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Bats and People: Assessing Awareness, Threats, and Conservation Challenges in Three Selected Barangays in Naawan, Misamis Oriental

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Abstract. This study assessed community knowledge, perceptions, and attitudes toward bats in Barangays Patag, Mapulog, and Tagbalogo in Naawan, Misamis Oriental. Data were collected through surveys of 98 individuals and key informant interviews with eight local officials. Respondents reported awareness of the importance of forests and bats and expressed support for habitat protection, anti-poaching measures, and natural resource conservation. Knowledge gaps and uncertainty persisted regarding the ecological roles of bats and their interactions with people. Pesticide use, noise pollution, garbage dumping, quarrying, and illegal logging were among the most frequently reported potential disturbances. Interview responses indicated limited information about bat populations and uneven awareness of local conservation measures. The findings describe community perceptions and do not directly measure ecological threats, population trends, or policy implementation. They support targeted environmental education, biodiversity monitoring, coordination among local institutions, and opportunities for community participation in conservation.

Keywords: bats; Chiroptera; community perceptions; conservation; Naawan

Introduction

Bats belong to the order Chiroptera, a name derived from the Greek words for “hand” and “wing.” Their wings are formed by elongated fingers supporting a thin membrane. Unlike gliding mammals, bats are capable of sustained powered flight (Wund & Myers, 2005). In the Philippines, Republic Act No. 9147 provides the legal framework for conserving wildlife and their habitats and regulating wildlife collection, possession, and trade (Republic of the Philippines, 2001).

Bats provide ecosystem services through insect control, pollination, and seed dispersal (Kunz et al., 2011). Experimental evidence also links bats and birds to crop production in tropical agroforestry systems (Maas et al., 2013). The Philippines contains important areas for biodiversity conservation (Ambal et al., 2012), making local understanding of wildlife and its conservation relevant to environmental planning.

People’s beliefs, cultural values, experiences, and perceptions of risk can shape whether wildlife is feared, tolerated, or protected (Kansky et al., 2014; Knight, 2008). For bats, these attitudes may affect support for habitat protection and conservation activities (Kingston, 2016). Social research can help explain these human dimensions and inform communication, community engagement, and local environmental programs (Bennett et al., 2017).

The study had three objectives:

1. Assess residents’ self-reported knowledge, perceptions, and attitudes toward bats in Patag, Mapulog, and Tagbalogo, Naawan, Misamis Oriental;

2. Identify human activities that residents perceive as potential disturbances to local bat populations; and

3. Provide baseline social information to inform future conservation research and management planning.

Methodology

Individual surveys and key informant interviews (KIIs) were conducted in areas near bat sampling stations in Barangays Patag, Mapulog, and Tagbalogo. Survey respondents were adults aged 18 years or older. The sampling approach combined stratification by barangay with random selection within each stratum.

The stated sample size was based on 2015 population records obtained from the Local Government Unit (LGU) of Naawan. The three barangays had a combined population of 4,919 individuals, from which a sample of 98 respondents was determined using a stated 10% margin of error. Individuals formed the sampling frame. Respondents were allocated proportionally across the barangays and selected through a lottery procedure. The population count includes individuals of all ages, whereas participation was restricted to adults; this difference limits interpretation of the stated sampling precision.

The questionnaire had five sections: socioeconomic characteristics; knowledge of bats and their ecological roles; perceptions of conservation; attitudes toward wildlife protection; and perceived human-related disturbances. Most items were closed-ended,

with some opportunities for written responses. The questionnaire was prepared in English and translated into Cebuano-Bisaya to support comprehension.

The KIIs involved eight barangay officials from the three study barangays and focused on their experiences of local governance and conservation. Officials were selected by lottery from those who were willing and available. The semistructured guide covered their profile and length of service, awareness of bat populations, local ordinances, anti-poaching measures, awareness activities, and implementation challenges. Responses were documented through notes, organized, and transcribed for analysis.

The research proposal and instruments were reviewed and approved by the Dean of the College of Agriculture, Forestry and Environmental Sciences and the Chairperson of the Department of Environmental Science of Mindanao State University at Naawan. Permission to conduct the research was requested from the LGU of Naawan and officials of the three barangays before data collection.

Participants provided written informed consent. They were informed of the study's objectives, the voluntary nature of participation, and their right to decline or withdraw without penalty. The questionnaire included a consent section for participants' names, signatures, and dates.

Personal information was collected for research purposes and treated confidentially. The researchers reported that information was handled in accordance with the Data Privacy Act of 2012 and was not disclosed to unauthorized individuals or institutions.

Subject matter experts in wildlife conservation and social research reviewed the individual questionnaire and KII guide for relevance and clarity. Pilot testing involved residents outside the study area who were not included in the final sample. Their feedback informed revisions to question wording and sequence. Knowledge, perception, and attitude findings are presented descriptively as response percentages. The multiple-response disturbance checklist is summarized as frequencies, and interview findings are summarized by topic.

Results And Discussion

Knowledge, Perceptions, and Attitudes

The individual survey covered 98 respondents from the three barangays. Tables 1-3 summarize their responses to questions about knowledge, perceptions, and attitudes.

Table 1

Self-Reported Knowledge of Forests and Bats

Question	Yes (%)	No (%)	Maybe (%)
Do you know why forests are important to the ecosystem?	100	0	0
Do you know that some bat species use forests as habitat?	90	6	4
Do you know what bats, locally called “kwaknit,” are?	98	2	0
Do you know what bats usually eat?	87	9	4
Do you know that bats play an important role in forests?	83	9	8
Do you know any uses of bats from forests?	51	45	4
Do you know what equipment is used to catch bats?	43	57	0
Do you know that bats contribute to the environment?	62	30	8
Do you know that some human activities threaten bats and forests?	77	21	2
Do you know that the loss of bats from forests could cause major environmental changes?	62	27	11

Note. N = 98 individual respondents. Percentages are rounded; each question is summarized separately.

Table 1 reports self-assessed awareness rather than performance on an objective knowledge test. All respondents indicated that they knew the importance of forests to the ecosystem, and 98% reported familiarity with bats, locally called “kwaknit.” Ninety percent reported knowing that some bats use forests as habitat, while 87% reported knowing what bats eat.

Awareness varied across the more specific items. Eighty-three percent reported knowing that bats play an important role in forests, 62% reported awareness of their environmental contributions, and 51% reported knowing uses of bats from forests. Forty-three percent reported knowing about bat-catching equipment; this item does not itself measure support for conservation or participation in bat capture.

Seventy-seven percent reported knowing that human activities can threaten bats and forests. Sixty-two percent reported awareness of environmental changes that could follow the loss of bats, while 11% were uncertain. These responses identify topics for further education, but the survey does not establish the depth or accuracy of respondents’ ecological knowledge.

Differences between familiarity with wildlife and more detailed conservation knowledge have also been examined in other settings. In a Mediterranean protected area, Cortés-Avizanda et al. (2022) found that species knowledge and perceptions varied among social groups, and that some threatened, elusive species were poorly

recognized. This supports examining locally specific knowledge gaps when designing conservation communication.

For Naawan, environmental education could build on residents' familiarity with bats while explaining their ecological functions, habitat needs, and conservation challenges. Collaboration among barangay officials, schools, and conservation organizations could make this information more accessible.

Table 2

Perceptions of Bats and Environmental Conservation

Question	Yes (%)	No (%)	Maybe (%)
Do you believe that protecting forests also protects bats that contribute to the ecosystem?	92	2	6
Do you believe that people's willingness to participate is important to conservation?	96	2	2
Do you believe that conservation programs for bats and forest species are important?	89	4	7
Do you believe that community participation can help conserve bats?	89	7	4
Do you believe that pollution is a government problem?	66	32	2
Do you believe that pollution is a serious problem that needs to be addressed?	98	2	0
Do you believe that bats are important to environmental health?	70	19	11
Do you believe that bat poaching is acceptable?	13	76	11
Do you believe that bats are dirty and disease carriers?	34	51	15
Do you believe that bats are harmful to humans?	30	53	17

Note. N = 98 individual respondents. Percentages are rounded; each question is summarized separately.

Table 2 indicates broad support for conservation alongside differing views about bats and environmental responsibility.

Most respondents believed that protecting forests also protects bats (92%), that willingness to participate is important for conservation (96%), and that conservation programs and community participation are important (89% for each item). These responses suggest support for involving residents in habitat protection.

Sixty-six percent agreed that pollution is a government problem, and 98% agreed that pollution is a serious problem requiring action. Agreement with the first item does not establish that respondents regarded government as solely responsible.

Seventy percent believed bats are important to environmental health, and 76% rejected the acceptability of bat poaching. However, 34% endorsed the combined statement that

bats are dirty and disease carriers, and 30% regarded bats as harmful to humans. Uncertain responses were 15% and 17%, respectively. Because these questions combine broad judgments about animals and risk, they should not be treated as direct tests of knowledge about disease transmission.

Perceptions of bats can reflect fear, cultural associations, and incomplete ecological information (Mildenstein, 2013; Shafie et al., 2017). The present survey did not test which of these factors explained the responses in Naawan. Conservation communication should therefore acknowledge residents' concerns while clearly explaining ecological benefits and appropriate precautions around wildlife.

Community seminars, school activities, and materials in locally used languages could address the specific questions and uncertainties identified in the survey. Positive attitudes may provide a basis for engagement, but sustained participation also requires practical opportunities and institutional support.

Table 3

Attitudes Toward Wildlife and Natural Resources

Question	Yes (%)	No (%)	Maybe (%)
Do you agree that wildlife, including bats, has the right to live?	100	0	0
Do you agree that people should not destroy bat roosts?	94	6	0
Do you agree that people should be aware of the environmental importance of bats and forests?	94	2	4
Do you agree that more regulations prohibiting wildlife hunting are needed?	94	4	2
Do you agree that natural resources should be conserved for future generations?	98	2	0
Do you agree that surroundings should always be kept clean?	100	0	0
Do you agree that natural resources are limitless?	87	9	4
Do you agree that more regulations prohibiting bat hunting are needed?	94	0	6
Do you agree that garbage and other waste can be thrown into forests?	9	91	0
Do you agree that throwing garbage into forests should be prohibited?	100	0	0

Note. N = 98 individual respondents. Percentages are rounded; each question is summarized separately.

Table 3 shows substantial support for wildlife protection and several environmentally responsible practices.

All respondents agreed that wildlife has a right to live, that surroundings should be kept clean, and that throwing garbage into forests should be prohibited. Ninety-eight percent supported conserving natural resources for future generations.

Ninety-four percent supported protecting bat roosts, increasing awareness of bats and forests, and introducing more regulations against wildlife and bat hunting. Ninety-one percent rejected the statement that waste can be thrown into forests.

At the same time, 87% agreed with the statement that natural resources are limitless, while 9% disagreed and 4% were uncertain. This response contrasts with the strong support for resource conservation and indicates a potential gap in understanding resource limits.

These responses illustrate why broad support for conservation should be distinguished from understanding particular environmental concepts. Studies of attitudes toward bats likewise emphasize the value of targeted education (Shafie et al., 2017; Tanalgo & Hughes, 2021).

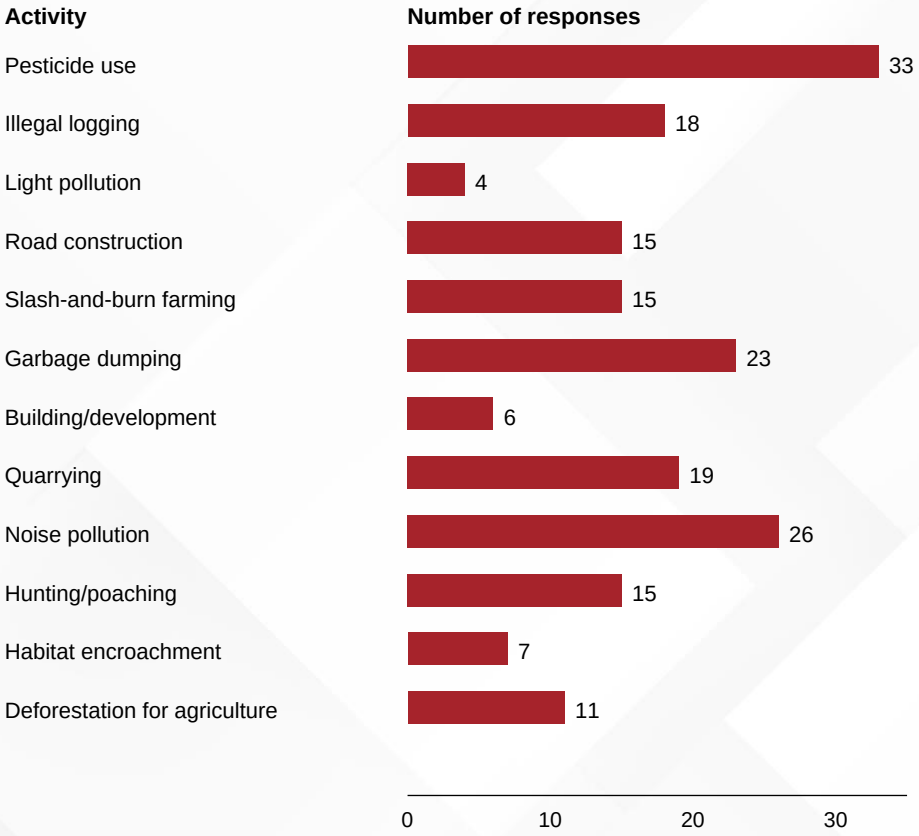
Support expressed in a questionnaire does not establish conservation behavior. Practical opportunities to participate, access to information, livelihood considerations, and institutional capacity may shape whether favorable attitudes lead to action. Future work should examine these relationships directly in the three barangays.

Human-Related Disturbances to Bat Populations

The disturbance checklist contained 12 predefined activities and an open-ended option. Respondents could identify multiple activities they believed might affect local bats. Figure 1 presents the reported frequencies. The available records do not establish the number who completed this section or a separate eligibility rule; therefore, percentages are not calculated. These counts describe reported concerns and cannot be interpreted as prevalence among the 98 survey participants. They do not measure exposure, ecological damage, or changes in bat abundance.

Figure 1

Reported Human Activities Perceived to Disturb Bat Populations



Pesticide use was the most frequently cited activity, with 33 responses. Exposure to organic contaminants is a recognized concern in bat conservation (Bayat et al., 2014). The survey did not measure pesticide residues or their effects on bats in the study area.

Noise pollution received 26 responses. Research has shown that some foraging bats avoid noise (Schaub et al., 2008), but the present study did not measure sound levels or bat responses to local noise.

Garbage dumping received 23 responses. Respondents also identified quarrying (19 responses), illegal logging (18), and conversion of forests to agriculture (11). These perceptions highlight concerns about land use and habitat condition. Habitat fragmentation, logging, and deforestation are recognized conservation issues for tropical bats (Meyer et al., 2016).

Road construction, slash-and-burn farming, and hunting or poaching each received 15 responses. Other reported activities were habitat encroachment (7 responses), building and development projects (6), and light pollution (4). Urbanization and artificial lighting can affect bats, although effects differ across species and settings (Russo & Ancillotto, 2015; Stone et al., 2015).

Bat conservation faces multiple, potentially interacting pressures (Frick et al., 2020). The reported local concerns can guide future field assessments, but they do not establish the relative ecological severity of each disturbance.

Potential responses include reviewing pesticide practices, protecting roosts and habitat connections, improving waste management, and incorporating wildlife considerations into land-use planning. Field monitoring would be needed to determine which interventions address the most consequential local pressures.

Key Informant Interviews with Barangay Officials

Table 4

Key Informant Responses on Bat Conservation

Topic	Summary of responses
Protection of bats and their resources	Five of eight responses reported that the barangay provides protection; other responses differed.
Available information on bat conditions	Seven of eight responses reported no available information about the condition of bats.
Local government awareness of bat conditions	Two responses indicated awareness; other responses indicated a lack of awareness or uncertainty.
Anti-poaching resolutions	Three respondents reported awareness of local anti-poaching resolutions.
Implementation of anti-poaching measures	Two respondents reported implementation; most reported no implementation.
Awareness activities	Responses were inconsistent: two officials reported activities, while others reported none. The interviews do not establish why these accounts differed.
Conservation challenges	Reported challenges included low awareness, poaching, noncompliance, habitat degradation, and weak implementation.

The interview summaries in Table 4 indicate uneven awareness of local conservation activities. Five of eight responses reported some protection of bats and their resources. These accounts describe officials' perceptions and should not be interpreted as an independent assessment of policy implementation.

Seven of eight responses indicated that information about the condition of local bat populations was unavailable. Only two responses indicated local government awareness of bat conditions. Limited access to baseline information can make it difficult to identify changes and prioritize conservation action.

Three respondents acknowledged anti-poaching resolutions, while two reported implementation. Republic Act No. 9147 provides a national framework for wildlife conservation and regulation (Republic of the Philippines, 2001). The interview findings concern respondents' awareness of local measures; they do not establish whether particular ordinances exist or how consistently they are enforced.

Accounts of awareness activities were inconsistent: two officials reported such initiatives, while other responses indicated no activities. These reports do not establish that programs were uniformly present or absent across the barangays. Differences may reflect variation in respondents' awareness or experiences, but the interviews do not

establish their cause. Bat-watching research in the Philippines has demonstrated the potential of educational visitor experiences to improve awareness and support for conservation (Tanalgo & Hughes, 2021), although any local activity would require appropriate safeguards for bats and their habitats.

Officials identified low public awareness, poaching, noncompliance, deforestation, habitat degradation, and weak implementation as conservation challenges. Local collaboration and opportunities for community participation could help address these concerns. Work on Philippine institutions and biodiversity conservation also emphasizes the importance of local capacity and coordination (Raquino et al., 2023; Tumbaga et al., 2021).

Taken together, the interviews suggest priorities for biodiversity information, communication about existing regulations, and coordination among barangays, environmental agencies, academic institutions, and residents. Follow-up work should document actual programs, resources, and implementation outcomes.

Conclusion

The survey of 98 individuals indicated familiarity with forests and bats and broad support for wildlife protection. More specific knowledge items, concerns about human-bat interactions, and the response to the resource-limit item identified topics for further environmental education. Self-reported awareness should be distinguished from demonstrated knowledge or conservation behavior.

Residents identified pesticide use, noise, waste disposal, quarrying, logging, and other land-use activities as potential disturbances. Officials' accounts suggested limited information about bat populations and uneven awareness of conservation measures. These findings describe perceptions and provide priorities for further assessment; they do not demonstrate local population declines or establish causal effects of particular activities.

Conservation planning can build on expressed support for wildlife while improving ecological information and opportunities for participation. Linking social research with field monitoring would provide a stronger basis for assessing threats, designing interventions, and evaluating results.

Recommendations

Policy and implementation. Review existing wildlife measures, clarify responsibilities, and improve communication about applicable regulations. Document implementation so that perceived enforcement gaps can be assessed against actual practice.

Institutional coordination. Strengthen cooperation among LGUs, academic institutions, the Department of Environment and Natural Resources, and conservation organizations to support research, monitoring, and community education.

Environmental education. Develop sustained programs in locally used languages that address bat ecology, habitat protection, resource limits, and residents' concerns. Evaluate changes in understanding and participation.

Habitat protection. Identify and protect important roosts and habitat connections. Involve residents in appropriate restoration activities and use locally suitable native species where reforestation is warranted.

Resources and training. Provide practical tools, recording procedures, and training for noninvasive community monitoring. Any wildlife handling should be undertaken only by appropriately trained and authorized personnel.

Monitoring. Establish consistent methods to document bat populations, habitats, and disturbances over time, in coordination with relevant experts and agencies.

Further research. Examine how demographic characteristics, livelihoods, and proximity to roosts relate to perceptions and behavior. Combine repeated social surveys with ecological monitoring to evaluate conservation outcomes.

References

Ambal, R. G. R., Duya, M. V., Cruz, M. A., Coroza, O. G., Vergara, S. G., de Silva, N., Molinyawe, N., & Tabaranza, B. (2012). Key biodiversity areas in the Philippines: Priorities for conservation. Journal of Threatened Taxa, 4(8), 2788-2796. https://doi.org/10.11609/JoTT.o2995.2788-96

Bayat, S., Geiser, F., Kristiansen, P., & Wilson, S. C. (2014). Organic contaminants in bats: Trends and new issues. Environment International, 63, 40-52. https://doi.org/10.1016/j.envint.2013.10.009

Bennett, N. J., Roth, R., Klain, S. C., Chan, K., Christie, P., Clark, D. A., Cullman, G., Curran, D., Durbin, T. J., Epstein, G., Greenberg, A., Nelson, M. P., Sandlos, J., Stedman, R., Teel, T. L., Thomas, R., Veríssimo, D., & Wyborn, C. (2017). Conservation social science: Understanding and integrating human dimensions to improve conservation. Biological Conservation, 205, 93-108. https://doi.org/10.1016/j.biocon.2016.10.006

Cortés-Avizanda, A., Pereira, H. M., McKee, E., Ceballos, O., & Martín-López, B. (2022). Social actors' perceptions of wildlife: Insights for the conservation of species in Mediterranean protected areas. Ambio, 51, 990-1000. https://doi.org/10.1007/s13280-021-01546-6

Frick, W. F., Kingston, T., & Flanders, J. (2020). A review of the major threats and challenges to global bat conservation. Annals of the New York Academy of Sciences, 1469(1), 5-25. https://doi.org/10.1111/nyas.14045

Kansky, R., Kidd, M., & Knight, A. T. (2014). Meta-analysis of attitudes toward damage-causing mammalian wildlife. Conservation Biology, 28(4), 924-938. https://doi.org/10.1111/cobi.12275

Kingston, T. (2016). Cute, creepy, or crispy; How values, attitudes, and norms shape human behavior toward bats. In C. C. Voigt & T. Kingston (Eds.), Bats in the Anthropocene: Conservation of bats in a changing world (pp. 571-595). Springer. https://doi.org/10.1007/978-3-319-25220-9_17

Knight, A. J. (2008). "Bats, snakes and spiders, Oh my!" How aesthetic and negativistic attitudes, and other concepts predict support for species protection. Journal of Environmental Psychology, 28(1), 94-103. https://doi.org/10.1016/j.jenvp.2007.10.001

Kunz, T. H., Braun de Torrez, E., Bauer, D., Lobova, T., & Fleming, T. H. (2011). Ecosystem services provided by bats. Annals of the New York Academy of Sciences, 1223(1), 1-38. https://doi.org/10.1111/j.1749-6632.2011.06004.x

Maas, B., Clough, Y., & Tscharntke, T. (2013). Bats and birds increase crop yield in tropical agroforestry landscapes. Ecology Letters, 16(12), 1480-1487. https://doi.org/10.1111/ele.12194

Meyer, C. F. J., Struebig, M. J., & Willig, M. R. (2016). Responses of tropical bats to habitat fragmentation, logging, and deforestation. In C. C. Voigt & T. Kingston (Eds.), Bats in the Anthropocene: Conservation of bats in a changing world (pp. 63-103). Springer. https://doi.org/10.1007/978-3-319-25220-9_4

Mildenstein, T. (2013). Flying foxes: Myths with more bark than bite. Global Environment Facility. https://www.thegef.org/newsroom/news/flying-foxes-myths-more-bark-bite

Raquino, M. E. R., Pajaro, M., Enaje, J. E., Tercero, R. B., Torio, T. G., & Watts, P. (2023). Capacitating Philippine indigenous and local institutions and actualising local synergies on restorative ridge-to-reef biodiversity conservation for food security and livelihoods. In M. Nishi & S. M. Subramanian (Eds.), Ecosystem restoration through managing socio-ecological production landscapes and seascapes (SEPLS) (pp. 247-265). Springer. https://doi.org/10.1007/978-981-99-1292-6_13

Republic of the Philippines. (2001). Republic Act No. 9147: Wildlife Resources Conservation and Protection Act. https://pcsd.gov.ph/republic-act-9147/

Russo, D., & Ancillotto, L. (2015). Sensitivity of bats to urbanization: A review. Mammalian Biology, 80(3), 205-212. https://doi.org/10.1016/j.mambio.2014.10.003

Schaub, A., Ostwald, J., & Siemers, B. M. (2008). Foraging bats avoid noise. The Journal of Experimental Biology, 211(19), 3174-3180. https://doi.org/10.1242/jeb.022863

Shafie, N. J., Sah, S. A. M., Mutalib, A. H. A., & Fadzly, N. (2017). General perceptions and awareness level among local residents in Penang Island toward bats conservation efforts. Tropical Life Sciences Research, 28(2), 31-44. https://doi.org/10.21315/tlsr2017.28.2.3

Stone, E. L., Harris, S., & Jones, G. (2015). Impacts of artificial lighting on bats: A review of challenges and solutions. Mammalian Biology, 80(3), 213-219. https://doi.org/10.1016/j.mambio.2015.02.004

Tanalgo, K. C., & Hughes, A. C. (2021). The potential of bat-watching tourism in raising public awareness towards bat conservation in the Philippines. Environmental Challenges, 4, Article 100140. https://doi.org/10.1016/j.envc.2021.100140

Tumbaga, J. R. A., Hipolito, M. C., & Gabriel, A. G. (2021). Community participation toward biodiversity conservation among protected areas in Pangasinan, Philippines. Environment, Development and Sustainability, 23, 4698-4714. https://doi.org/10.1007/s10668-020-00705-1

Wund, M., & Myers, P. (2005). Chiroptera. Animal Diversity Web. https://animaldiversity.org/accounts/Chiroptera/

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