduced chances of successful rehabilitation (Matsuzawa, 2019).

Moreover, this overcrowding fosters a growing dependency on human-provided care, further complicating the possibility of returning the orangutans to the wild. Orangutans raised in these conditions become accustomed to constant feeding and support from caregivers, losing their ability to adapt to life in their natural habitat (Sherman et al., 2020). Without the necessary skills to survive independently, such as finding food or building nests, these orangutans face significant challenges if released. Additionally, the lack of suitable large, forested areas for rehabilitation worsens the problem, as the sanctuaries cannot mimic the expansive environments orangutans require for full recovery. This persistent overcrowding and dependency not only limit the effectiveness of conservation programmes but also create long-term challenges in ensuring the orangutans' survival and independence.

b. Balancing Conservation and Tourism

Balancing conservation efforts with tourism presents a profound challenge for orangutan sanctuaries, as it involves navigating the delicate interplay between ecological preservation and economic benefits. Tourism, while vital for generating essential funding, creates significant pressures on the sanctuary's environment. The influx of visitors can lead to increased foot traffic and infrastructure development, which

often results in habitat degradation. This physical disruption can adversely affect the quality of the habitat where orangutans are rehabilitated, diminishing the sanctuary's capacity to support healthy, self-sustaining populations of these endangered primates. The constant presence of tourists also poses a psychological and behavioural strain on the orangutans (Pandong et al., 2019). Frequent human interactions can disturb their natural behaviours, leading to increased stress and potentially hindering their ability to adapt to life in the wild. The rehabilitation process requires that orangutans develop natural foraging and social skills, but excessive human contact can impede this development. The challenge here is to manage tourist activities in a way that minimises stress on the animals, which requires implementing strict guidelines and monitoring to protect the well-being of the orangutans while still accommodating visitor interests (Sherman et al., 2020).

Moreover, the economic incentives of tourism can sometimes shift the focus from conservation priorities to financial gains. The pressure to attract tourists and generate revenue may lead to compromises in conservation strategies, as resources and attention are diverted towards enhancing visitor experiences rather than improving rehabilitation outcomes. This conflict necessitates a delicate balance, and effective management must ensure that conservation objectives are not overshadowed by economic considerations. It involves crafting policies that protect the sanctuaries' ecosystems and prioritise the welfare of orangutans while still leveraging the economic benefits that tourism can provide.

Conservation Challenges in Komodo Island, Indonesia

Komodo Island, Indonesia, faces significant conservation challenges due to its unique environmental and climatic conditions, as well as human-induced pressures. Situated at the crossroads of the Asian and Australian biogeographic regions, Komodo National Park experiences a range of climatic factors, including long dry seasons, high temperatures, and low rainfall, which shape its fragile ecosystem (Sianipar et al., 2024). This diversity, while contributing to the island's rich biodiversity, also makes it highly vulnerable to threats such as habitat loss and climate change. The park's marine ecosystems are particularly vulnerable to the impacts of El Niño and La Niña events, which can cause warming ocean waters and exacerbate strong ocean currents (Reuleaux et al., 2020). In addition, increased tourism has created further pressures, leading to habitat degradation and increased human-wildlife conflict. These conflicts include attacks by Komodo dragons on humans and livestock, as well as retaliation by the local community which undermine conservation efforts and threatens the survival of this iconic species. For the other conservation challenges, please have a look at the further explanation below.

a. Illegal Wildlife Trade

Illegal wildlife trade has been a significant problem on Komodo Island, despite the Komodo National Park being designated a protected area in 1980 (Sianipar et al., 2024). Historically, illegal hunting and trapping of Komodo dragons have been rampant, posing a serious threat to their population. While this activity has declined over time due to increased law enforcement and conservation efforts, it has not been eliminated (Reuleaux et al., 2020). A persistent illegal trade still occurs, often driven by demand for exotic pets and traditional medicines. This illegal activity undermines conservation efforts and threatens the delicate balance of the island's ecosystem, removing key species from their natural habitats and disrupting ecological interactions. In addition, human-wildlife conflict further complicates the situation. Local responses to Komodo attacks and habitat encroachment can result in retaliatory actions against Komodo dragons, exacerbating their vulnerability. Such conflicts often arise when Komodo dragons enter agricultural or residential areas in search of food, leading to increased tensions between local communities and wildlife. Addressing these conflicts requires a multi-pronged approach, including education programmes for local populations, better habitat management, and stronger enforcement of wildlife protection laws to reduce the incidence of illegal trade and the impacts of human-wildlife interactions (Fatina et al., 2023).

b. Balancing Conservation and Tourism

Balancing conservation efforts with tourism presents an additional layer of complexity for Komodo Island. The booming tourism industry, while essential for funding conservation initiatives, increases human presence and activity in sensitive areas. This influx of visitors can lead to habitat degradation and disturbance to wildlife, as increased foot traffic and infrastructure development disrupt the natural habitat of Komodo dragons and other species. The stress caused by human presence can disrupt natural wildlife behaviour, potentially leading to ecological imbalance and compromising the effectiveness of rehabilitation efforts (Ginanjar et al., 2024). Effective management is essential to addressing these challenges and ensuring that conservation goals remain a priority. Strict controls on tourism practices, such as regulating visitor numbers and enforcing guidelines, are needed to prevent habitat degradation and minimise disturbance to wildlife (Latip et al., 2023). Additionally, fostering better communication between park managers and local communities can help address human-wildlife conflict and increase cooperation in conservation efforts. Enforcing regulations to combat illegal wildlife trade and reduce the impacts of tourism are important steps in conserving the island's unique biodiversity while promoting sustainable tourism practices (Mapjabil et al., 2016).

5.0 DISCUSSION

The experiences of the Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia provide important lessons for conservation strategies and sustainable tourism practices. In Sepilok, increased tourism has brought financial benefits but has also put pressure on wildlife and natural habitats. Therefore, conservation strategies need to integrate comprehensive visitor management by limiting visitor numbers, establishing guidelines for wildlife interactions, and ensuring that tourism infrastructure does not disturb critical habitats. In addition, it is important to avoid activities that could threaten habitat loss and land conversion. Local community involvement is also important in supporting conservation, reducing human-wildlife conflict, and creating economic incentives that align with conservation goals.

On Komodo Island, the surge in tourism has placed additional pressure on the island's natural resources and infrastructure, requiring stringent sustainable tourism practices. Regulations to limit visitor numbers and reduce environmental impacts are needed, as is strengthening conservation efforts through local community engagement and stronger law enforcement. Training programmes for local communities in sustainable tourism practices and conservation management can help them adapt to tourism development, as well as generate economic benefits associated with conservation achievements. Harmony between tourism and conservation can be achieved through cooperation between tourism actors, local communities, and conservation parties.

5.1 The linkage between the six categories of tourist visits

The table below is a comparative table between Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia based on the six categories of tourist visits. Researchers provide an assessment of which island performs better in each category. Please refer to Table 2 and explanations below for more details.

Hedonic Value

In this hedonic category, it means activities that can cause excitement, enjoyment, and create a deep impression in terms of wildlife and natural habitat. In this category, Sepilok Orangutan Rehabilitation Centre in Malaysia focuses more on education and raising awareness of Orangutan conservation. In this case, visitors can feel a deep impression, or visitors feel emotionally connected to the plight of endangered Orangutans. While on Komodo Island in Indonesia offers adventure and wildlife exploration with Komodo

dragons, creating a different impression, more challenging, and creating a unique experience for visitors so that for a better experience, Komodo Island in Indonesia is better.

The explanation above regarding Komodo Island experiencing more hedonism is supported by the statement from the results of the study by Mohd-Asri et al. (2021), which explains that orangutan ecotourism in Malaysia only experiences a hedonism of 44.8%, which means reaching moderate hedonism. This gives us an idea of the general picture of tourists towards their visit as a whole, where the feeling of being welcomed contributes to joy and the need to feel more emotional expression. This can cause tourists to repeat their visits and again contribute to increasing awareness through future participation. Although this figure is quite large, another study (Sianipar et al., 2024) states that hedonism on Komodo Island is more than 50%.

Table 2. The linkage between the six categories of tourist visits to Sepilok Orang Utan in the Rehabilitation Centre in Malaysia and Komodo Island, Indonesia.

Category	Sepilok Orang Utan Rehabilitation Centre in Malaysia	Komodo Island (Indonesia)
Hedonic		✓
Comfort	✓	
Novelty		✓
Interactive	✓	✓
Stimulation	✓	✓
Personal Safety	✓	

Comfort Experience

Comfort in this category is about physical relaxation and the peaceful tranquillity of nature. Orangutan Island in Malaysia is more comfortable compared to Komodo Island in Indonesia. Sepilok Orangutan Rehabilitation Centre in Malaysia is more comfortable and educational with organised tourism. The environment is controlled, with limited risks. The facilities are more tailored to the education and comfort of visitors. Meanwhile, Komodo Island is more challenging and sometimes steep, with less focus on comfort. Visitors may need to walk and explore in harsher conditions. For these reasons, Sepilok Orang Utan Rehabilitation Centre in Malaysia makes its environment more comfortable and controlled. This statement is supported by research results (Mohd-Asri et al., 2021). Environmental issues concerning social and economic development should be linked to the authority of ecotourism management so that the industry's objectives can be achieved.

Novelty

This category means something new and unique, and states that the experience is rare and most of them have never had it before. Sepilok Orang Utan Rehabilitation Centre in Malaysia offers a unique opportunity to see orangutans in a controlled environment and focuses on rehabilitation. However, the experience can be more passive. However, seeing Komodo dragons in their natural habitat offers a more unique and rare wildlife experience, especially for adventure seekers. This is what makes Komodo Island a better experience than Orangutan Island because of the rarity and novelty of seeing Komodo dragons in the wild. This is supported by the results of the research Reuleaux et al. (2020) which explains that Komodo Island performs better in experiencing new things. Tourists feel enthusiastic because many of them have never been in a challenging area and interacted more closely with wild animals.

Interactive

Interactive here means involvement in viewing and observing wildlife and fulfilling desires and needs. Another meaning is that it can be more interactive, making it easier to communicate with various parties and meet new people. In this category, both natural habitats have their own advantages so that both can be

considered balanced in terms of interaction, the difference is only in the type of activity. At Sepilok Orang Utan Rehabilitation Centre in Malaysia Interaction with orangutans is very controlled, visitors observe them from a distance to avoid stress on the animals. Educational tours are available. While on Komodo Island Indonesia, Visitors can see Komodo dragons in their natural habitat during guided tours but with limited physical interaction for safety reasons. The overall level of interaction with nature is higher due to additional activities such as snorkelling. If tourists are more interested in something more educational, then Sepilok Orang Utan Rehabilitation Centre in Malaysia is the choice, while if tourists want more natural interaction with wildlife and diverse activities, then Komodo Island in Indonesia offers a better experience.

Stimulation

In this stimulation category, Sepilok Orang Utan Rehabilitation Centre in Malaysia and Komodo Island have their own characteristics. In terms of stimulation, it depends on the preferences of the tourists themselves, whether they want to find a more educational or physically stimulating experience. Sepilok Orang Utan Rehabilitation Centre in Malaysia offers mental stimulation through learning about orangutan conservation and behaviour. However, the experience is more educational than physically stimulating. While Komodo Island provides mental and physical stimulation through trekking, wildlife viewing, snorkelling, and more. Various activities add to the excitement.

Personal Safety

Personal safety This category includes safety in transportation to the island itself. For example, such as paying attention to the safety of tourists when getting on and off boats or water transportation. In this category, Sepilok Orang Utan Rehabilitation Centre in Malaysia is a step up because it is a highly controlled environment with minimal risk to visitors. Safety measures are in place to ensure minimal contact between visitors and orangutans. However, on Komodo Island in Indonesia, guides ensure safety, but the presence of Komodo dragons and the rugged terrain pose some inherent risks. Visitors need to be careful and follow safety protocols carefully. This is the reason that makes Orangutan Island more controlled and safer for tourists.

The last element discussed in this category is the tourist assessment of the safety experience during a visit to orangutan ecotourism in Malaysia. The results of the analysis concluded that orangutan ecotourism visitors had a low safety experience because the average positive response reached 57.15% (Mohd-Asri et al., 2021). However, technically the threat to the animal itself is measured to be quite safe compared to the Komodo dragon on Komodo Island. The study of Sianipar & Suryawan (2024) noted several common incidents that can occur during ecotourism activities, namely slipping, tripping, and falling. In these common incidents, at least at Sepilok Orang Utan Rehabilitation Centre in Malaysia, it is more controlled than on Komodo Island. In conclusion, Sepilok Orang Utan Rehabilitation Centre in Malaysia is more suitable for those looking for a more comfortable, educational, and safe experience, which focuses on learning about conservation in a controlled environment. Meanwhile, Komodo Island is more suitable for adventure, stimulation, and offering new experiences. The island excels in providing interactive and thrilling ecotourism, especially for those looking for a more challenging and active experience. The choice depends on the tourist's preference, whether for a more relaxed and educational experience (Sepilok Orang Utan Rehabilitation Centre in Malaysia) or a more challenging and interactive trip (Komodo Island).

5.2 Strategies to overcome the pressure and challenges

Table 3 explains the strategies that can support the implementation of the implications and recommendations of the lessons learned from ecotourism at Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia.

Table 3. Strategies to support sustainability at Sepilok Orang Utan Rehabilitation Centre in Malaysia, and Komodo Island, Indonesia.

Strategy Area	Sepilok Orang Utan Rehabilitation Centre in Malaysia	Komodo Island, Indonesia
Implement Comprehensive Visitor Management Plans	Visitor Quotas and Scheduling Guideline Development	Visitor Limits and Fees Infrastructure Development Controls
Promote Environmentally Friendly Infrastructure	Eco-Friendly Design Habitat Protection Measures	Focus on Sustainable Practices
Enhance Conservation Education and Involvement	Educational Programmes Volunteer Opportunities	Eco-Tourism Packages Feedback Mechanisms:
Strengthen Local Community Partnerships	Community Involvement Sustainable Livelihoods	Capacity Building Economic Incentives
Strengthen Conservation Efforts and Adaptive Management		Enhanced Law Enforcement Adaptive Management Strategies

Based on the table above, it can be concluded that five strategic areas can support sustainability at Sepilok Orang Utan Rehabilitation Centre in Malaysia and Komodo Island, Indonesia. In the Implement Comprehensive Visitor Management Plans section, there are Visitor Quotas and Scheduling that can be managed, the use of which is to Introduce daily visitor limits and a reservation system to manage visitor flows and avoid peak times. Furthermore, there is Guideline Development which is useful for Creating and communicating strict wildlife interaction guidelines through directions and signs. While on Komodo Island in Indonesia, Visitor Limits and Fees are useful for setting visitor number regulations and implementing fees to fund conservation initiatives and Infrastructure Development Controls are useful for Regulating the development of tourism infrastructure to prevent habitat degradation.

To Promote Eco-Friendly Infrastructure, Sepilok Orang Utan Rehabilitation Centre in Malaysia can implement Eco-Design and Habitat Protection Measures. These activities can develop infrastructure with minimal environmental impact, using sustainable materials and energy-efficient technologies. Then, designing paths and viewing platforms to avoid critical habitats. Using elevated walkways and paths. Meanwhile, in Komodo Island, Indonesia, focus on Sustainable Practices to Ensure tourism operations are aligned with conservation goals and reduce environmental impacts. Third, Increase Conservation Education and Engagement. Education Programmes, namely Offering guided tours and workshops to emphasise wildlife conservation and responsible tourism. Then, volunteer opportunities are useful for creating programmes for tourists to participate in conservation activities such as habitat cleaning. Education programmes and volunteer opportunities are very suitable to be implemented at Sepilok Orang Utan Rehabilitation Centre in Malaysia. Meanwhile, on Komodo Island in Indonesia, Ecotourism Packages and Feedback Mechanisms are more pronounced. This is useful for developing ecotourism packages that highlight conservation efforts and involve tourists in activities. To add to this, create channels for tourists and local communities to provide feedback on conservation and tourism practices.

Strengthening Local Community Partnerships Sepilok Orang Utan Rehabilitation Centre in Malaysia can be done in two ways, namely Community Engagement which can Involve local communities in tourism planning and decision-making by considering their needs. Then, Sustainable Livelihoods can support local businesses that are aligned with conservation goals and offer training for sustainable tourism practices. Meanwhile, Strengthening Local Community Partnerships on Komodo Island in Indonesia can be done by developing training programmes for local communities on sustainable tourism and conservation management and creating incentives for communities that support conservation goals and sustainable practices. Lastly, there is a discussion about Strengthening Conservation Efforts and Adaptive Management. This is very suitable to be applied in Komodo Island because it can Increase resources for patrols and law enforcement against illegal activities. This strategy is also reflected in (Sianipar et al., 2024; Sianipar & Suryawan, 2024) research discussion. In addition, it can also Apply a flexible management approach to respond to emerging threats and changes.

6.0 CONCLUSION

Ecotourism offers travellers the opportunity to experience nature while promoting sustainable practices that protect the environment. However, it is not a smooth journey to achieve the benefits of ecotourism as it also has its own unique challenges. For example, the Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia are both dedicated to conserving endangered species and their environment. There are many pressures on these endangered habitats. A study on habitat suitability showed a dramatic loss of core habitat for Bornean orangutans of 24% between the 1950s and 2010, with predictions showing a loss of up to 74% by 2080. The main causes of this habitat loss are deforestation, fires, and plantation expansion. As seen from the results of this study, the pressures on Bornean orangutans are habitat loss, land conversion, human-wildlife conflict, poaching activities, and visitor impacts. Meanwhile, on Komodo Island in Indonesia, where the Komodo dragon was first discovered in 1910, the island is home to fewer than 4,000 of these magnificent creatures. To protect this endangered species, a conservation area was established in 1980, now known as Komodo National Park, which protects an area of 173,300 hectares. Resource depletion is one of the pressures on Komodo Island in Indonesia, followed by other pressures related to the influx of tourism.

In addition to pressures on endangered habitats, this of course leads to ecological challenges for habitat conservation at both the Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia. Where the main focus is on limited space for rehabilitation, illegal wildlife trade, and the balance between conservation and tourism. Lessons from the Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia illustrate the delicate balance between tourism and conservation. At Sepilok, the focus is on integrating visitor management with conservation strategies to minimise ecological stress on endangered orangutans, while promoting community engagement and sustainable tourism practices. Similarly, Komodo Island faces pressures from increased tourism, which requires strict regulation, community engagement, and adaptive conservation strategies to protect its unique biodiversity. Both sites emphasise the importance of aligning tourism growth with long-term conservation goals to ensure the sustainability of these fragile ecosystems.

In summary, strategies to support sustainability at Sepilok Orangutan Rehabilitation Centre in Malaysia and Komodo Island in Indonesia focus on several key areas. Both sites emphasise the need for comprehensive visitor management, with Sepilok implementing quotas and scheduling, while Komodo has visitor limits and fees. They promote environmentally friendly infrastructure, including eco-friendly design and habitat protection measures. Conservation education is also a priority, with Sepilok offering educational programmes and volunteer opportunities, and Komodo developing ecotourism packages and feedback mechanisms. Strengthening local community partnerships is critical, with Sepilok focusing on community engagement and sustainable livelihoods, while Komodo emphasises capacity building and economic incentives. In addition, conservation efforts are enhanced through adaptive management and stronger law enforcement on Komodo Island.

These strategies directly contribute to several Sustainable Development Goals (SDGs). The protection of orangutans and Komodo dragons, along with their habitats, aligns with SDG 15 (Life on Land) by safeguarding biodiversity and combating habitat degradation. The emphasis on eco-friendly infrastructure and sustainable tourism practices supports SDG 12 (Responsible Consumption and Production), ensuring that tourism growth minimises environmental impact. Conservation education and volunteer programmes foster awareness and lifelong learning opportunities, reflecting SDG 4 (Quality Education). Strengthening local community partnerships, capacity building, and promoting sustainable livelihoods contribute to SDG 8 (Decent Work and Economic Growth) by providing economic incentives tied to conservation. At the same time, visitor limits, regulation, and adaptive management enhance SDG 13 (Climate Action) by reducing pressures that exacerbate climate-related vulnerabilities.

Ultimately, the lessons from Sepilok and Komodo highlight that sustainable ecotourism is not only about preserving endangered species but also about creating a model of development that integrates conservation with community well-being. By aligning tourism management with the SDGs, both sites

illustrate how biodiversity conservation can support global sustainability efforts while ensuring that fragile ecosystems remain protected for future generations.

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This research and the preparation of the manuscript were conducted solely by the author. No other individuals were involved in the research or writing process.

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The author agrees that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declares the absence of conflicting interests with the funders.

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