The dynamics of traditional hunting and blue whale conservation in Lamakera, East Nusa Tenggara, Indonesia

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Abstract. The blue whale (*Balaenoptera musculus*) is recognized as an endangered species; however, the indigenous Lamakera community on Solor Island continues to practice traditional whale hunting, which is integral to their socio-cultural identity and subsistence livelihoods. This situation has resulted in ongoing tension between customary traditions and contemporary conservation frameworks that emphasize the sustainable reduction of anthropogenic pressures. This study aims to examine the perceptions of Lamakera fishermen in Motonwutun Village, Solor Island, East Nusa Tenggara (NTT), regarding the conservation and survival of blue whales in the Sawu Sea. A mixed methods research design was employed, integrating descriptive qualitative and quantitative approaches. Respondents were selected purposively, then developed through snowball sampling techniques. Quantitative data were analyzed statistically using Exploratory Factor Analysis (EFA) and Cronbach's alpha coefficient approaches. The results indicate that the most influential attitudinal factor shaping fishermen's perceptions of blue whale sustainability is the cognitive belief that blue whales should not be captured (factor loading = 0.98), followed by acceptance and awareness of the importance of conservation (0.51) and the role of government-led educational initiatives (0.33). In contrast, external factors influencing whale-hunting behavior include compliance with boat owners' demands (0.95), the absence of effective government monitoring programs (−0.61), the frequency of whale occurrences (0.26), and hunting activities conducted by other parties (0.24). Overall, fishermen's perceptions of blue whale survival are primarily reflected in their cognitive opposition to whale capture and their awareness of the importance of blue whale conservation.

Key Words: *Balaenoptera musculus*, compliance, governance, stewardship, subsistence.

Introduction. The blue whale (*Balaenoptera musculus*) is the largest living mammal and is found in oceans around the world and since 1966, this species has been protected from commercial whaling (Attard et al 2024; Jossey et al 2024; Savoca et al 2024). According to the Red List published by the IUCN, the conservation status of the blue whale is classified as endangered (Guzman et al 2024; Jossey et al 2024). This status is mainly due to massive commercial whaling around the 20th century before the International Whaling Commission imposed a global moratorium on blue whale hunting (Aguilar & Borrell 2022; Guzman et al 2024; Jossey et al 2024; Lagerquist et al 2024). Despite the moratorium, population recovery has been very slow. This is due to the biological characteristics of blue whales, such as their relatively long sexual maturity and low reproduction rate. In addition to these biological factors, blue whale populations also face a variety of contemporary pressures, including collisions with ships, marine pollution, underwater noise disturbance, climate change, and fluctuations in food availability (Flinders University 2024; Guzman et al 2024).

The threat to blue whales due to historical exploitation shows that a hunting moratorium alone is not enough to ensure the recovery of their population, even though there are already significant signs of progress in the recovery of the population (Flinders

University 2024). Therefore, research is needed that emphasizes the importance of science-based conservation strategies that include legal protection, habitat management, and sustainable mitigation of anthropogenic pressures (Flinders University 2024; Guzman et al 2024; Jossey et al 2024).

The tradition of hunting blue whales carried out by the indigenous Lamakera community in Motonwutun Village, Solor Island, East Nusa Tenggara, Indonesia, is a culture that has been passed down from generation to generation by their ancestors. This hunting tradition has been going on since the 17th century and is known as Baleo, usually carried out from April to October (Sudikan et al 2024; Taum et al 2024; Boli et al 2025; Laba & Resi 2025). Traditional whale hunting is carried out using wooden sailboats (peledang) and hand spears (tempuling) (Aur et al 2023; Laba & Resi 2025). Whale hunting takes place in the waters of the Sawu Sea, which has been a regular migration route for blue whales and a conservation area since 2014 (Aur et al 2023). According to the beliefs of the Lamakera indigenous community, this hunting tradition reflects the resilience and courage of the local community (Aur et al 2023; Sudikan et al 2024).

The geographical location of the Sawu Sea is very strategic because it lies between the western Pacific Ocean and the Indian Ocean and in the middle of the Lesser Sunda Shelf, making it a natural migration corridor for whales and other marine mammals, including blue whales (Double et al 2014; Hartoko et al 2023; Jihadi et al 2025). The currents in the Sawu Sea are relatively strong and dynamic because they are located at the meeting point of currents from the Indian Ocean and the Banda Sea, which helps whales move more efficiently during migration. In addition to being a regular migration route for blue whales, the waters of the Sawu Sea also serve as a resting place for their long journey and a place to find food (Raudina et al 2021; Jihadi et al 2025; Syahrur 2025).

The results of the study by Aur et al (2023) emphasize the exploration of socio-ecological values in the sustainable management of traditional whale hunting practices (lefa nuang) based on the customary rules of lefo, tena-laja, and ola nuâng-lefa nué by the Lamalera community. Sudikan et al (2024) examined the tradition of whale hunting in Lamalera, particularly the customary rules governing the types of whales that may or may not be caught, the hunting season, traditional equipment, and the barter system for catches. The research by Hartoko et al (2023) discusses the application of local wisdom in the management of whales and marine mammals integrated with traditional zoning patterns. Wahon et al (2025) reviewed the importance of the lefa nuang ritual process for the realization of safety, catch results, and as a form of respect for the sea and ancestors.

Various studies have reviewed whale hunting and the local wisdom of the Lamakera indigenous community, but studies focusing on their perceptions of blue whale conservation efforts in the waters of the Sawu Sea have not yet received adequate attention.

The contradiction between the traditional practice of blue whale hunting and conservation strategies that minimize anthropogenic pressure on the indigenous Lamakera community of Solor Island, East Nusa Tenggara, gave rise to the idea of conducting research on the community's perception of the sustainability of these fish in the wild so that they continue to benefit the Sawu Sea ecosystem. The objective of this study is to determine the perceptions of Lamakera fishermen in Motonwutun Village, Solor Island, East Nusa Tenggara, regarding the survival (conservation) of blue whales in the waters of the Sawu Sea.

Material and Method

Description of the study sites. The research was conducted over a period of two months, from May to June 2025, among the Lamakera indigenous community in Motonwutun Village, East Solor Subdistrict, East Flores Regency, East Nusa Tenggara Province, specifically at astronomical coordinates 8°26’27.6” South Latitude/SL and 123°9’48.8” East Longitude/EL. On a map, this village is located on Solor Island (Figure 1). The landscape of this village is located on the coast of the Sawu Sea. To reach the

open sea zone in the Sawu Sea, which is deeper (beyond the horizon) than the local coastline, it usually takes 15-30 minutes under normal weather and wave conditions, using a small fishing boat (motorboat).

Administratively, Motonwutun Village, also known as Lamakera Village, is one of 17 villages within the administrative area of East Solor Subdistrict. The village has a total area of 0.39 km^2, with an administrative area comprising 6 neighborhood associations (RT) and 3 community associations (RW). The total population of this village is 1,032 people, consisting of 512 men and 520 women, most of whom have completed elementary and junior high school. The main professions of the residents are mostly sea fishermen, while others are farmers and private workers. In general, this village experiences a fairly long dry season and a relatively short rainy season, following the typical monsoon climate pattern in the Nusa Tenggara region (East Flores Regency Central Statistics Agency 2023).

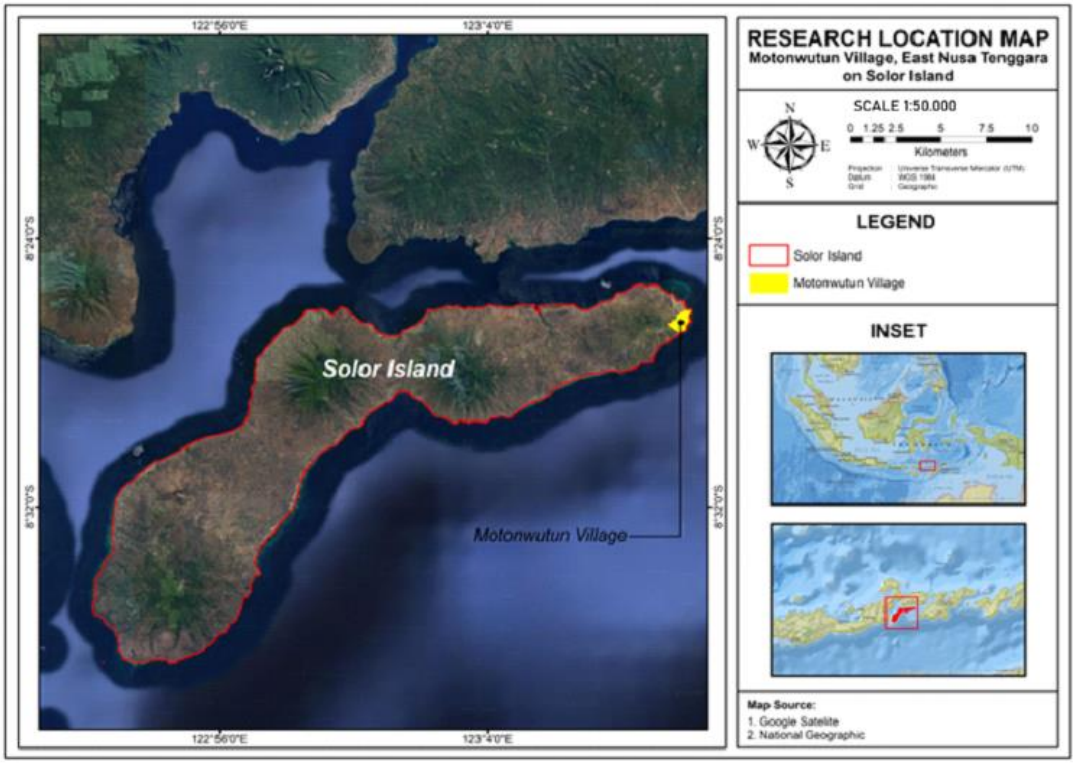

Figure 1. Research location: Motonwutun Village, East Nusa Tenggara, on Solor Island.

Research methods, respondent selection, and statistical analysis. This study uses a mixed methods approach that integrates descriptive qualitative and quantitative methods (Abikoye & Abikoye 2025; Budi et al 2025; Darwin 2025). Respondents were selected using purposive sampling and then developed using snowball sampling techniques (Tongco 2007; Neuman 2014). Quantitative data were analyzed using Exploratory Factor Analysis (EFA) with polychoric correlations to handle ordinal variables, estimated using LISREL 8.80 (Jöreskog, 2005). EFA was used to assess the initial factor structure of the indicators, ensuring that each variable adequately represented the latent construct. Furthermore, construct reliability and validity were tested using Cronbach's alpha coefficient to measure internal consistency, composite reliability to assess construct consistency, and convergent validity evaluated through standard factor loadings (Hair Jr. et al 2010).

After EFA, the factor model was confirmed using Structural Equation Modeling (SEM) to test the suitability of the measurement model and the structural model between constructs. Parameter estimation was performed using Maximum Likelihood (ML), with the application of Satorra-Bentler correction to address potential data non-normality. Model fit was evaluated using various fit indices: Chi-Square (χ^2) and p-value to measure overall model fit, RMSEA to assess parameter approximation error, RMR for mean

residual variance, GFI and AGFI for the proportion of covariances explained by the model, and NFI to compare the chi-square of the model with that of an independent model. The values of these indices indicate whether the estimated model is statistically consistent with the empirical data.

This approach ensures that factor analysis, reliability, validity, and SEM are integrated with each other, so that the research methodology becomes quantitative, robust, and in accordance with international standards in testing the relationship between latent constructs.

The research sample consisted of 33 sea fishermen from the Lamakera community, who were selected to participate as respondents in this study.

Interview material. This study is based on planned behavior theory. According to the theory, human behavior is affected by attitude, subjective norms, and perceived behavior. However, only attitudes and subjective are included in the model. The conceptual definition of attitude is a learned tendency to respond consistently to a specific orientation object (Tyrvainen & Karjaluoto 2022). Beliefs and values contribute to the formation of attitude systems, determining part of the content of these systems. Diverse attitudes also cause differences in perception among people (Ou 2017). The operational definition of fishermen's attitudes toward their orientation toward blue whale conservation is based on responses to the following six variables, which are measured using categorical and ordinal scales:

1. During which months do you often see blue whales passing by (April-June, others)?
2. Is blue whale hunting still common (often, rarely)?
3. What are the reasons blue whales may not be caught (heritage, protected animals, don't know)?
4. What does the government do to ensure fishermen fish safety and protect blue whales (monitoring and sanctions, advice and training, don't know)?
5. What types of fishing regulations do boat owners comply with (fishing permits, don't know)?
6. Are you willing to participate in blue whale conservation efforts (yes, no)?
7. A number of descriptive questions were also asked, such as age, education, monthly income, role on the fishing vessel, number of crew members, and tonnage of the fishing vessel.

Results

Respondents' demographic profile. The demographic and descriptive profiles of the respondents (fishermen from fishing boats) are summarized in Table 1. Most respondents were under 60 years of age (approximately 85%), had completed primary school (60.6%), junior high school (27.3%), senior high school (12.1%), and none had completed university. The average take-home pay was between 2 and 5 million rupiah per month. Regarding the profile of fishing vessels, most use fishing vessels with a size of 5 GT or less (60.6%), with a crew of approximately 6-10 people (72.7%), and among them, some can act as captains (30.3%) or crew members (48.5%).

Table 1

Respondents' demographic profile

No	*Descriptive variables*	*Frequency*	*%*
1	*Age (years)*		
	< 40	16	48.5
	40-60	12	36.4
	> 60	5	15.1
2	*Education*		
	Elementary school	20	60.6
	Junior high school	9	27.3
	Senior high school	4	12.1

3	*Monthly income (million Rupiah)*		
	< 2	15	45.5
	2-5	14	42.4
	> 5	4	12.1
4	*Role in fishing vessels*		
	Crew member	16	48.5
	Captain	10	30.3
	Owner	7	21.2
5	*Number of crew member on board*		
	< 5	4	12.1
	6-10	24	72.7
	> 10	5	15.2
6	*Fishing vessel tonnage (GT)*		
	< 5	20	60.6
	5-10	10	30.3
	> 10	3	9.1

Respondents' attitude profile. The respondents' attitudes toward blue whale conservation are summarized in Table 2. The interview results illustrate that more than half of the respondents (54.5%) frequently see blue whales in their fishing grounds between April and June each year. Respondents' perceptions of the number of blue whales that could potentially be caught showed that more than half of the respondents (57.6%) stated that there were still many, while the remaining 42.4% assumed that there were only a few blue whales left to catch. Respondents' perceptions of the ban on hunting blue whales in the fishing waters of the Lamakera community in Motonwutun village indicate that 21.2% believe blue whales should be preserved for future generations, 45.5% believe whales should be protected, and 33.33% of respondents do not know.

Concerning the respondents' perceptions of government programs on fisherman safety and blue whale conservation, 21.2% of respondents said they obtained information through monitoring and law enforcement, while 60.6% understood government programs through counseling and training, and 18.2% were unaware of the programs. Concerning the perceptions of boat owners (respondents) regarding compliance with fishing regulations, 42.4% stated that they understood the regulations regarding the types of fish permitted to be caught, while 57.6% were unaware of them. Concerning respondents' (boat crew and boat owners) perceptions of the statement on whether blue whale hunting should continue or not (conservation or sustainable use), 57.6% are willing to participate in blue whale conservation, while the remaining 42.4% are unwilling or refuse to participate.

Table 2

Respondents' attitude profile

No	*Code*	*Variable*	*Category*	*Label*	*Frequency*	*%*
1	MONTH	What month do blue whale pass by	2	April-June	18	54.5
			1	Other	15	45.5
2	CATCH	Is there still hunting for blue whale	2	Rarely	14	42.4
			1	Often	19	57.6
3	REASON	The reason blue whale cannot be caught	3	Inheritance	7	21.2
			2	Protect animals	15	45.5
			1	Don't know	11	33.3
4	GOVROL	The role of govermment in sade fishing for whale conservation	3	Monitoring and sanctions	7	21.2
			2	Advisory and training	20	60.6
			1	Don't know	6	18.2

5	BOATOW	Boat owner comply with fishing regulations	2	Fishing license	14	42.4
			1	Don't know	19	57.6
6	WILLING	Willing to participate in blue whale conservation effort	2	Yes	19	57.6
			1	No	14	42.4

Attitudes and subjective norms factors of the blue whales conservation. We were interested in obtaining a suitable correlation matrix of inter-items ordinal variables of the attitudes shown in Table 3. It was estimated by a polychoric correlation method (Jöreskog 2005). Testing a unidimensional model resulted that the six attitude variables do not measure a unidimensional factor. Furthermore, according to Table 3, WILLING, REASON, and GOVROL are intercorrelated to one factor, and the three remaining variables are due to one another factor.

Table 3

Correlation matrix of variables

	REASON	*WILLING*	*GOVROL*	*CATCH*	*BOATOW*	*MONTH*
REASON	1					
WILLING	0.501	1				
GOVROL	0.424	0.199	1			
CATCH	-0.389	-0.207	-0.342	1		
BOATOW	-0.151	-0.012	-0.642	0.207	1	
MONTH	-0.083	-0.071	-0.074	0.071	0.264	1

The variable GOVROL contains two referents, educational advice and monitoring-sanctions pressure. This variable might elicit perceptions of the normative beliefs of government regulations bearing on what behaviors should or should not be performed, in which case the emphasis is on the government official for monitoring and sanctions; or it might too endorse people's cognitive beliefs in which case the emphasis is on the government official for educational advice of the conservations. In the first case, GOVROL measures Subjective Norms, and in the second case, it measures Attitude. Therefore, GOVROL is a complex variable, as a variable measuring both Attitude and Norms or a mixture of them.

The parameter estimates (standardized factors loading) of the two-factor model are shown in Table 4. The maximum likelihood method would be used to fit the model as well as a smaller sample size. However, the standard errors and chi-squares would be corrected for non-normality into account by using an asymptotic covariance matrix (Jöreskog 2005). The reliability analysis of the two-factor measurement model is shown in the last two columns of Table 4.

Table 4

Parameter estimates of the two-factor model

No	*Factor and variable*	*Standard loading*	*t*	*Composite reliability*	*Cronbach's alpha*
	Attitude			0.795	0.87
1	REASON	0.98	1.68		
2	WILLING	0.51	1.69		
3	GOVROL	0.33	1.20		
	Subjective norm			0.483	0.72
1	GOVROL	-0.61	-1.75		
2	BOATOW	0.95	2.16		
3	CATCH	0.24	0.88		
4	MONTH	0.26	0.94		
	Over all variables			0.70	

The statistical results for Chi-Square, RMSEA, RMR, GFI, AGFI, and NFI in Structural Equation Modeling (SEM) are as follows. Degrees of freedom for model fit = 7, Satorra-Bentler Scaled Chi-Square = 2.05, probability value = 0.9568, Root Mean Square Error of Approximation (RMSEA) = 0.000, Root Mean Square Residual (RMR) = 0.082, Goodness of Fit Index (GFI) = 0.94, Adjusted Goodness of Fit Index (AGFI) = 0.82, and Normalized Goodness of Fit Index (NFI) = 0.95.

Discussion

Respondents' demographic profile. Based on the age of the respondents, it can be said that they are in their productive years, meaning that physical strength is no longer a barrier to activities in the ocean, including hunting blue whales. However, when considering their educational background, the respondents belong to a relatively low-educated group, as most of them only completed elementary school. Nevertheless, their experience as fishermen cannot be overlooked, as the average age of fishermen is 23-60 years old, meaning they have significant experience related to fisheries issues. This condition reflects that demographic factors are related to the social capacity of fishermen in achieving marine resource economic objectives (Karakara et al 2025; Mentari & Hasibuan 2025).

The average monthly income of fishermen is relatively low, only around 2-5 million rupiah, and some even earn less than 2 million rupiah per month. This low income is due to the unpredictable/uncertain fish catch, mainly due to weather factors. For example, their catch may only amount to 30 coolers at night or 20 coolers during the day, or sometimes they only go fishing two days a week due to bad weather. Typically, the fish catch is shipped and sold to Lembata Island, Adonara Island, or the Flores mainland. This income is used to meet family needs, and most of them have 4-9 family members in each household. In addition, this income is also used to support fishing operations the next day, maintain fishing equipment, or purchase new equipment. Therefore, sometimes their income is not enough to meet family needs, such as not enough to pay for their children's school fees. A typical fishing boat has 6-10 crew members. Each boat owner usually employs more than 10 people. There are 9 "peledang" boats owned by villagers that operate at night, and 40 boats that operate during the day. In addition, there are 30 small boats used for fishing with trawl nets. Specifically, it can be said that the wealth of coastal resources has not been able to improve the welfare of fishermen evenly due to dependence on catches and environmental factors, resulting in fishing communities living in difficult economic conditions (Minsas et al 2023; Pulungan & Utomo 2024; Achmad & Sidiq 2025).

In the fishing activities of Motonwutun Village, there are no adequate facilities, and there is no pier where fishing boats can dock after finishing their fishing trips. Fishermen must anchor their boats in the middle of the sea, relatively far from the shoreline, and then use small boats to reach the shore. Motonwutun Village also lacks an ice plant, so the caught fish cannot be stored using refrigeration; instead, they are simply dried under the scorching sun. This reflects that fishing activities in villages face infrastructure limitations, namely the absence of docks and refrigeration facilities, which greatly affect the decline in fish quality and economic value, food security, and the sustainability of fishery resources (Hanafiah et al 2024; Siddiqui et al 2024).

Respondents' attitude profile. Based on the interview results, around 66.6% of fishermen agreed and committed to preserving blue whales in their waters for the benefit of future generations. This is related to their assumption that the number of blue whales that can potentially be caught is still relatively high (57.6%) (Table 2). This condition is also reinforced by their attitude towards understanding the government's program in terms of fisherman safety and blue whale conservation, with 60.6% of respondents understanding the government's program through counseling and training. Additionally, compliance with fishing regulations among boat owners is largely understood (42.4%), while the remainder are unaware of such regulations. Similarly, the commitment between

boat crew and boat owners is largely aligned (57.6%), with most expressing willingness to participate in blue whale conservation to ensure its sustainability.

Based on the above description, it can be concluded that the Lamakera fishing community in Motonwutun Village has demonstrated its commitment to supporting the government's conservation program through the implementation of sustainable fishing practices, including in the context of blue whale hunting, while still considering the sustainability of its benefits for future generations. This commitment is in line with the views of Fabinyi (2024) and Chen & Huang (2025), who emphasize the importance of policy and governance frameworks that balance resource utilization and conservation efforts, as well as the role of support and active participation of fishing communities in the implementation of sustainable fisheries strategies. One activity that fishermen strictly avoid during fishing activities in marine waters is the use of explosives that can kill fish larvae. To ensure that this commitment is effectively implemented on the ground, government involvement is necessary, either through monitoring programs or financial assistance to advance the fisheries system in Motonwutun Village. This activity is relevant to the statements made by Stacey et al (2021) and Zhang (2023) that small-scale fishing communities face challenges posed by destructive fishing practices, thereby actively avoiding destructive methods such as the use of explosives, while emphasizing the importance of a collaborative approach with the government in supporting sustainable fishing practices.

Attitudes and subjective norms factors of the blue whales conservation. It has been suggested in behavioral science by Ajzen (1991), Ajzen & Fishbein (2005), Ajzen (2020), and Jingyi & Syed Ali (2025) that there are three core factors (namely, attitude, subjective norms, and perceived behavioral control) that influence the individual's behavioral intentions. In the context of this study, two of the three factors can be applied in a relevant manner. Specifically, the WILLING and REASON indicators represent behavioral attitudes or beliefs, while the other variables function as indicators of subjective norms or normative beliefs. Based on this, we constructed a factor model to analyze the inter-item correlations of these variables.

The goodness of fit of this model has degree of freedom = 7, Satorra-Bentler Scaled Chi-Square = 2.05, probability-value = 0.9568, Root Mean Square Error of Approximation (RMSEA) = 0.000, Root Mean Square Residual (RMR) = 0.082, Goodness of Fit Index (GFI) = 0.94, Adjusted Goodness of Fit Index (AGFI) = 0.82, and Normed Fit Index (NFI) = 0.95. Furthermore, testing of the two-factor model involving one of the six variables as a mixed measurement of both factors showed that the model remained consistent with the data and had a good fit.

In line with the model fit results showing a good fit, factor loadings above 0.50 indicate that most items have adequate convergent validity and empirically represent the latent constructs being measured, making them suitable for use in further analysis. However, some path coefficients have not reached or approached this threshold value, particularly in the relationship between the Attitude construct and GOVROL, and between the Norm construct and MONTH and CATCH. The relatively low coefficient values on these paths indicate that the explanatory power of the indicators for the latent constructs is not yet optimal, so their interpretation needs to be carried out more carefully in the discussion of the structural model. The reliability analysis of the two-factor measurement model is shown in the last two columns of Table 4. The Cronbach's alpha value for the two factors is greater than the threshold limit of 0.70, indicating high internal consistency among the factors. The composite reliability shows high reliability for the attitude factor (0.795) and low reliability for the subjective norms factor (0.483).

The standard loading coefficients from Attitude to GOVROL, Subjective Norms to CATCH and MONTH are not significant (t-value 1.20, 0.88, and 0.94, respectively). However, the fact of these coefficients (to GOVROL or CATCH) that they are non-significant does not mean that they do not exist. Rather, the sample size is not sufficiently large to make them significant (Jöreskog 2005; Skallerud et al 2021; Begum et al 2022; Wang et al 2025).

According to parameter estimates of the measurement model in Table 4, the most significant attitude of fishermen toward blue whales is indicated by the most dominant cognitive attitude that blue whales are not to be caught (0.98), willingness and awareness on preservation of blue whales (0.51) and government's role on education and socialization as well as improvement of catch result (0.33). Meanwhile, external responses that motivate the behavior of whale hunting are indicated by the compliance of ship owner (0.95), government control (-0.61), frequency of whale passing (0.26) and incidence of blue whale hunting from other actors (0.24).

The results of modeling based on the Theory of Planned Behavior show that cognitive attitudes and compliance with boat owners are two major factors that influence fishermen's attitudes toward blue whale hunting. In the model structure, the attitude construct is represented by the cognitive attitude component, while subjective norms are represented by compliance with boat owners and the role of government control. These findings indicate that although most fishermen understand the importance of conservation, their behavior in practice is still greatly influenced by the authority and decisions of boat owners.

Therefore, educational efforts should not only be directed at fishermen, but also at boat owners, particularly regarding the ecological role of blue whales in maintaining the balance of the marine ecosystem. In line with this, Vallejos (2023) and Navarro et al (2026) emphasize that subjective attitudes and norms significantly contribute to the level of public compliance with marine conservation regulations.

Cognitive understanding is required if the conservation of blue whales in Lamakera is to succeed. This result is in line with studies by Owusu et al (2023), Kim et al (2023), and Ryan et al (2025) that the higher the respondents' understanding of conservation policy, the more likely that they comply with the policy. In this study, most fishermen (80%) understand the conservation policy, although only slightly more than half of the population (57%) agreed to participate in conservation.

The importance of cognitive attitude is supported by previous studies. A correct understanding of the ecological aspects of blue whales may encourage attitudes toward blue whale conservation. Naylor & Parsons (2018) conducted a survey among 858 youth in the US. They found that 25% of respondents regarded blue whales as the most important whale species for conservation. Blue whales ranked second after humpback whales (*Megaptera novaeangliae*). Both whale species have media coverage as blue whales are the largest animal in the world, while humpback whales are the most popular object of whale watching. However, the survey showed that only 5% of respondents regarded the North Pacific right whale (*Eubalaena japonica*) as the most important whale species for conservation, which is critically endangered. There are only 400 individuals of the North Pacific right whale, which is smaller than the population of blue whales and the growing population of humpback whales. Despite limited education programs about blue whale conservation, the cognitive attitude of Lamakera community is promising for future conservation programs.

In addition to the subjective attitudes and norms described above, there is another aspect that has the potential to strengthen the cognitive attitudes of the people of Lamakera, namely ecosystem services (ES). This concept provides a framework for understanding the ecological and socio-economic benefits generated by the presence of a species in an ecosystem. In the context of whales, Malinauskaite et al (2022) explain that ecosystem services related to whales include contributions to nutrient cycles, marine productivity, and ecosystem stability. Understanding this concept can encourage people to better appreciate the ecological role of blue whales and increase their participation in conservation efforts.

Another equally important aspect is attitudes toward willingness to participate in blue whale conservation programs among the Lamakera community. This willingness contrasts with Kim's (2020) study of the Makah tribe in Washington State, who around the 1990s wanted to continue their tradition of hunting gray whale (*Eschrichtius robustus*), thus triggering a global storm that turned this issue into an arena of intense political, legal, moral, spiritual, and physical struggle that continues to this day. Meanwhile, various neighboring Native American communities with similar traditions

support whale conservation. They have transformed their whaling traditions into whale watching, which is more relevant to the current conservation status of gray whales. However, the Makah tribe wants to continue their whaling traditions even though they use modern whaling equipment and even intend to participate in commercial whaling. The Makah tribe's intentions do not reflect their willingness to participate in whale conservation. The result of this study in Lamakera shows that this community is ready to adapt its tradition to whale conservation.

In addition to attitudes toward willingness to participate in conservation programs, the role of the government is also an important aspect that has the potential to strengthen the cognitive attitudes of the people of Lamakera. García-Gallego et al (2021) emphasize that educational interventions carried out by the government to raise awareness about whale conservation are highly significant, especially in communities that historically have a tradition of whale hunting. In the context of Lamakera society, which still maintains this tradition, providing comprehensive education on the ecological role of blue whales, including their contribution to ecosystem services, is highly relevant. This effort is expected to foster a deeper understanding and strengthen conservation orientation in the community's social practices.

The value of government control is negative, which means that the high score of motivation is not caused by a high level of supervision. Rather, it is caused by the low level of supervision. This supervision is mostly advisory and training activities.

Another important aspect that has strong potential in realizing cognitive strength among the Lamakera community is the support and role of the government in increasing the community's income sources, which are still very limited. As stated by Ikeya (2013), hunting gray whales (*Eschrichtius robustus*) and bowhead whales (*Balaena mysticetus*) among the Chukchi villagers in Siberia, Russia, supports their economic activities. Besides a source of meat for human consumption, whale meat is used to feed their dogs. Those dogs are part of their seal hunting. Any conservation effort that may change their lifestyle and main economic income requires government support, although government support is not covered in the study of Ikeya. This study of whaling in Siberia, Russia, is relevant to the situation in Lamakera because both local communities have relatively limited sources of income.

Another aspect that is also considered quite important is the ship owner's compliance with whale conservation which can influence the community regarding blue whale hunting. According to Kim (2020), community leaders intended to distribute the whale carcass to the community as proof of their position in the community. In this context, the compliance of ship owners is an effect of their decision as one who has a certain influence in the community.

One of the aspects that also contributes to the development of strong cognitive attitudes within the Lamakera community is the role of the government in exercising control through legal instruments. This role is crucial because regulations and law enforcement can influence how communities understand and evaluate practices related to the utilization of marine resources. As explained by Kim (2020), the federal government of the United States held discussions with the Makah tribe regarding efforts to maintain the ban on whale hunting as part of conservation policy. However, to date, there has been no detailed study specifically addressing the implementation of legal measures aimed at prohibiting the hunting of the blue whale in Indonesia.

Another important aspect is that the abundance of blue whale migrating through the waters surrounding Solor Island has not yet been extensively studied. Previous blue whales captured are a baby blue whale in 2021 and an adult in 2022. No blue whale was captured in 2023 and 2024. This is a good sign for blue whale conservation that people are no longer hunting whales. On the other hand, this can be another sign that blue whales are less abundant in the area.

The final aspect supporting the development of strong cognitive attitudes within the Lamakera community is that the search for blue whale can be influenced by whale-searching practices carried out by other communities. The other community who are hunting whales is in the neighboring Lamalera of Lembata island which captured only sperm whales (*Physeter macrocephalus*). Although whale hunting in Lembata Island is in

a different context from the one in Lamakera, it can still motivate people in Lamakera. An example of a different situation is reported by Kim (2020) that the aboriginal whale hunter community in Washington abandoned their tradition. Rather, they transform it into whale-watching businesses for tourists. The same example also occurred with the indigenous Māori tribe in Aotearoa, New Zealand (Elmahdy et al 2025).

The limitations of this study are the limited number of respondents, because a smaller number of respondents affects the statistical results. In addition, there were also language barriers. Some respondents were not fluent in Indonesian. Therefore, this issue can be addressed through more comprehensive sampling design planning, strengthening statistical methodologies, integrating mixed approaches, and involving local actors in the research process. These steps are expected to improve the validity, reliability, and depth of analysis in future studies on whale hunting in Lamakera.

Conclusions. Fishermen's perceptions of blue whale sustainability in the waters of the Sawu Sea are mainly reflected in cognitive aspects, characterized by an understanding that blue whales are a species that should not be exploited, as well as an awareness and willingness to participate in marine and blue whale conservation efforts. However, whale hunting behavior is also influenced by external factors, particularly fishermen's compliance with ship owners' instructions and the effectiveness of government monitoring.

This study makes a theoretical contribution by enriching scientific knowledge through the presentation of empirical evidence on the interaction between cognitive dimensions, social hierarchy structures, and governance systems in influencing fishermen's behavior towards the sustainability of blue whales in the Sawu Sea. These findings provide an important foundation for future research, particularly in designing more comprehensive and integrative behavioral models that incorporate aspects of power relations, institutional effectiveness, and socio-cultural dynamics. Thus, this research contributes to expanding the interdisciplinary approach in marine conservation studies, especially in contexts where traditional livelihoods intersect with efforts to protect endangered species.

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