BIODIVERSITAS
Volume 25, Number 11, November 2024
Pages: 4535-4542

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d251152

Ecosophy as a form of protection for the Tapanuli Orangutan (*Pongo tapanuliensis*) in the Batang Toru Landscape, North Sumatra, Indonesia

YUDHA LESMANA[1,♥], SAMBAS BASUNI[2], RINEKSO SOEKMADI[2]

[1]Program of Tropical Biodiversity Conservation, Faculty of Forestry and Environment, Institut Pertanian Bogor. Jl. Ulin-Lingkar Akademik, Kampus IPB Dramaga, Bogor 16680, West Java, Indonesia. Tel.: +62-251-8621947, ♥email: yudhalesmana26@gmail.com

[2]Department of Forest Resources Conservation and Ecotourism, Faculty of Forestry and Environment, Institut Pertanian Bogor. Jl. Ulin-Lingkar Akademik, Kampus IPB Dramaga, Bogor 16680, West Java, Indonesia

Manuscript received: 13 September 2024. Revision accepted: 27 November 2024.

Abstract. *Lesmana Y, Basuni S, Soekmadi R. 2024. Ecosophy as a form of protection for the Tapanuli Orangutan* (Pongo tapanuliensis) *in the Batang Toru Landscape, North Sumatra, Indonesia. Biodiversitas 25: 4535-4542.* Forest clearing for economic development often conflicts with saving biodiversity. Forest clearing by humans to date has been anthropocentric in its utilization of forest resources, which are still classified as exploitative in the Batang Toru Landscape, South Tapanuli District, North Sumatra, Indonesia. As a result, the Tapanuli orangutan (*Pongo tapanuliensis*) become alienated in its own home and migrates to community gardens for get food. The community considers orangutans to be very cruel by stealing and destroying their plantation products, which results in a decrease in economic income, triggering human-orangutan conflict. Local communities carry out evictions in various ways based on their initiatives and experiences. This study aims to analyze the concept of ecosophy (ecological philosophy) and factors of human-orangutan conflict as an alternative conservation of wild and endangered species protection. The research location focused on six sub-districts of the Tapanuli orangutan range in the other-use forest area of South Tapanuli District. This research used qualitative methods through interviews and discussions with communities living around the forest. The results showed that the concept of ecosophy can integrate intellectual, spiritual, and emotional dimensions at all levels of education for public awareness of the importance of protecting the Tapanuli orangutan. Higher levels of education showed positive results towards saving the Tapanuli orangutan. This study suggests that a long-term solution to human-orangutan conflict requires a comprehensive approach that emphasizes the ecosophy between humans and nature.

Keywords: Conservation, ecological balance, ecosystem, harmonious relationship, human behavior

INTRODUCTION

The habitat of the Tapanuli orangutan (*Pongo tapanuliensis* Nurcahyo, Meijaard, Nowak, Fredriksson & Groves, 2017) is tucked away in the Batang Toru Landscape, North Sumatra, Indonesia. The species' range includes lowland (300m above sea level), montane forests (1,500m above sea level), state forests (nature reserves and production forests) and other utilization forests or cultivated land (Kementrian Lingkungan Hidup dan Kehutanan 2017; Kuswanda et al. 2020). Since the publication of the research by Nater et al. (2017), the Government of the Republic of Indonesia has designated the Tapanuli Orangutan as a protected species through Decree No.P.106/MENLHK/SETJEN/KUM.1/12/2018 and is listed on the IUCN (International Union for Conservation of Nature) and CITES (The Convention on International Trade in Endangered Species of Wild Fauna and Flora) red lists (Kementrian Lingkungan Hidup dan Kehutanan 2022).

The Tapanuli orangutan is one of the rare species discovered in 2017 (Samsuri et al. 2024). Currently, the Tapanuli Orangutan species is threatened with extinction due to human activities, making it a global issue and attracting public attention (Mlambo et al. 2024; Montagnini 2024; Mubarok et al. 2024; Samsuri et al. 2024). The major threat to the survival of the Tapanuli orangutan is based on human activities such as forest clearing for settlements, agriculture, plantations, mining, infrastructure and area utilization for the energy industry. As a result, Tapanuli orangutans visit local people's plantations and farms, so local people often carry out forced evictions (Maskulino et al. 2021; Wardana and Geubrina 2024). If this continues, it could threaten the survival of the Tapanuli orangutan and exacerbate conflicts with local communities (Harahap et al. 2024; Yanti et al. 2024).

Various studies have recorded conflicts between humans and Tapanuli orangutans in the Batang Toru Landscape. Research by Meijaard et al. (2021) describes the historical range and drivers of the decline of the Tapanuli orangutan. Research by Sitompul et al. (2024) reported that some people did not show tolerance for orangutans as neighbors. In addition, research by Samsuri et al. (2023) identified that distance to agricultural land was the main factor influencing human-Tapanuli orangutan conflict. Based on conservation evaluations over the past 20 years, orangutan-human conflict mitigation in Indonesia has not achieved maximum results (Santika et al. 2022). The challenges faced by the Tapanuli orangutan require a more comprehensive solution (Palmer 2020). Alternatives to reduce conflict between humans and orangutans require deep consideration between humans and nature (Chavan and Sharma 2024).

The concept of ecosophy (ecological philosophy) emphasizes the importance of the symbiotic relationship between humans and nature. It integrates intellectual, spiritual and emotional dimensions to achieve conservation goals (Alikodra 2021) that focus on the harmony between ecosystem sustainability and human well-being through education, habitat restoration and collaborative resource management (Yang and Young 2019; Rubio-Mozos et al. 2020; Liordos 2024). An approach with the basic principles of ecosophy can support sustainable natural resource management and preserve the environment for future needs and emphasize the maintenance of biodiversity for ecosystem stability (Lysaker 2023; Barman and Borah 2024; Gupta 2024).

Ecosophy as a branch of ecological philosophy emphasizes the importance of direct experience and an empathetic perspective in understanding the relationship between humans and the environment (Mathews 2024; Zeng et al. 2024). Ecosophy invites us as humans to feel and understand the world from the perspective of other living beings such as the Tapanuli orangutan. The reflection "Being an Orangutan for a Moment" can find innovative ways to increase public awareness and involvement in conservation efforts. Orangutans are currently feeling the pressure and hardship of habitat loss, hunting, and negative interactions with humans. This insight helps us realize that the Tapanuli orangutan, as an integral part of the ecosystem, is facing threats that not only affect them individually, but also the wider ecological balance.

It is necessary to conduct research on the concept of ecosophy so that it can help create harmonious between humans and the Tapanuli Orangutan and increase public awareness in the involvement of conservation efforts. The purpose of this study is to analyze the concept of ecosophy in supporting conservation for the survival of the Tapanuli orangutan and assess conflict factors between humans and Tapanuli orangutans in the Batang Toru Landscape.

MATERIALS AND METHODS

Study area

This research was conducted from April 2023 to August 2023 in the Other Use Forest, especially community forests in the Batang Toru Landscape, South Tapanuli District, North Sumatra Province, Indonesia. The total population and area of the study site are 34,029 people and 13,062 Hectares (ha) (Tridjono 2018) (Figure 1).

Data collection

Data collection was carried out using purposive sampling method. According to López (2023) and Mariam et al. (2024) purposive sampling is a sampling method and samples are selected based on certain considerations. Data sources came from interviews and questionnaires with directly affected communities (Table S1) as well as government documents, journals, research results and other publications. Qualitative data follows an approach that emphasizes the inductive inference process and on the analysis of the dynamics of the relationship between observed phenomena and by using scientific logic (Timmermans and Tavory 2022). The respondents were 150 people from six sub-districts, namely West Angkola, East Angkola, Arse, Batang Toru, Marancar, and Sipirok.

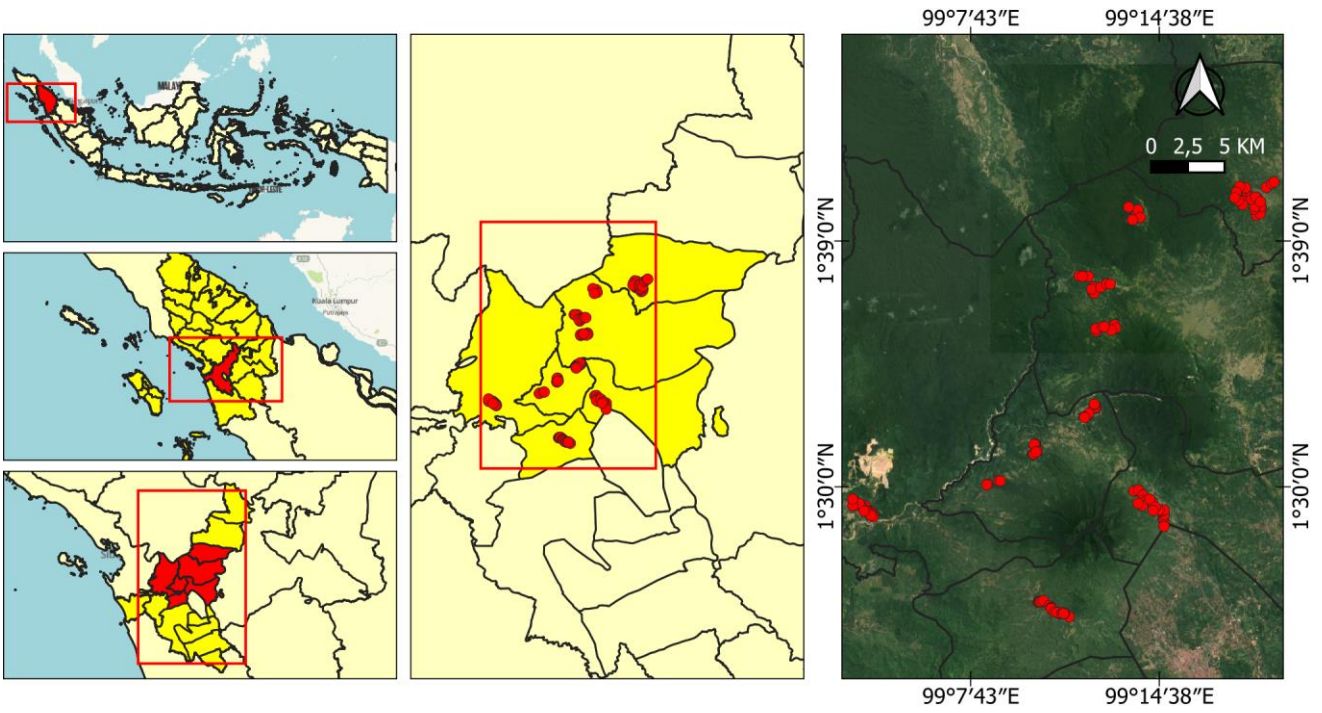

Figure 1. Map showing the location of the study area in South Tapanuli, North Sumatera, Indonesia

Data analysis

Data analysis uses a descriptive qualitative approach that involves collecting data that is open-ended and based on general questions and analyzing information from respondents that is inductive in nature. Analyzing interviews and questionnaires using the Likert scale approach. The Likert scale can be used and modified to reveal perceptions so that it can be seen whether a person's perception is positive or negative towards a thing or object (Mariam et al. 2024). Data from each alternative answer (1,2,3,4,5) will be given a different score, namely; for answers that choose strongly agree are given a score of 5, for answers that choose agree are given a score of 4, for answers that choose neutral are given a score of 3, for answers that choose disagree are given a score of 2 and for answers that choose strongly disagree are given a score of 1. The ecosophy assessment is analyzed from the representation of human relationships with humans and human relationships with nature (Naess 2019). This relationship assessment is related to emotional feeling reactions that give birth to attitudes of influence, judgment and appreciation. The data obtained was tabulated and then analyzed using descriptive methods. In-depth discussions were conducted on each discourse, especially in the Tapanuli Orangutan discourse, then the facts that occurred were explained by looking at environmental philosophy.

RESULTS AND DISCUSSION

Farmer professions based on community education level

The level of education of the community at the research location can be seen in detail in Figure 2. Respondents based on formal education level of elementary school amounted to 67 respondents, junior high school 36 respondents, senior high school 33 respondents and undergraduate 14 respondents. Communities as local farmers with elementary school education are higher in number compared to other education levels from each sub-district. According to Mosanya and Kwiatkowska (2023) explains that the level of education will have effect on what happens to the surrounding environment.

Local communities around the Batangtoru forest do not continue their education to a higher level due to inadequate accessibility and distance from home to school. As a result, they choose to follow their parents who work as farmers. The farming profession is a hereditary occupation that they manage traditionally and simply. This profession is a shortcut for them to get a job because it is difficult to compete for other more promising jobs if they only rely on a diploma. The formal education certificates they have are mostly below senior high school .

Community and orangutan interactions in plantation

Based on research data by Kuswanda et al. (2020), the number of Tapanuli orangutans in the forest buffer zone of South Tapanuli District is 87 individuals. Tapanuli orangutans in the forest buffer zone have the potential for conflict with humans due to the close proximity of plantations to conservation and protected forest areas. In accordance with research by Samsuri et al. (2023), distance to agricultural land is the main factor influencing human and Tapanuli orangutan conflicts.

The farming profession is a hereditary occupation of local communities. They depend on the agricultural and plantation products that they manage. They cultivate durian (*Durio ziberthinus* Murray), petai (*Parkia speciosa* Hassk.), jengkol (*Archidendron pauciflorum* (Benth.) I.C.Nielsen), sugar palm (*Arenga pinnata* (Wurmb) Merr.) and banana plants, which are also favored by orangutans. The large number of cultivated plants cultivated by the community has triggered human-orangutan conflicts in the buffer villages of the Sipirok Nature Reserve, Sibual-buali Nature Reserve, Lubuk Raya Nature Reserve and protected forests in North Sumatra.

To prevent disturbance of the community's cultivated plants from Tapanuli orangutans, they mitigate the conflict with various methods of eviction. These mitigation efforts aim to reduce the risk of loss. The community conducts evictions by igniting fires, activating firecrackers, shooting with air rifles, throwing hard objects (stones or wood) and screaming. This aims to suppress imperfections in plant growth and damage to fruit that will be ready for harvest. The various eviction techniques practiced by local communities will have a negative impact on other habitats in the Batang Toru Landscape. The eviction techniques carried out by the community against orangutans are explained in Table 1.

Table 1. Tapanuli orangutan mitigation techniques used by local communities

Mitigation techniques	Risk
Lighting the fire	Risk of fire, destruction of corridors and habitats, hazards and other animals
Use firecrackers	Stress in orangutans and other animals
Shooting with an air rifle	Physical injuries, trauma and long-term negative impacts
Throwing hard things	Physical injury, stress and changing behaviour
Screams	Stress in orangutans

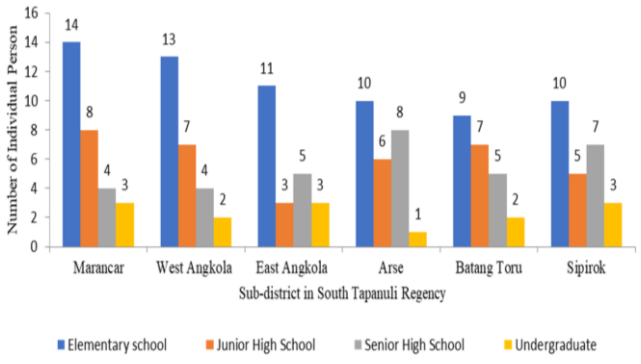

Figure 2. Characteristics of community respondents based on education

Samsuri et al. (2024) in their paper explained that people around the Batang Toru ecosystem drive orangutans away using various methods. Community fire lighting causes some orangutans to leave the plantation area, but has a very dangerous risk to the forest and Tapanuli orangutans. This action has the potential to trigger widespread forest and land fires, resulting in the destruction of forest corridors and other wildlife habitats in the Batang Toru forest. This is in line with the thinking of research by Batista et al. (2023) and Kalogiannidis et al. (2023) which explains that the use of fire as a means of repelling animals can increase the potential for forest fires and habitat destruction. In addition, another form of local community repulsion is the use of firecrackers. Firecrackers made of bamboo or paralon (plastic pipes) are widely used by local communities because they are cheap and easy to use and are common as traditional games of the Tapanuli community. The use of firecrackers is done at a distance of around ten meters from the orangutan's position.

For local people who own air rifles, they drive orangutans away by aiming at their bodies to wound them. This method is very dangerous because it can result in disability and potentially death due to lead bullet holes lodged in the orangutan's body. This mitigation technique carries a high level of risk and is not friendly to orangutan survival. The use of air rifles has significant negative impacts on orangutan health and behavior (Kmetiuk et al. 2023). Furthermore, the method of eviction by throwing hard objects such as stones or wood can worsen the behavior of Tapanuli orangutans. As a result, they feel challenged, so they fight back by showing aggression by destroying young shoots, branches or twigs and dropping fruits around them that are within reach. Furthermore, when orangutans are hit by humans throwing hard objects, it causes physical injury and increases stress to the orangutan (De Marco et al. 2022). Local Tapanuli people in mountainous areas have loud, booming voices. They chase Tapanuli orangutans away with high-pitched screams. The screams resonate to the orangutans' ears, disturbing them and causing them to move away.

Local community perceptions of crop damage compensation

The Tapanuli orangutan, known locally as the mawas juhut bottar, only lives in the forests of the Batang Toru Landscape. Today, the forests of the Batang Toru Landscape, which are home to orangutans and other species, have undergone drastic changes, resulting in habitat loss. Habitat loss due to land clearing under the guise of development has led wildlife such as orangutans to venture into community plantations and fields, causing conflict between the two.

Most local communities make a living from gardening and farming. They invest financially and also dedicate themselves to the crops they cultivate with the hope of future returns. As a result, these hopes are dashed by the presence of Tapanuli orangutans in their gardens during the flowering and fruiting season. They felt that they had been wronged by the arrival of this endangered wildlife species. They were very angry and disappointed. The fruit that they used to sell as merchandise was damaged by the orangutans, which disrupted their economy and triggered a prolonged conflict between the two.

The conflict between the two can damage their welfare. The community is disturbed by the damage to the crops they manage and the orangutan is disturbed by human behavior that endangers it. As a result of the selfishness of both, the conflict that occurred until now has not been resolved properly. The community hopes that the role of the government will be present to resolve the conflict, one of the strategies is by providing compensation to victims of theft and destruction by orangutans. Therefore, this study was conducted to determine the amount of public assessment of compensation due to orangutans.

Based on the research results, 68.67% of respondents requested compensation from the government (central and local). This compensation is a form of justice in maintaining the sustainability of coexistence between humans and orangutans so that no party feels disadvantaged. The form of compensation is in the form of a monetary value commensurate with the value of the market price of goods when converted. Research by Toomey (2023) confirms that the human mindset will change if it feels disadvantaged from an economic and social aspect. One approach that can be taken is to calculate the number of damaged plants/fruits multiplied by the average yield in the area of the plant owner. This compensation fund can be in the form of an activity program from the DIPA budget allocation of the government (central and regional).

Not only from the government, compensation funds can also come from companies/privates that utilize forests and land in the Tapanuli Orangutan habitat. Companies have a social responsibility to the community through government policies with Corporate Social Responsibility (CSR) programs through planned programs. With appropriate compensation, communities can actively protect and preserve and coexist with the Tapanuli orangutan.

To date, no village has been designated as a human-orangutan harmony village in South Tapanuli District. In fact, these areas are very important, especially in buffer forest areas with other use forests (APL) status. Coexistence signifies a way for humans to adapt to wildlife, fostering harmonious living where both parties respect each other's space. Coexistence areas require collaboration between the government, village officials and local communities in the formulation and determination of decisions. Coexistence is a situation where co-adaptation behavior between humans and wildlife is governed by institutions that ensure tolerable risks, long-term development of wildlife populations and social legitimacy to meet community needs (Carter and Linnell 2016).

On the other hand, 31.33% of the community rejected the concept of compensation. They revealed that the Tapanuli orangutan is an endangered species that must be protected together because it only exists in the Tapanuli forest. Orangutans only occasionally visit the fields and only take enough fruit. This is because the farm is located far from conservation and protection forests. Respondents with a high level of education rejected the concept of the compensation fund because they believed that orangutans

were only occasionally present in their fields and that orangutans were the previous inhabitants of the forest before the community was present, so respondents felt sorry for the Tapanuli orangutan. Previous research confirms that education level has a significant influence on strategic or conservation approaches (Roura 2021). Furthermore, the community hopes that the government can proactively provide activities that can develop economic improvement from various sectors, especially for people who are active around the forest.

Ecosophy as a holistic approach

An anthropocentric worldview is at the root of humanity's freedom to overexploit nature to fulfill its worldly desires (Sollund 2024). This action is of particular concern to the United Nations Climate Change (UNCC) in environmental conservation, which emphasizes biodiversity loss, climate change and pollution (Fletcher et al. 2024). Biodiversity loss due to deforestation has put the population of the Tapanuli orangutan species at risk of extinction in the Batang Toru Landscape. Currently, this endangered species is facing a precarious existence in its own home because it is not considered as a priority by humans.

Capitalist thinking argues that the need for development and economic growth is the barometer of progress (Ellis 2024). This is what drives massive exploitation by humans as an antidote to the issue of public welfare. As a result, greed competes wildly to utilize forest resources that make the forest in the Batang Toru Landscape critical. In (Alikodra 2021), when the earth is increasingly critical, environmental conservation efforts are strengthened by the notion of ecosophy.

Ecosophy is an understanding that applies the unity of three interrelated dimensions as a whole, namely the intellectual dimension, spiritual dimension and emotional dimension. The concept of ecosophy can help the personal philosophy of local communities as the basis for efforts to conserve natural resources, especially the Tapanuli orangutan. The application of ecosophy emphasizes the importance of harmonization between humans and the environment in conservation efforts (Mishra 2016; Mirek and Witkowski 2017). With the existence of ecosophy, humans no longer set their sights on the desire for economic gain, but rather on quality of life issues that require each other. Research by Molina-Motos (2019) emphasized that ecosophy-based education focuses on delivering in-depth information for emotional change.

Ecosophy can shape behavioral and emotional changes that can make a positive contribution to humans to nature based on science and religious teachings. The positive contribution of religious teachings is combined by syncretism in achieving harmony and balance. Ecosophy flows an understanding of balance with nature and its contents, where humans have a strong bond of interdependence in the same space and need each other on planet earth. In its development, the concept of Ecosophy is based on the science of environmental philosophy which is much more holistic and comprehensive about human interactions with nature with all ethical responsibilities to maintain the balance and harmony of the ecosystem (Masykur et al. 2023). It is this that can enable humans to respect the rights of nature and the needs of other living things. Therefore, orangutan protection can be applied in society through the concept of ecosophy (Table 2).

Research by Wali et al. (2017) and Indellicato (2023) explains that the approach of providing education related to ecosophy can change the mindset of the community in efforts to handle animals, including orangutans. The results of previous studies also confirm that the concept of ecosophy, which focuses on habitat maintenance and community involvement, is able to face long-term conservation challenges (Truong 2022; Gupta et al. 2023). In this case, the concept of ecosophy towards community attitudes in protection requires proactivity in integrating intellectual, emotional, and spiritual aspects so that the threats faced by the Tapanuli orangutan can be resolved. Concern for the protection of orangutan ecosystems depends on one's mindset (Duchi et al. 2020).

Table 2. Applications of ecosophy in orangutan protection that can be applied in the community

Indicators of ecosophy	Approach	Action	Goals
Intellectual	Education and research	Education programmes for communities and students on orangutans and their ecosystems	Increase understanding and knowledge of orangutans
		Research on orangutan behaviour, needs, living space and threats	Identify data-driven solutions for protection
		Conservation-based curriculum development in schools	Increase awareness of the importance of conservation among the younger generation
Spiritual	Religious values and local wisdom	Promoting spiritual values that appreciate life and nature	Linking orangutan protection to spiritual beliefs that promote respect and responsibility for nature
		Engagement with local communities to discuss conservation values in a spiritual context	Strengthen the spiritual connection between humans and nature
		Integrated lessons on nature balance in religious practices	Utilise vacant land by planting tree seedlings
Emotional	Empathy and attitude	Conduct public awareness campaigns involving communities for orangutan protection	Build empathy towards orangutans and conservation issues
		Building awareness and sensitivity to impacts	Strengthen the emotional connection between humans and orangutans
		Taking positive action in orangutan habitats	Encourage active community involvement in orangutan protection

Being a Tapanuli orangutan for a moment

Batangtoru forest resources, the home of the Tapanuli orangutan, are limited in meeting human needs. Humans are newcomers to the Batangtoru forest. They are guests. Therefore, they live in the same house. Like guests, humans who move should have good manners and respect for the predecessors who were present and lived in the Batangtoru forest. Every now and then, humans can reflect on themselves as "Tapanuli Orangutans for a moment" in order to understand.

Currently, Tapanuli orangutans are not doing well. Their presence in other use forests (APL) is suffering physically and some are suffering from human-induced mental disorders. There is a big question that arises from within us as humans. "Are orangutans asking for payback for protecting the forest all these years?" and 'Are orangutans asking for financial compensation for harming and killing their friends?' of course not. If humans understood the language of orangutans, they would surely ask for justice and wisdom from humans as perfect beings. Orangutans do not need money as a means of payment, they only need love and to live in harmony to protect and preserve the forest as a common habitat in order to fulfill their needs.

It is economic factors that change the mindset of contemporary humans towards orangutan habitat preservation. Contemporary humans tend to underestimate the cognitive value of feelings. Meanwhile, the way of relating to nature, humans and the world is basically a matter of feeling (Naess 1990). Therefore, based on the understanding of Zeng et al. (2024), Naess suggests that humans pay more attention to subjective experience, rather than relying on objective scientific evaluation. The subjective contemporary human being is the meaning of human individuality, which is undermined by the capitalist forces of the integrated world and by the lack of knowledge so that it must delve into mental ecosophy (Cavalcante and Alves 2020).

Ecosophy has a holistic perspective. By understanding ecosophy, people can relent and make peace with the situation for a sustainable common life. To be a real human being who has feelings. Human relationships with fellow living beings must have a sense of emotional empathy. Because humans are very different from animals, they do not only exist in the world, but exist together with the world because humans are always in contact with the world in a critical mind. They can understand the objective data of reality through reflection and not just instinctively like animals. Therefore, human self-introspection is needed in reflection to obtain interdependent sustainable action.

In conclusion, the application of ecosophy for local communities that integrates intellectual, spiritual, and emotional aspects is an alternative in the conservation of Tapanuli orangutan species in the Batang Toru Landscape. Awareness, understanding and behavior of local communities can be influenced by in-depth information regarding the importance of endangered species protection. Efforts to improve the economic factors of local communities are fundamental to the success of the Tapanuli orangutan conservation strategy. The relationship between humans and humans and humans and the environment is an important bond that cannot be separated in the principles of ecosophy. This will directly contribute to the survival of humans and the Tapanuli orangutan. Consciously or unconsciously, the balance of the universe and its contents, including the Tapanuli Orangutan, can be disturbed due to all human activities. The concept of ecosophy as an alternative conservation strategy for the Tapanuli orangutan can be considered as a basis for decision-making for sustainable ecosystem protection.

ACKNOWLEDGEMENTS

The authors wish to thank the Tropical Biodiversity Conservation Study Program of Institut Pertanian Bogor, Bogor, Indonesia, the local communities in the Batang Toru Landscape, South Tapanuli District, North Sumatra, Indonesia, and all parties supporting this research.

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Table S1. "Being an orangutan for a moment"

A list of questions	Answer				
	SA	**A**	**N**	**D**	**SD**
A. Human relationships with humans					
1. Humans living around the forest are the main actors in the success of orangutan protection.					
2. Cooperation between government, companies, and communities can protect orangutan habitat.					
3. Orangutan protection is a cultural value of local communities.					
4. The presence of orangutans provides economic value for local communities.					
5. The conflict between humans and orangutans must be resolved immediately for the success of conservation.					
6. The level of understanding and knowledge about the importance of protecting orangutans must be increased among humans.					
B. Human relationships with nature					
7. Sustainable forest management is essential in maintaining orangutan habitat.					
8. Deforestation is the biggest threat to orangutan populations.					
9. Orangutan species play an important role in maintaining the balance of the forest ecosystem.					
10. Forests protect against natural disasters such as floods and storms.					
11. Forests provide invaluable living resources.					
12. Properly managed forests can help reduce conflicts between humans and orangutans.					

Note: SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree