

UNDERSTANDING LOCAL COMMUNITIES PERCEPTIONS TOWARDS THE CONSERVATION OF THE ENDEMIC MOLUCCAN MEGAPODE (*Eulipoa wallacei*) ON HARUKU ISLAND, INDONESIA

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ABSTRACT

Assessment of conservation community perceptions has been an important aspect of wild species research. Harvesting the eggs of Moluccan megapodes has implications for the preservation of bird populations. This study aims to assess the perceptions of local communities living near bird nesting sites regarding the conservation of the endemic Moluccan megapodes (*Eulipoa wallacei*). The survey was conducted on 200 respondents from the productive age group (aged 15 to 65) using a proportionate stratified random sampling technique with a closed-ended questionnaire. The Likert scale was used to analyze perception data. Research findings indicated that the majority of the community supported the practice of harvesting eggs, even though they were aware that the birds were protected species. Community perceptions of conservation only focused on adult birds and their habitat rather than conserving bird eggs. Therefore, the perceptions of egg conservation must be considered when developing an effective conservation program. It was recommended to design a conservation program to increase local people's awareness of the importance of Moluccan megapode conservation through sustainable egg harvesting.

Key words: Conservation knowledge, Eggs harvesting, Moluccan scrubfowl

INTRODUCTION

Assessing local communities' perceptions of conservation has become critical for determining the effectiveness of species conservation programs. Local community perceptions can be used as a guide for policymakers and practitioners when determining appropriate and effective management and conservation options for wild biological resources (Bennett, 2016; Blair and Meredith, 2018; Mubalama et al., 2020). The wild species conservation program's success depends on the community's attitude toward the existence of the wild species population, particularly the utilized ones (Coad et al., 2019; Epananda et al., 2019; Royuela et al., 2019, Otero et al., 2020; Commercon et al., 2021; Dawson et al., 2021; Manfredo et al., 2021). Unsustainable use of wild species population was a major contributor to regional and global biodiversity loss (Oyegbami et al., 2018; Ghosh-Harihar et al., 2019; Bolam et al., 2020; Ceballos et al., 2020). As a wild species, various species of megapodes have been used as a source of protein by indigenous peoples in the Pacific region (White and Bruce, 1986; Del Hoyo et al., 1994; Dekker et al., 1995; Steadman, 1999; Anderson et al., 2010). Moluccan megapodes (*Eulipoa wallacei*) in Maluku Islands, Indonesia, were also intensively exploited by local communities. Luis Frois (Portugal) wrote the first official record of the use of Moluccan megapode eggs in 1556 on Morotai Island in North Maluku (Heij, 2001). Egg harvesting also takes place at a bird's nesting site on Haruku Island in the Maluku Islands and has become a

hereditary tradition. Ancestors were believed to have given bird eggs to the community for use (Heij et al., 1997; Heij, 2001; Heij and Rompas 2011). As a result, several populations of Moluccan megapodes have become locally extinct on several islands in the Maluku Islands due to egg collection (Heij et al., 1997; Heij and Rompas 2011). Therefore, the International Union for Conservation of Nature (IUCN) has designated the Moluccan megapode a vulnerable species since 1994 (BirdLife Internasional, 2016).

Recent studies indicate the current state of the Moluccan megapode in their two main habitats in the Maluku Islands. The population size of the Moluccan megapode can be indicated by the number of eggs harvested from bird nesting sites. Studies on Haruku Island in 1990s found that an average of 36.000 eggs were harvested (Heij et al., 1997; Heij and Rompas 2011), but in 2017 only found 21.707 eggs were obtained (Simanjuntak, 2020). Between these time intervals there was a decrease in the number of eggs harvested by 30.70%. The reduction in egg yields in 27 years intervals indirectly indicates a reduction in the size of the Moluccan megapode population on Haruku Island. In 2011, study in Galela region on Halmahera Island estimated the population size of the Moluccan megapode to be $5.505,09 \pm 4,26$ individuals, but in 2012 it was reduced to $5.000,60 \pm 5,90$ individuals. There was a 9.2% reduction in their population size between 2011 and 2012 in the Galela area of Halmahera Island (Sjafani et al., 2015). Although the use of its eggs continues to this day, the Moluccan megapode are not classified in the

CITES appendix as a trade species (UNEP 2020), because their eggs are only used by local communities around their nesting sites, both on Halmahera Island and on Haruku Island.

Conservation of exploited wild species was one of the strategies to support sustainable use and at the same time maintain population existence (Niesenbaum, 2019). As a vulnerable endemic species and its social value to the community, their conservation strategies must take into account the needs of local communities (Dekker et al., 2000). Implementing the right conservation strategy ultimately requires alignment between conservation efforts and user attitudes (Bennett, 2016; Wali, 2017). Studies on social aspects related to the conservation of the Moluccan megapodes have only been limited to the ongoing egg harvesting tradition (Heij et al., 1997; Heij and Rompas 2011; Tagueha and Liur, 2020; Simanjuntak et al., 2020). Meanwhile, local community perceptions regarding the conservation of bird populations have not been reported. Therefore, this study is designed to assess local people's attitude and perceptions of the conservation of the endemic Moluccan megapodes on Haruku Island, especially because of the large influence of traditional beliefs on the practice of using their eggs. In the future, knowledge of community conservation perceptions will become a reference in designing appropriate and effective Moluccan megapode conservation strategies.

RESEARCH METHOD

This study focused on local communities near the Moluccan megapode nesting site at Cape Maleo on Haruku Island, Indonesia. Cape Maleo is located on the

west coast in the northern part of Haruku Island and was known as one of the main nesting sites for this species in the Maluku Islands. The birds nesting site in Cape Maleo is close to the residential area of Kailolo Village residents (Figure 1) and is administratively divided into four hamlets. This location was chosen because the routine egg harvesting activity was carried out mainly due to the encouragement of traditional beliefs. Therefore, the community's perception of Kailolo Village can provide an overview of the chances of success of a bird conservation strategy.

A closed questionnaire survey was conducted on the productive age group (aged 15 to 65 years) in four hamlets in Kailolo Village. The productive age group was chosen because they were considered to have knowledge of the Moluccan megapode egg harvesting activities and their use. Respondents were selected using a proportionate stratified random sampling technique (Forthofer et al., 2016). The minimum number of respondents was determined using the Cochran equation (Cochran, 1977; Adam, 2020). Respondents were asked to indicate the extent of their opinion on the conservation aspect of the Moluccan megapodes. Perceptions surveyed included bird conservation status, egg harvesting practices, the effect of egg harvesting on bird populations, conservation of nesting habitats and daily habitats, birds protection, imposing sanctions on perpetrators of destruction of nesting habitats, and the influence of community activities on nesting behavior. The questions were framed using a Likert scale with answer choices of strongly agree, agree, neutral, disagree, and strongly disagree.

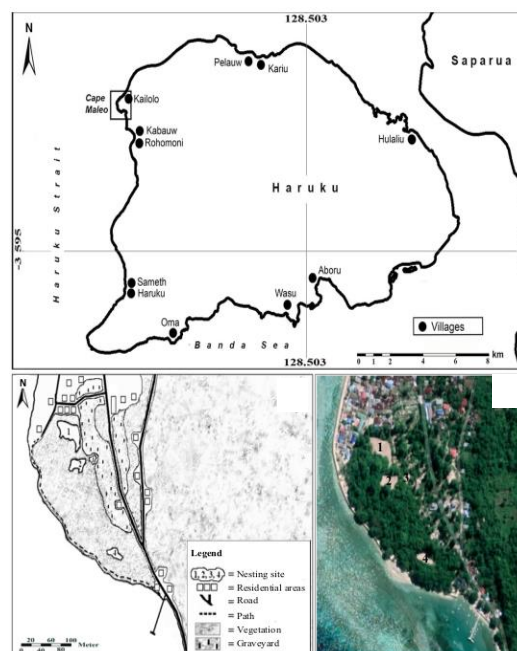


Figure 1. Research location on Haruku Island (a) Haruku Island, (b and c) sketch and google map satellite view of a bird's nesting site in Cape Maleo with residential areas nearby

Each respondent’s answer was analyzed using a Likert scale assessment to determine the score of the perception parameter. The Likert scale was determined by summing the rating of respondents’ answers (Norman, 2010). The highest score of 5 (five) was given for ‘strongly agree’, which is then sorted down to the lowest value of 1 (one) for ‘strongly disagree’. Based on the perception score, the level of conservation perception was grouped into three categories, which were low (< 50.57%), medium (50.57 – 75.27%), and high (> 75.27%). This study used a one-way analysis of variance (Forthofer et al., 2016) to examine differences in perceptions of nesting site management and Moluccan megapode conservation among the four hamlets in Kailolo Village.

RESULT AND DISCUSSION

1. Socio-demographics

A total of 200 respondents participated in this study, with a questionnaire return rate of 100%. The age of the respondents mostly ranged from 31 to 35 years (19%). The occupations of the respondents are dominated by farmers (27%) and housewives (24%) (Figure 2). The respondent’s profile provides an overview of the

representation of all components of society in the survey conducted. The involvement of all components was expected to represent the community’s perception of egg harvesting and conservation of the Moluccan megapodes.

2. Perception of Moluccan megapode nesting site management

Harvesting Moluccan megapode eggs at their nesting sites have developed into a hereditary tradition in the Kailolo Village community. Until now, the village government has regulated the activity of bird egg harvesting through an open auction mechanism in which the entire village community participates. The study’s findings indicate that most people support the tradition of bird egg harvesting. A favorable perception of the practice and management of bird nesting sites was an indicator of community support. The average value for the three perceptual aspects of birds nesting site management was 90.47% (Table 1). Most people in the four hamlets in Kailolo Village generally have the same perception of the birds nesting site management regulation in Cape Maleo ($F_{calculate} = 1,292 < F_{table} = 6,591$; $P\text{-value} = 0,392$).

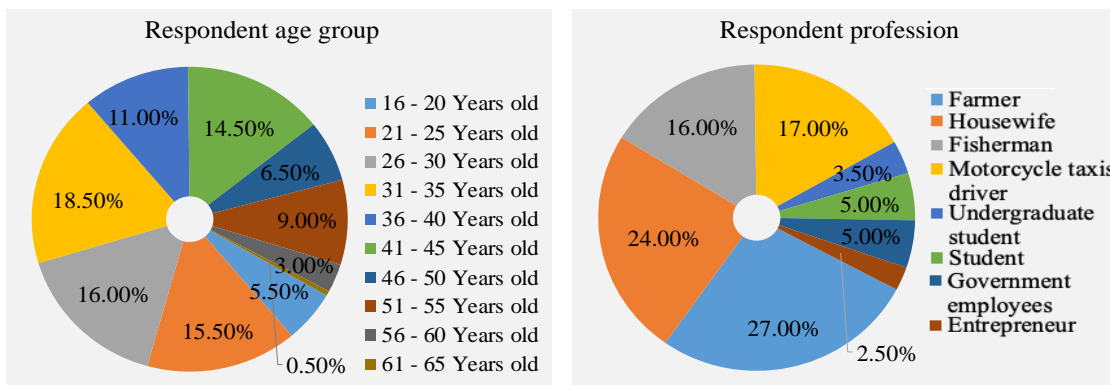


Figure 2. Profile of respondents in the productive age group (15 – 65 years) in Kailolo Village based on (a) age and (b) occupation

Table 1. Perceptions of the Kailolo Village community regarding Moluccan megapode (*Eulipoa wallacei*) egg harvesting management through the auction process for bird egg harvesting rights.

Moluccan megapoda nesting site management in Cape Maleo, Haruku Island	Community perception (%)				Perception score
	Hamlet 1	Hamlet 2	Hamlet 3	Hamlet 4	
Traditional policies to manage egg harvest through auction mechanism	91.20	89.20	87.20	87.20	High
Traditional management policies of bird nesting sites	84.80	88.40	100.00	92.80	High
Community participation in traditional policies for managing bird nesting sites	93.60	95.20	96.00	80.00	High
Average score	89.87	90.93	94.40	86.67	High

This study was the first attempt to assess local communities' knowledge of Moluccan megapode conservation. According to their level of perception, the majority of people living near the nesting site support the current egg harvesting management regulation. This community perception demonstrates their unwavering support for using and harvesting Moluccan megapode eggs. In practice, the village government coordinates arrangements for bird egg harvesting. According to an agreement reached between the village government and the community, the right to harvest eggs was obtained through an open auction process in which the entire village community participates (Heij *et al.*, 1997; Heij & Rompas, 2011; Saiya & Heij, 2017). The auction winner has the right to harvest eggs annually and was obligated to protect the birds' nesting habitat. This management regulation did not restrict the number of eggs harvested to promote conservation. As a result, between the 1980s and 2011, the number of eggs harvested decreased by 2% (Heij *et al.*, 1997; Heij & Rompas, 2011). Thus, it was necessary to develop appropriate management actions based on public perception data to ensure the Moluccan megapode population's sustainability and sustainable egg harvesting. Thus, wild species conservation strategies must balance the interests of species populations' use and survival (Kansky *et al.*, 2016; Blair & Meredith, 2018; Coad *et al.*, 2019; Mubalama *et al.*, 2020).

3. Moluccan megapode conservation perception

The conservation perceptions of Moluccan megapodes were classified into three categories, egg conservation, bird habitat conservation, and adult birds. In general, community perceptions of Moluccan megapode conservation were favorable, with an average perception value of 68.28% (Table 2). The perceived value of medium conservation varies according to how

eggs, bird habitats, and adult birds were perceived. Because most people oppose efforts to restrict the number and timing of egg harvesting and to prohibit egg harvesting outright, perceptions were relatively low. On the other hand, the community supports bird habitat protection, which includes both nesting and non-nesting areas. Similarly, adult birds arrests were prohibited. This perceptual difference contributes to the elevated level of concern for habitat conservation and adult birds. The negative perception of bird egg conservation was largely due to the traditional belief that egg harvesting would not reduce the population of adult birds and that birds will always come to nest. Interestingly, while the majority of the community was aware of birds' protected status, their awareness contradicts their low regard for bird egg conservation. Overall, the people in the four hamlets in Kailolo Village have the same perception for every aspect of the surveyed Moluccan megapodes conservation ($F_{calculate} = 0,092 < F_{table} = 2,798; P_{value} = 0,964$).

The interesting finding from this study was that while most villagers were aware of the Moluccan megapodes' conservation status as a protected species, their perception of conservation was more focused on bird habitat and adult birds. The community did not support all activities that cause disturbance to or destruction of nesting and daily habitats. Additionally, the community opposes the capture of adult birds. On the other hand, the perception that bird eggs should be conserved through restrictions or prohibitions on egg harvesting is undesirable. This condition demonstrates that the village community places a lower premium on bird egg conservation than on habitat preservation or adult bird conservation.

Table 2. Perceptions of the people of Kailolo Village on the conservation of the Moluccan megapodes (*Eulipoa wallacei*).

Moluccan megapode conservation aspects	Community perception (%)				Perception score
	Hamlet 1	Hamlet 2	Hamlet 3	Hamlet 4	
▪ Knowledge of Moluccan megapode conservation status	100.00	100.00	100.00	100.00	High
▪ Restriction on the number of eggs harvesting	30.80	32.40	35.60	34.80	Low
▪ Time limitation for egg harvesting activities	26.80	31.60	29.60	20.00	Low
▪ Egg retrieval reduces adult birds	0.00	0.00	0.00	0.00	Low
▪ Nesting activities were affected by transportation activities	20.00	20.00	20.00	20.00	Low
▪ Banning egg harvesting	53.20	51.60	42.40	49.60	Low – medium
▪ Destruction and disturbance of nesting habitats will reduce the number of eggs and adult birds	64.00	66.80	97.20	81.60	Medium – High
▪ Protecting bird nesting habitats	92.40	96.40	98.40	100.00	High
▪ Protecting the daily habitat of birds	100.00	100.00	100.00	100.00	High
▪ Imposing sanctions on perpetrators of destruction of nesting habitats	100.00	100.00	100.00	100.00	High
▪ Prohibit the capture of adult birds	100.00	100.00	100.00	84.80	High
▪ Destruction of nesting habitats will reduce the number of eggs and birds	88.40	90.80	94.80	93.20	High
▪ prohibit the expansion of residential areas towards nesting sites	94.00	96.80	98.40	94.40	High
Average score	66.89	68.18	70.49	68.28	Medium

Differences in views between habitat conservation, adult bird conservation, and egg conservation have made Moluccan megapode conservation efforts ineffective. As a super-precocial species lacking parental care from incubation to hatching, egg conservation was critical for nest success and population reproduction (Mayfield, 1961; Hepp et al., 2019; Weiser et al., 2020). The communities' differing conservation priorities for Moluccan megapodes were strongly influenced by their beliefs of the origin of the Moluccan megapodes' eggs in Cape Maleo. According to hereditary beliefs, ancestors provide bird eggs for use, and adult birds should not be captured to continue producing eggs (Heij et al., 1997; Heij and Rompas, 2011). Economic considerations from egg sales and the social standing of the winner of the egg harvesting rights auction in the eyes of the village community also contribute to the disparity in conservation priorities for Moluccan megapodes (Heij et al., 1997; Heij and Rompas, 2011; Simanjuntak et al., 2020). Thus, despite prohibitions on destroying nesting habitats and capturing adult birds, egg harvesting activities typically continue.

This study showed that communities around bird nesting sites did not yet understand the relationship between the Moluccan megapode conservation and the concept of sustainable use. When people have a clear understanding of the ecology of the species being used,

CONCLUSION

In conclusion, the community's tradition of harvesting Moluccan megapode eggs near the birds nesting site at Cape Maleo on Haruku Island continues to serve as the foundation for the ongoing activity of bird egg harvesting to this day. Although the community was aware of the Moluccan megapodes' conservation status, their perspective on conservation was limited to habitat and adult birds. On the other hand, egg conservation has not been elevated to a community priority. Disparities in community perceptions of conservation will determine the future success of Moluccan megapode conservation. As a result of the involvement of traditional beliefs in the utilization of Moluccan megapode eggs, the initial stage of conservation is education the public on the importance of egg conservation efforts through determining quotas for the number and timing of bird egg collection. Therefore, it was necessary to develop a program to raise public awareness of Moluccan megapode egg conservation in collaboration with relevant government agencies, conservation organizations, and local communities.

CONCLUSION

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they will apply the practices of using these resources to support their future availability (Bakhiet, 2021; Clemenson, 2021). Using biological resources in a sustainable manner means that the rate of their use must be maintained at a level that is renewable by the population. Therefore, knowledge about the ecology of wild species that are used is very important to support the sustainability of their natural populations. At present and in the future, conservation efforts for the Moluccan megapode should be prioritized on egg conservation. The initial stage of conservation efforts must begin by increasing public awareness about the importance of egg conservation and opportunities for sustainable egg use because it is related to the traditional beliefs of egg-using communities on Haruku Island. The relationship between the existence of the population and harvesting activities, beliefs, and sociological conditions of the community must be an aspect to be considered when planning efforts to conserve populations of wild species that are utilized (Royuela et al., 2019; Otero et al., 2020; Commercon et al., 2021; Manfredo et al., 2021). The next stage is to limit the number of eggs that can be taken and timing of the collection. This approach ensures the continuity of recruitment of new members into the Moluccan megapode population to maintain the continuity of its natural population, and ultimately ensures the availability of eggs for use.

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