

Importance of indigenous communities' knowledge and perception in achieving biodiversity conservation: A case study from Manobo tribe of Southern Mindanao, Philippines

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Abstract. *Salvaña FRP, Arnibal SLT. 2019. Importance of indigenous communities' knowledge and perception in achieving biodiversity conservation: A case study from Manobo tribe of Southern Mindanao, Philippines. Asian J Ethnobiol 2: 84-91.* Indigenous communities play a relevant role in setting biodiversity management and conservation. This study aims to determine the knowledge and perceived importance of the Manobo tribe toward biodiversity. A total of 100 Manobos were included in the study to assess indigenous communities' ability and perception, particularly the Manobo tribe towards biodiversity. A semi-structured survey questionnaire was used to determine responses on knowledge and importance perception/ Our study found a consistent significant difference in the mean responses on knowledge and perception across gender and education attainment. Interestingly, traditional knowledge is significantly associated with the biodiversity importance perception of Manobos. Our findings suggest involving indigenous communities is equally important in achieving balanced biodiversity conservation and protection. Thus, strengthening collaborations among local government sectors and community leaders must develop conservation priorities and protection.

Keywords: Biodiversity, conservation, knowledge, Manobo, perception

INTRODUCTION

Biodiversity supports the health of ecosystems and the services they provide to society. However, biodiversity is in rapid decline globally, despite commitments by governments to reduce the rate of loss (Butchart et al., 2010). Monitoring is an essential part of biodiversity conservation, allowing governments and civil society to identify problems, develop solutions, and assess the effectiveness of actions and progress toward meeting the Convention on Biological Diversity (Secades et al. 2014). The Philippines' biodiversity heritage is globally essential due to high species endemism and concentration of threatened species (Myers et al. 2000; Garrity 2001; Posa et al. 2008). However, the establishment of protected areas alongside the implementation of policies towards limiting biodiversity threats, yet human activities (e.g., deforestation, agricultural expansions) remain to persist in many country regions. The protection of species and habitats provides the essential backdrop to existing biodiversity conservation management strategies and policies globally (Bille et al., 2012). Traditionally, conserving nature has been equated with protecting charismatic and rare species or protecting their habitats and spectacular landscapes (Shafer 1990; Home et al. 2009). However, one of the current challenges in decision-making is the limited and inadequate human and financial resources

to protect particular species or invest in the management and protection of habitats that are of substantial biological value (Jaisankar et al., 2018).

Considering that ancestral lands and territories contain 80% of the planet's biodiversity, indigenous people can play a crucial role in conserving and sustainable management of natural resources (IFAD 2014; Garnett et al. 2018). Indigenous people play an essential role in regenerating their natural resources and ancestral environments and systems (Russell et al., 2015). Indigenous people often inhabit territories rich in minerals and natural resources; thus, they have in-depth, varied, and locally rooted knowledge systems of the natural world. Local people are increasingly being recognized as partners in more comprehensive efforts towards sustainable management; an approach generally termed as 'community-based conservation' (Mehta and Kellert 1998). The approach is based on the principle that conservation strategies should emphasize the role of local communities in decision-making towards conservation (Adams and Hulme 1998), and indigenous communities can be involved as active partners in protected area management (Murphree 1995; Songorwa et al. 2000). Community-based conservation programs could effectively achieve its goals by (i) allowing people living in and around protected areas to participate in land-use policy and management decisions, (ii) giving people proprietorship or ownership over wildlife

resources, and (iii) providing local people with economic benefits from wildlife conservation (Hackel 1998).

Moreover, there is evidence that indigenous people's role as nature conservationists can be easily undermined by counter-examples such as species extinction due to human hunting in the prehistoric past and giving grants on extensive timber cutting or mining concessions on their lands. Indigenous people have a variety of reactions to these claims (Cunningham 2001). Some studies adopt a more pragmatic stance that stresses the practicality and urgency of coordinating local communities and conservationists (Orlove and Brush 1996).

In the Philippines, Manobos are the largest ethnic group based on the relationships and ethnolinguistic branching and distribution. The group occupies a wide range of distribution but is localized in some regions and has assumed the character of distinctiveness as a separate ethnic grouping such as the Bagobo or the Higaonon and the Atta (Elkins 1964). These tribes are typically forest-dwellers and reside near protected areas. They usually live on timber and non-timber forest products. Although their cultural background is well explored, the knowledge and perception of the Manobo tribe on biodiversity conservation are not well understood. Thus, this study aims to determine the knowledge and perception of this indigenous group on biodiversity conservation, which is necessary to evaluate the various perspectives of indigenous people on this matter. Traditional knowledge and perception towards diversity can be a helpful foundation in developing adaptive management strategies. Moreover, this will be an excellent basis to develop and implement community-based conservation management with the involvement of indigenous people since most of

these communities live within or in the vicinity of protected areas and biodiversity hotspots.

MATERIALS AND METHODS

Location of the study

The study was conducted in Brgy. Bentangan, Carmen, North Cotabato (Figure 1). Bentangan is one of the twenty-eight barangays of Carmen, North Cotabato, Philippines, located at 7.3250 N and 124.6941 E. The area is inhabited by the Tri-people group composed of Christians, Muslims, and Arumanen-Manobo ethnic group. The area belongs to a type III climate wherein seasons are not very pronounced, relatively dry from November to April, and wet during the rest of the year. Karstic hills bound the area with fertile soil utilized mainly for agriculture. There are forest patches along valleys and river banks with reported wildlife. Most settlement areas are located near agricultural lands. There are no major roads near the site, and farm-to-market roads are not concrete.

Respondents and sampling procedure

Prior informed consent was sent to barangay (Filipino term for the lowest government unit in the Philippines) and community leaders. The study's rationale was presented as part of the requirements for securing a survey permit. We surveyed a total of 100 randomly selected individuals belonging to the Manobo tribe to interview. Respondents were validated by barangay officials and tribal leaders as members of the Manobo tribe.

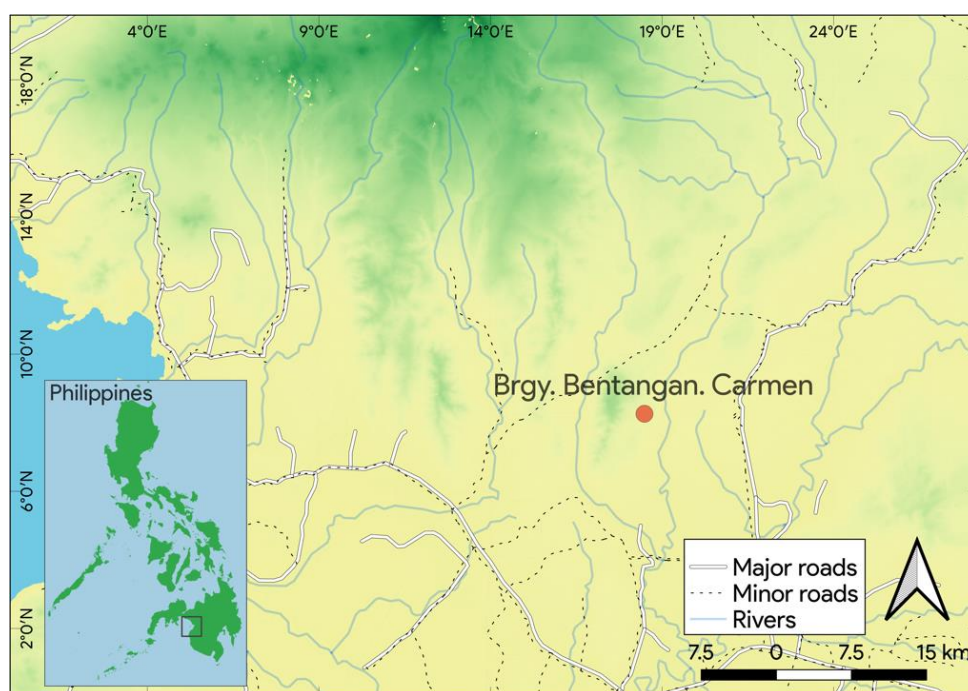


Figure 1. Map of the sampling site showing the relative distance to nearest roads. Map was generated using QGIS 3

Table 1. Summary of reliability test across indicators of biodiversity knowledge and overall perception of biodiversity importance

Variables	Cronbach's α
(1) Knowledge of Biodiversity	0.8589
(2) Understanding of threats to Biodiversity	0.8574
(3) Understanding the role of Biodiversity in sustainable development	0.8636
(4) Efforts and policies are important for Biodiversity conservation	0.8485
(5) Traditional knowledge is important for biodiversity conservation	0.9066
(6) General Perception of the Importance of Biodiversity	0.9159

Using a validated semi-structured questionnaire adapted from Turner-Erfort (1997) and Halim et al. (2012), modifications, levels of knowledge, and perception were measured. The questionnaire consisted of three parts: (i) sociodemographic profile of each respondent (e.g., gender, age, religious affiliation, years of residency, and educational attainment); (ii) Part 2 of the questionnaire consisted of ten statements regarding respondent's knowledge on biodiversity aspects (e.g., Biodiversity can be understood as biological in nature) and respondents' indicated strongly agree, agree, disagree or strongly disagree with each statement; and (iii) Part 3 of the questionnaire consisted of ten statements regarding respondent's perception on the importance of biodiversity (e.g., Maintaining biodiversity is needed for the sustainable utilization of natural resources) and respondents indicated very important, important, slightly important or not important with each statement.

A face-to-face interview was conducted with each respondent. Clarification on each statement on knowledge and perception towards biodiversity was done when needed.

Of the 100 respondents, sixty percent (60%) were female and forty percent (40%) were male respondents. Most of the respondents belonged to the age group of <20 years old (52%). Other respondents were >20-40 years old (31%) and >40 years old (29%). Regarding their religious affiliation, 83 % of the respondents were Langkat (religious movement of the Manobos); 10% were Roman Catholic; 3% were UCCP; 2% were Protestants, and 2% were Muslims. Fifty (50%) of the respondent were residents in the area for 10-19 years. Others were residents in the area for 1-9 years (20%) and 20-29 years (20%) in the area. In terms of educational attainment, 60 (60%) out of 100 were high school level, 21 (21%) were elementary level and 7 (7%) were college level.

Statistical analysis

Before statistical analyses, categorical responses were transformed to numerical scales (4= Strongly Agree/Very Important - 1= Strongly Disagree/Not Important). Some statements on biodiversity were lumped to develop a more reliable statistical model. Using Cronbach's alpha coefficient was employed to test the reliability and internal consistency of the items in the questionnaire. Based on the reliability test, the overall alpha-value is 0.896. This indicates that all indicators of biodiversity knowledge and general perception of biodiversity importance (Table 2). To determine the significant difference in responses across demographic scales, a non-parametric Kruskal-Wallis test

was used. Categorical classifications of sociodemographic remained the same except we transformed "Age" into three categories (A=<20, B=>20-40, and C=>40). A stepwise general linear regression was to determine publicminants of public perception on the importance of biodiversity using local understanding variables to predict biodiversity (e.g., Sakurai et al. 2013). We used the open software JASP (version 0.11) statistical to perform all reliability and statistical tests. All significance was set at $p=0.05$.

Ethical note

Before the personal interviews, each respondent was briefed on the purpose of the research. Respondents were informed of their rights to discontinue the interview if deemed necessary. All responses provided by the respondents were kept in an envelope, and only an authorized person could access it.

RESULTS AND DISCUSSION

Results

Based on the computed mean responses (Figure 2), it was observed that female respondents have greater knowledge on biodiversity ($\bar{x}=3.43$), perceived that traditional knowledge ($\bar{x}=3.53$) and related policies ($\bar{x}=3.35$) are important for biodiversity conservation ($\bar{x}=3.53$), and overall perception on the importance of biodiversity ($\bar{x}=3.54$). They also have a better understanding of the relationship between biodiversity and sustainability ($\bar{x}=3.56$). It was also observed that female respondents have a better understanding on possible threats to biodiversity ($\bar{x}=3.4$). According to age category (Figure 3), category B (>20-40 years old) have greater knowledge on most aspect of biodiversity including threats to biodiversity (3.02), on the importance of related policies (3.22) and traditional knowledge (3.48) on conservation, and overall perception towards biodiversity importance (3.59). While, computed mean response according to religious affiliation (Figure 4) showed that respondents from United Christian Church of the Philippines, Inc. (UCCP) have greater knowledge on biodiversity (3.44), better understanding of biodiversity threats (3.0), the link between biodiversity and sustainability (3.67), and perceived that policies related to biodiversity (3.17) and traditional knowledge (3.67) are important for conservation. However, protestants have higher mean response in terms of overall perception of the importance of biodiversity (3.65). In terms of educational attainment

(Figure 5), respondents with higher educational attainment have tended to have college graduates have greater knowledge on biodiversity (3.93), threats to biodiversity (3.9), and perceived that policies towards biodiversity (3.8) and traditional knowledge (4.0) are important for conservation. In terms of overall perception of the importance of biodiversity, respondents who are elementary graduates have higher mean response (4.0).

Based on the result of Kruskal-wallis test (Table 2), there was a significant difference on the mean responses

towards biodiversity according to gender and educational attainment. In terms of the general perception of the importance of biodiversity, there was a significant difference in the mean response according to gender.

Furthermore, general multiple regression model showed that independent variables are associated with overall importance perception of respondents ($R^2=0.34$, $F_{(9,90)}=5.6935$, $p<.0001$) but only “importance of traditional knowledge biodiversity” conservation showed strong positive association ($\beta=0.32$, $p<.01$).

Table 2. Non-parametric Kruskal-Wallis Test on the significant difference across sociodemographic scales in different indicators of biodiversity knowledge and overall perception of biodiversity importance. (*P* values with ** indicates significance)

	Statistic	df	p-value
(1) Knowledge of Biodiversity			
Gender	19.272	1.000	0.001**
Age	5.542	2.000	0.063
Religion	0.958	4.000	0.916
Educational Attainment	37.492	5.000	0.001**
(2) Understanding of threats to Biodiversity			
Gender	48.736	1.000	0.001**
Age	1.080	2.000	0.583
Religion	1.139	4.000	0.888
Educational Attainment	39.187	5.000	0.001**
(3) Understanding on the role of Biodiversity in sustainable development			
Gender	13.570	1.000	0.001**
Age	4.940	2.000	0.085
Religion	1.090	4.000	0.896
Educational Attainment	36.214	5.000	0.001**
(4) Efforts and policies are important for Biodiversity conservation			
Gender	39.674	1.000	0.001**
Age	3.572	2.000	0.168
Religion	2.802	4.000	0.592
Educational attainment	32.150	5.000	0.001**
(5) Traditional knowledge is important for biodiversity conservation			
Gender	4.940	1.000	0.026**
Age	1.662	2.000	0.436
Religion	4.732	4.000	0.316
Educational attainment	11.357	5.000	0.045**
(6) General Perception on the Importance of Biodiversity			
Gender	5.187	1.000	0.023**
Age	3.901	2.000	0.142
Religion	2.124	4.000	0.713
Educational attainment	6.192	5.000	0.288

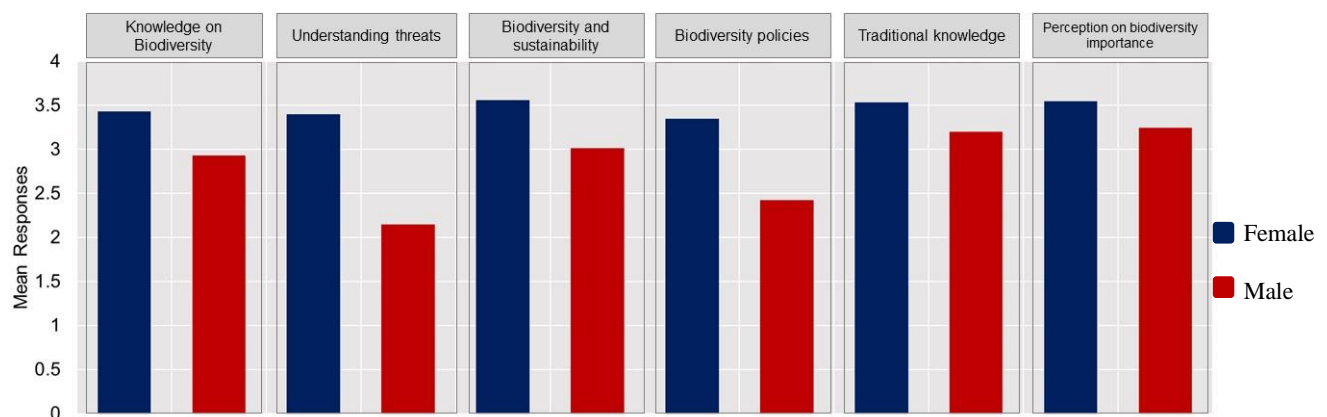


Figure 2. Levels of knowledge and perception importance on biodiversity according to gender (expressed in \bar{x} values where 4 as “strongly agree”)

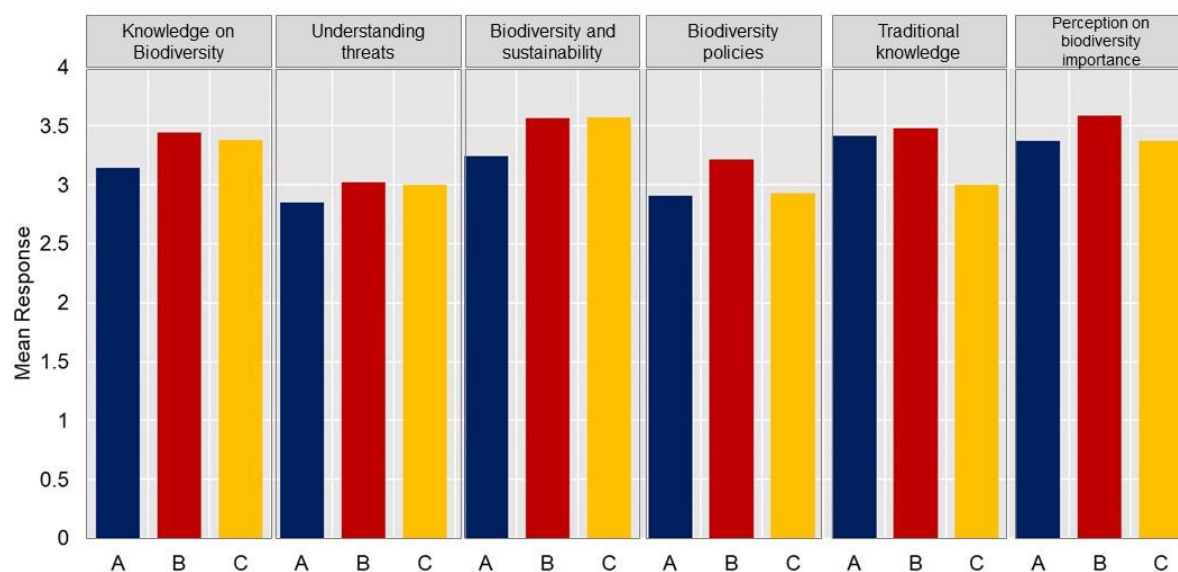


Figure 3. Knowledge on biodiversity and perception on biodiversity importance according to age category (A- <20 years old; B- >20-40 years old; C- >40 years old)

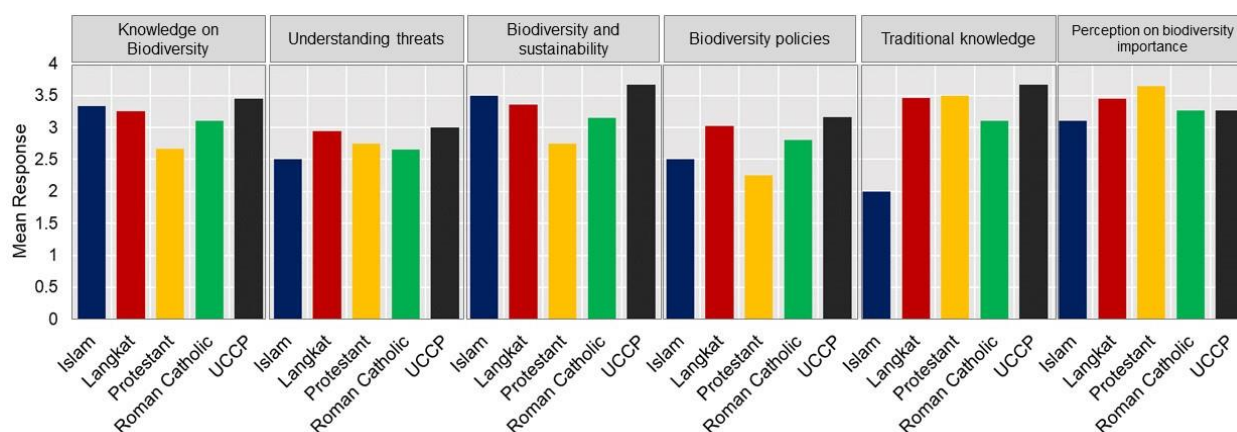


Figure 4. Knowledge of biodiversity and perception of biodiversity importance according to religious affiliation

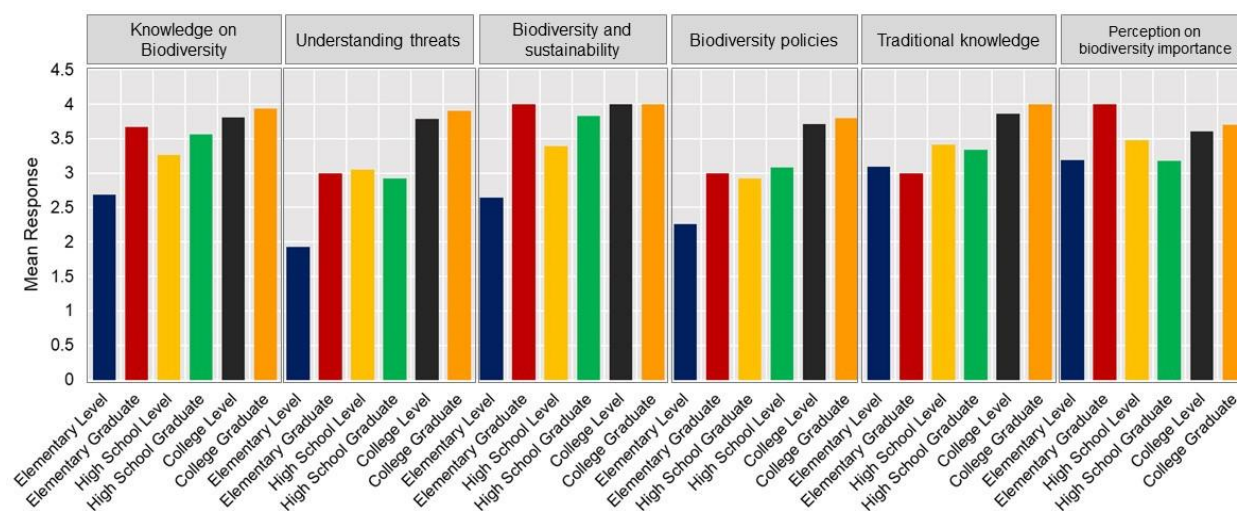


Figure 5. Knowledge of biodiversity and perception of biodiversity importance according to educational attainment.

Table 3. General multiple linear regression on the association of local biodiversity understanding to general perception on the importance of biodiversity. (*P* values with ** indicates significance. $R^2=0.363$, *Mean square*=1.3418, *F*=5.6935. Note: β = standardized coefficient, SE=Standard Error)

	β	SE	t	p-value
(Intercept)		0.51	3.27	0.01
Gender	-0.04	0.18	-0.25	0.80
Religion	-0.05	0.06	-0.54	0.59
Age	0.12	0.00	1.37	0.17
Educational attainment	-0.15	0.05	-1.27	0.21
Knowledge on biodiversity	0.35	0.30	1.21	0.23
Understanding of threats to biodiversity	0.17	0.15	0.74	0.46
Understanding the role of biodiversity in sustainable development	-0.34	0.20	-1.49	0.14
Efforts and policies are important for biodiversity conservation	0.25	0.18	1.09	0.28
Traditional knowledge is important for biodiversity conservation	0.32	0.09	3.03	0.01**

Discussion

There was a significant difference in the mean responses on knowledge and perception towards biodiversity according to gender and educational attainment. It was observed that female respondents have higher mean responses on both knowledge and perception towards biodiversity. This result is in agreement with the study of Lim and Wilson (2019) wherein females significantly viewed the importance of bats in fruit production compared to males. Murphy (2004) also added that females are more knowledgeable and tend to have more positive attitude towards environment. In terms of educational attainment, respondents with higher educational attainment were more knowledgeable and have better understanding of the aspects of biodiversity. Increased ecological and biodiversity knowledge can be acquired through formal education which can be used in developing educational programs related to biodiversity (Pinheiro et al. 2016). In the case of Kenya, compulsory biology courses possibly increase positive attitudes towards biodiversity, like perception towards bats (Prokop and Tunnicliffe 2008). Among the respondents, those who were elementary graduates have higher mean response on the overall perception of the importance of biodiversity. This result indicates that even at the lower educational level, the importance of biodiversity has been discussed and taught. In addition, respondents with lower educational levels have been involved in some activities related to biodiversity conservation which may have contributed to their perception. It is also possible that perception of the importance of biodiversity is a result of traditional knowledge transfer from elder Manobos.

It is interesting to note that traditional knowledge of Manobo tribe significantly affects their perception of the importance of biodiversity. This can support the aforementioned statement on the perception of Manobo on the importance of biodiversity. This indicates that Manobo tribe believes that their traditional knowledge has a big contribution to preserving biodiversity which they can use as a source of basic needs. In the study of Ruddle and Johannes (1990), many indigenous people are dependent on traditional knowledge and practices in caring for their traditional territories, and for the harvesting of wild food and animals, medicines, water, and other basic needs to

preserve their environment and biodiversity. There are traditional activities conducted by the Manobo tribe that balance ecological cycles. It indicates that biodiversity is very important for them since it is also part of the survival of the present and future generations aside from being the source of their basic needs. This result is in agreement with the study of Elder et al. (1998) which stated that the indigenous people's meaning of biodiversity is not connected to scientific definitions but anchored to the respondents' daily practices, experiences, knowledge, and emotions.

Perception of the importance of biodiversity can be associated with biodiversity conservation and according to Jordan (1988), conservation has a critical role to play in maintaining biodiversity. However, it is not an adequate strategy in conserving biological diversity. Eventually, there is a need for a way of putting pieces back together when something has been altered, damaged, or even destroyed as what Manobo does to conserve their biodiversity. Biodiversity is of global importance for humanity as a whole, for the maintenance of ecosystem services.

The results of this study indicate that biodiversity and culture can be related. Most discussions on the complex relationship between the conservation of biodiversity and cultural diversity center on the argument that cultural diversity can sustain a wide variety of practices that promote conservation of natural resources (Posey 1999). An example is how different 'indigenous' groups around the world have protected those species and habitats related to their cultural beliefs which provide an insight into the relationship and role of human diversity in the conservation of biodiversity. Manobos perceived that forest ecosystem and protection of species and habitats are important aspects that linked to cultural beliefs which provide insights on the connection and role of humans in biodiversity conservation. This is related to the statement of Posey (1999) wherein different cultures perceived and appreciate biodiversity in different ways because of their distinct heritage and experiences. As stated by the ASEAN Centre for Biodiversity (2010), the abundance of these diverse biological resources also ensures the continuous flow of goods and ecosystems services for the benefit of the present and future generations which can be done through

community-based conservation management. Some studies revealed that many indigenous communities depend directly on natural ecological systems for their sustenance. In Sabah, Malaysia, indigenous people have developed their unique indigenous systems for a sustainable livelihood (Halim et al. 2012). However, indigenous communities have scanty resources and few options to adapt (financially, technically and socially) by themselves where most adaptive strategies constitute local knowledge. Studies revealed that many indigenous communities depend directly on natural ecological systems for their sustenance. In this context, Geronimo et al. (2016) stressed that biological diversity and natural ecosystems are closely linked to the economy, identity, cultural and spiritual values, as well as the social organization of indigenous people.

Implementation of biodiversity conservation measures is often challenged through fierce debate and resistance to specific management approaches (Stoll-Kleemann 2001; Miller 2005; Lindström et al. 2006; Marshall et al. 2007). This lack of support at the local level has been linked to the seemingly inadequate knowledge of the general public about biodiversity, suggesting that the public might not have enough insight to appreciate the benefits of biodiversity and its conservation (DEFRA 2002; Hunter and Brehm 2003). Some studies examined this phenomenon describing individuals' understanding of biodiversity as an isolated concept.

In general, the result of this study indicates that traditional knowledge has a significant role in the perception of Manobo tribe on the importance of biodiversity, thus, conservation as well. Practices and beliefs that have been embedded in the indigenous knowledge among indigenous communities, particularly the Manobo tribe are good examples to establish biodiversity conservation and environmental obligations. The community of Brgy. Bentangan is the best venue for implementation of community-based conservation management since it is one of the vicinity of protected areas and biodiversity hotspots.

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