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Conservation Challenges and Local Awareness of *Rafflesia magnifica* in Maragusan, Davao de Oro, Philippines

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ABSTRACT

This study examines the conservation status of *Rafflesia magnifica,* an endangered species endemic to Maragusan, with a focus on its population, local awareness, and conservation practices. Data were collected through structured surveys and key informant interviews to assess the residents' knowledge, attitudes, and practices on the conservation of *R. magnifica* in Barangays Mapawa and New Panay, which serve as key monitoring sites for the species. Population monitoring revealed a significant decline in *R. magnifica.* In Barangay Mapawa, the number of healthy buds dropped from 13 in 2022 to just two by May 2024. Successful blooms also decreased from five in 2022 to four in 2023, with four buds blooming in early 2024. In contrast, Barangay New Panay recorded no buds in 2023 and only one bloom bud in May 2024, highlighting a severe decline. The study also assessed local awareness of *R. magnifica* conservation. Knowledge was low (mean score: 1.65), while attitudes were moderate (mean score: 1.75), and practices were also low (mean score: 1.76). Despite these gaps, 93.3% of residents were aware of the species' existence, and most recognized its critically endangered status. However, 40% believed habitat protection did not affect blooming. The community expressed strong support for conservation, with over 90% backing protected area legislation and showing interest in conservation training. These findings emphasize the need for immediate education programs, community engagement, and a formal management plan to ensure the survival of *R. magnifica* in Maragusan.

Keywords: *Biodiversity conservation, community engagement, ecological monitoring, endangered species, habitat protection*

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INTRODUCTION

The world's largest flower is the Rafflesia (Diway et al., 2022; Molina et al., 2025). *Rafflesia magnifica* was initially found in the municipality of Maragusan along the Mt. Candalaga mountain ranges (Madulid et al., 2005). According to Madulid et al. (2005) exploratory study, the distinctive features of *R. magnifica's* disk processes set it apart from other species. Large, flattened blade-like structures are distributed radially on the disk in the second zone of processes. A clear inner border of the disk is formed by smaller, similarly flattened processes that are perpendicular to these and occasionally coalesce and partially cleave. *R. magifica's* blossoming piques the interest of both locals and visitors. It is a well-liked attraction because of its unusual and eye-catching appearance, which frequently attracts tourists who want to take pictures of the flower (Madulid et al., 2005). For landowners where the species is found, this attention has also produced a small source of revenue. However, despite its visibility, *R. magnica's* documentation is still lacking. There have not been many technical reports or follow-up studies to update the species' status since Madulid et al. (2005) first described it. *R. magnifica* is cited in later studies by Malabrigo Jr. et al. (2025) and Barcelona et al. (2009). There are more comprehensive descriptions of Philippine *Rafflesia* species, but they do not offer any fresh local information. *R. magnifica's* conservation knowledge has been hindered by the absence of consistent documentation, unresolved taxonomic problems, and cultivation challenges. *R. magnifica* is one of the numerous Rafflesia species that are currently listed as critically endangered.

National highway construction in Maragusan has made it easier for people to access the region, which has increased disturbances that pose a threat to the species. Banana plantations have also been established in portions of the nearby forest (Madulid et al., 2005). Due to its restricted range, high bud mortality, dependence on specific host plants, habitat loss and degradation, and increasing economic interest, the species is at a higher risk of extinction (Malabrigo Jr. et al., 2025). The International Union for Conservation of Nature (IUCN) listed *R. magnifica* because of its small range, continuous habitat degradation, and small population size. In 2008,

R. magnica was listed as critically endangered. According to Madulid et al. (2005), the species' first and only published data indicate that no conservation measures had been implemented at the time of the study. To evaluate the current local conservation status of *Rafflesia magnifica* in Maragusan, Davao de Oro, this study examined population abundance, residents' awareness of the species' conservation, and the local government's conservation initiatives. The results will serve as a basis for future research and inform legislative action.

MATERIALS AND METHODS

Description of the study area

The study was conducted in the municipality of Maragusan, Davao de Oro, Philippines, which covers an estimated 39,427 ha and has a population of approximately 64,412 (PSA, 2024). Nestled within the mountain ranges of Mt. Candalaga, Maragusan is the only known locality of the endangered *Rafflesia magnifica*, a species recognized for producing the world's largest flower and possessing both ecological and cultural significance.

Maragusan's economy is predominantly agriculture-based, with residents engaged in the cultivation of banana, coconut, corn, abaca, and vegetables, complemented by emerging ecotourism activities that showcase the area's rich biodiversity and natural landscapes. The landscape itself is a mosaic of forested and agricultural lands, portions of which have been converted into banana plantations covering about 1,200 ha. These plantations, which yield approximately 15,000 metric tons of bananas annually (PSA, 2024), significantly contribute to the local economy but also drive habitat disturbance and fragmentation in forest-edge zones near Mt. Candalaga, posing threats to the remaining populations of endemic flora, such as *R. magnifica*.

Additionally, the construction of national highways has increased human access to forested areas, thereby further intensifying pressure on fragile ecosystems. The species depends on specific host plants and is highly sensitive to habitat alteration. Barangay Mapawa (≈approximately 1,250 ha) and Barangay New Panay (≈approximately 980 ha) are identified as key monitoring sites along the lower slopes of Mt. Candalaga, where *R. magnifica* naturally occurs (see Figure 1). Despite its ecological importance, the area continues to face habitat degradation, agricultural expansion, and declining habitat quality, underscoring the urgent need for sustained and effective conservation measures.

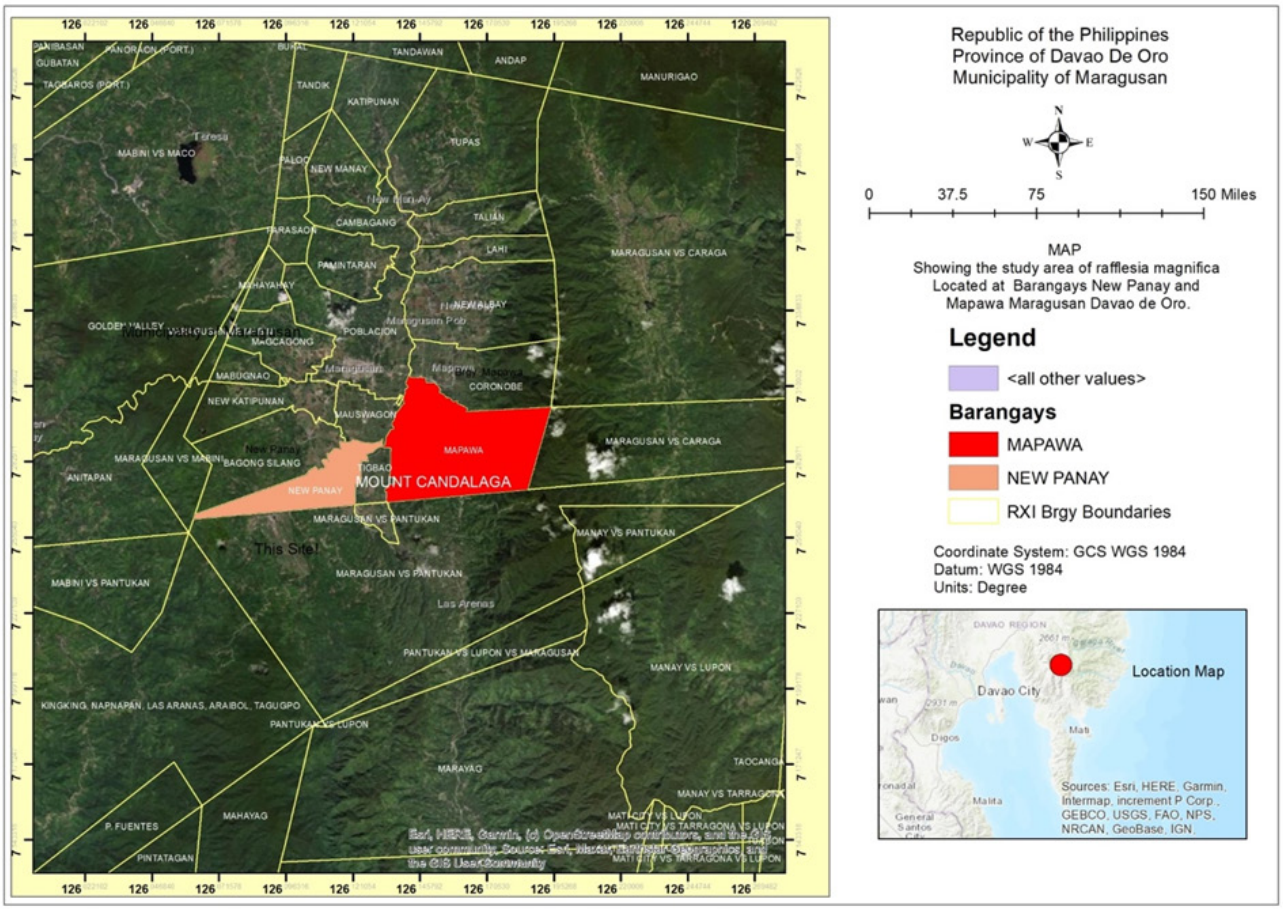

Figure 1. Map of the study area highlighting Barangays Mapawa and New Panay, Maragusan, Davao de Oro, Philippines and the locations of *Rafflesia magnifica*.

Research design

This study employed a mixed-methods research design that integrated quantitative surveys and qualitative interviews to comprehensively assess the population abundance of *R. magnifica* and the awareness, knowledge, attitudes, and practices (KAP) of residents regarding its conservation. The quantitative component utilized a validated KAP questionnaire, which was analyzed using descriptive statistical methods to quantify the levels of awareness and conservation engagement among residents. Meanwhile, the qualitative component consisted of key informant interviews (KIIs) with local government officials to corroborate, contextualize, and enrich the quantitative findings.

The first phase of the research evaluated the population abundance of *R. magnifica* and identified the local government's conservation initiatives using monitoring data obtained from the Municipal Environment and Natural Resources Office (MENRO) of Maragusan. The researchers formally requested

and were granted permission by MENRO to use these data for academic purposes and publication. These are considered secondary data sources and are duly acknowledged in the acknowledgement section of this manuscript. The second phase involved a descriptive survey to assess community awareness and behavioral tendencies toward *R. magnifica* conservation. A self-administered questionnaire served as the primary research instrument, and its content validity was established through expert review by professionals in environmental science and social research before implementation.

A Knowledge, Attitudes, and Practices (KAP) questionnaire was developed and validated to gather insights from the residents of Maragusan, Davao de Oro. The questionnaire consisted of three sections: The first set included ten questions assessing the respondents' knowledge of *R. magnifica*. The second set, also comprising ten questions, focused on their attitudes toward conservation efforts for the species. The third set consisted of ten questions about the respondents' practices and interests in the conservation of *R. magnifica*.

Additionally, Key Informant Interviews (KIIs) were conducted with four personnel from relevant local government units (LGUs) in Maragusan, including the Municipal Environment and Natural Resources Office (MENRO), the Tourism Office, the Municipal Information Office, and the Sangguniang Panlalawigan. These informants were purposively selected for their direct involvement in environmental management, tourism regulation, public communication, and local policy-making related to the conservation of *R. magnifica*. Their insights provided valuable contextual understanding of existing conservation measures and management challenges. Meanwhile, the survey component employed a 3-point Likert scale for residents' responses and open-ended questions for key informants to capture detailed qualitative information.

Population verification and field mapping

To ensure ecological accuracy, population verification of *Rafflesia magnifica* was conducted in collaboration with the Municipal Environment and Natural Resources Office (MENRO) of Maragusan. Field validation was performed under the supervision of Forester Ferdinand Bautista, who personally documented and counted all observable buds, flowers, and host vines within the established monitoring sites in Barangays Mapawa and New Panay. Each site was geo-tagged using Global Positioning System (GPS) devices, and photographic evidence was collected to confirm species identity based on diagnostic floral characteristics described by Madulid et al. (2005). The verified field data were compared with MENRO's 2022–2024 monitoring reports to identify changes in abundance and distribution patterns. The integration of verified counts and spatial mapping ensures that reported population trends reflect the actual status of *R. magnifica* in situ.

KAP scoring method

The KAP scoring method assigned points based on respondents' answers. For knowledge, a "yes" response received 3 points, "maybe" was assigned 2 points, and "no" received 1 point. For attitude, respondents who "strongly agreed" scored 3 points, those who "moderately agreed" scored 2 points, and those who "disagreed" scored 1 point. Regarding practices, "strongly interested" received 3 points, "moderately interested" received 2 points, and "not interested" received 1 point. The total score for each respondent was calculated for knowledge, attitude, and practice. To determine the mean score for each set, the summed scores were divided by the number of respondents. Percentage calculations were then used to identify the proportion of responses that met or exceeded the mean score.

Data analysis

Descriptive statistics, specifically the mean, were used to evaluate respondents' levels of awareness regarding the conservation of *R. magnifica*. A scale was applied to categorize the level of understanding (see Table 1). Comparative data on population abundance were obtained from the MENRO. At the same time, conservation efforts were compared with the 2008 IUCN report on *R. magnifica* and the existing efforts by the LGU of Maragusan over the past 17 years. This comparative analysis provided a basis for assessing the progress and effectiveness of current conservation initiatives.

Table 1. Likert scale for categorizing respondents' awareness levels on *Rafflesia magnifica* conservation.

Likert scale	Interval	Interpretation
1	1.00-1.66	Low
2	1.67-2.33	Moderate
3	2.34-3.00	High

RESULTS

Population abundance of *Rafflesia magnifica*

Rafflesia magnifica is found in lowland evergreen rainforests at elevations of 600-800 m above sea level (asl). In the municipality of Maragusan, *R. magnifica* has been identified in several locations, including Barangays New Albay, Mapawa, New Panay, and Talian. However, only Barangays Mapawa and New Panay are closely monitored due to their accessibility. The Municipal Environment and Natural Resources Office (MENRO) uses three key indicators to track the population of *R. magnifica*: (a) the number of healthy buds (buds that grow without damage), (b) the number of dead buds (buds that fail to bloom), and (c) the number of bloom buds (buds that successfully bloom and maintain exposed petals for 6 to 7 days). Figure 2 shows a blooming *R. magnifica*.

Figure 2. A *Rafflesia magnifica* in full bloom in its natural habitat, in Maragusan, Davao de Oro.

Figure 3 presents the secondary monitoring data on the population abundance of *R. magnifica* in Barangay Mapawa from 2022 to May 2024, as provided by the Municipal Environment and Natural Resources Office (MENRO) of Maragusan. It shows a noticeable decline in the number of healthy *R. magnifica* buds. In 2022, there were 13 healthy buds, but this number dropped significantly to just three in 2023, representing a 10-bud decrease. While the number of dead buds identified in 2023 was lower than in 2022, the number of successfully bloomed buds decreased from five in 2022 to four in 2023. Despite this decline, four buds successfully bloomed in the first semester of 2024.

On the other hand, the population data for *R. magnifica* in Barangay New Panay is concerning (see Table 2). In 2022, only three buds successfully bloomed, but in 2023, no buds were recorded. As of May 2024, only one blooming bud had been identified, indicating a sharp decline in the species' population in this area.

Verified population and distribution data

Field verification confirmed the presence of *R. magnifica* populations in Barangays Mapawa and New Panay, with coordinates mapped for each recorded bud, flower, and host vine. A total of seven individuals were observed across both barangays, including six in Mapawa and one in New Panay. Verified data from MENRO Maragusan (2024) and field validation conducted by Forester Bautista showed a decline in the number of mature flowers compared to earlier monitoring years, consistent with reported reductions in host vine density. The integration of photographic documentation and GPS mapping provides concrete evidence of spatial distribution shifts and localized population decline.

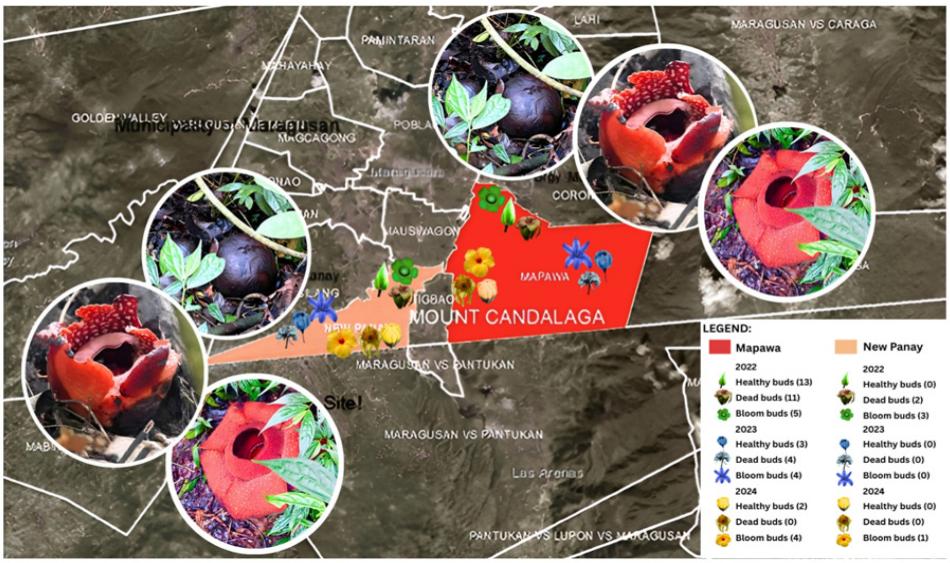

Figure 3. Monitoring data of *Rafflesia magnifica* in Barangay Mapawa and Barangay New Panay, Maragusan, Davao de Oro, Philippines (2022–May 2024).

Level of awareness of local residents regarding *Rafflesia magnifica*

The awareness of residents was assessed based on three categories: Knowledge (understanding the nature of *R. magnifica* and its habitat), Attitudes (recognizing the individual's role in contributing to the conservation of *R. magnifica*), and Practices (understanding the importance of conservation and how human actions impact the species' survival). The results (see Table 3) indicate that residents' knowledge of *R. magnifica's* nature and habitat conservation is at a low level, with a mean score of 1.65. In terms of Attitudes, residents displayed a moderate awareness, with a mean score of 1.75, reflecting some recognition of their potential role in conservation efforts. However, the residents' Practices, including their actions towards conservation and the species' survival, were also rated low, with a mean score of 1.76, indicating a gap in active involvement in conservation efforts despite some level of awareness.

Table 3. Results of the KAP (Knowledge, Attitudes, and Practices) analysis on the level of awareness of local residents.

Indicator	Mean	Interpretation	Remarks
Knowledge	1.65	Low	The local residents' understanding of *Rafflesia magnifica's* nature and the importance of habitat conservation is significantly low. This suggests a need for greater education and awareness about the species and its ecological role.
Attitudes	1.75	Moderate	While the local residents acknowledge the importance of conserving *Rafflesia magnifica*, their attitudes reflect only a moderate level of commitment. This indicates some awareness, but perhaps a lack of deeper engagement or urgency about their role in conservation.
Practices	1.76	Low	The local residents' actions toward conserving *Rafflesia magnifica* are limited. This low score suggests that, despite some awareness, the practical efforts or behaviors necessary to protect the species are not being sufficiently implemented.

Despite the respondents' low level of knowledge regarding the nature of *R. magnifica,* 93.3% were aware of its existence in the municipality (see Table 4). However, a small percentage (6.7%) were unaware of its presence, despite the flower being relatively well-known. The majority of respondents recognized that *Rafflesia* is a wildflower and is found in rainforests. Over half (53.3%) had seen *Rafflesia* in person, and 93.3% were aware that it was specifically *Rafflesia magnifica.* When asked about the species' status as endemic to Maragusan, more than half of the respondents expressed positive knowledge. Furthermore, 73.3% knew that *R. magnifica* is critically endangered and believed that not only Rafflesia but also other endangered species should be protected. Additionally, 93.3% expressed a strong willingness to learn more about endemic and wild species. However, 40% of respondents believed that protecting Rafflesia's habitat would not necessarily impact its ability to bloom.

Table 4. Percentage distribution under knowledge indicator.

A. Conservation is understanding the nature of Rafflesia species and their habitat	**Yes (%)**	**Maybe (%)**	**No (%)**
1. *Rafflesia* species exists in Maragusan.	93.3	-	6.7
2. *Rafflesia* is a wild flower.	80.0	6.7	13.3
3. *Rafflesia* can only be found in rainforest and grows thru a host vine.	86.7	-	13.3
4. Have seen Rafflesia flower personally.	53.3	-	46.7
5. *Rafflesia* species in Maragusan was classified as *magnifica*.	93.3	-	6.7
6. *Rafflesia magnifica* is endemic in Maragusan.	73.3	13.3	13.3
7. *Rafflesia magnifica* was listed in International Union for Conservation of Nature and Natural Resources (IUCN) as CRITICALLY ENDANGERED.	73.3	6.7	20.0
8. Only endangered species such as *Rafflesia* should be protected or conserved.	33.0	6.7	60
9. Eager to acquire and learn knowledge on endemic and wild species.	93.3	6.7	-
10. Protection of the *Rafflesia's* habitat does not affect the flowers to bloom.	40.0	13.3	46.7

When asked about their feelings upon seeing a blooming Rafflesia flower, all respondents expressed happiness (Table 5). Additionally, 53.3% moderately agreed that Rafflesia sites should be open to the public for viewing. Every respondent strongly agreed that Rafflesia should be conserved and that its sites should be declared protected areas. On the other hand, only 6.7% agreed that public viewing of Rafflesia should be banned, while 60% strongly supported the propagation of the species. Respondents also acknowledged the impact of habitat fragmentation caused by human settlements on Rafflesia's survival, with 93.3% agreeing that they would report illegal collection or habitat destruction and participate in public awareness campaigns to help protect the species. Surprisingly, only 63.3% strongly believed that Rafflesia's survival depends on human efforts.

Table 5. Percentage distribution under attitudes indicator.

B. Each of us can make a significant contribution to a good conservation status of Rafflesia species.	**Strongly agree (%)**	**Moderately agree (%)**	**Disagree (%)**
1. Happy to see Rafflesia flower blooms	100	-	-
2. Rafflesia sites should be open to public for viewing.	33.3	53.3	13.3
3. Rafflesia should be conserved.	100	-	-
4. Rafflesia sites should be declared as protected area.	100	-	-
5. Public viewing of Rafflesia should be banned.	6.7	53.3	40
6. Propagation of Rafflesia is desirable	60.0	20.0	20.0
7. Habitat fragmentation cause by human settlement affects the survival rate of Rafflesia	73.3	26.7	-
8. Report problems on illegal collection and or habitat destruction of Rafflesia.	93.3	6.7	-
9. Shares valuable insights and engage in public awareness campaign in media.	93.3	6.7	-
10. Rafflesia's survival depends on humans.	63.3	33.3	13.3

The results of the interview revealed that 53.3% of respondents visit the Rafflesia site every time the flower blooms and often take photographs of it (Table 6). A small portion (6.7%) expressed interest in touching the flower, while, notably, none showed any intention of building homes near the Rafflesia habitat. When asked about spending money to visit the site, 33.3% were strongly willing to do so. Meanwhile, a significant majority—80%—expressed strong interest in participating in awareness programs focused on Rafflesia conservation, and 73.3% showed interest in undergoing conservation training. All participants indicated a strong commitment to following established protocols when visiting Rafflesia sites. Furthermore, 93.3% supported the enactment of legislation to protect Rafflesia, and 80% expressed strong interest in ongoing conservation efforts.

Table 6. Percentage distribution under practices indicator.

C. The conservation status of wild species is important and human practices affects their survival rate	Strongly interested (%)	Moderately interested (%)	Not interested (%)
1. Visiting the Rafflesia every time it blooms	53.3	26.7	20.0
2. Taking pictures near the Rafflesia flower	53.3	26.7	20
3. Touching the Rafflesia flower	6.7	46.7	46.7
4. Build houses near the Rafflesia sites	-	20.0	80.0
5. Spend money to visit Rafflesia	33.	53.3	33.3
6. Attend/attended awareness program for Rafflesia's conservation	80.0	13.3	6.7
7. Attend/attended trainings for the conservation of Rafflesia such as monitoring, mapping, and data gathering	73.3	26.7	-
8. Follows existing rules and protocols when visiting Rafflesia sites	100	-	-
9. Supports in the enactment of legislations to declare Rafflesia sites as protected areas	93.3	6.7	-
10. Enjoin Rafflesia monitoring and other conservation efforts	80.0	20.0	-

Conservation Efforts of Rafflesia magnifica in LGU Maragusan

The findings of this study reveal the progress made by the Local Government Unit (LGU) of Maragusan in conserving R. magnifica over the past two decades (see Table 7). In 2008, following the exploratory research by Madulid et al. in 2005, the species was officially assessed by the International Union for Conservation of Nature (IUCN) and classified as Critically Endangered. At the time of the initial assessment, no formal conservation initiatives were in place.

However, data gathered through a key informant interview with the Municipal Environment and Natural Resources Office (MENRO) forester in 2024 indicates that substantial conservation measures have been implemented since then. A significant development is the creation of the Rafflesia magnifica Conservation and Management Program, which resulted in the establishment of the Rafflesia magnifica Management Team. This team is now actively responsible for monitoring the species' population trends and implementing protection strategies.

To assess the evolution of these efforts, the researcher conducted a comparative analysis between the conservation status and actions reported by the IUCN in 2008 and the current measures observed in 2024. The results (see Table 7) demonstrate a clear shift from the absence of protection in 2005 to a more structured and proactive conservation approach in the present.

Table 7. Comparative data on the conservation efforts of LGU Maragusan for *Rafflesia magnifica* in 2008 and 2024.

Conservation actions in place	2008 (IUCN)	2024
Research, Monitoring and Planning		
Action Recovery Plan	No	No
Systematic Monitoring Scheme	No	Yes (weekly monitoring but only to accessible areas)
Land/Water Protection and Management		
Conservation sites identified	Yes, over a part of range	Yes, Barangay Mapawa, New Albay, Talian, and New Panay
Occur in at least one Protected Area	No	No
Area based regional management plan	No	No
Species Management		
Harvest Management	No	No

The inclusion of field-verified data, GPS mapping, and photographic documentation enhances the credibility of the population assessment. The direct involvement of MENRO and Forester Ferdinand Bautista ensures that the observed changes, particularly the decline in healthy buds and limited blooming across elevational ranges, represent real ecological patterns rather than secondary estimations. This verified data now establishes a scientifically sound baseline for long-term biodiversity monitoring and strengthens the conservation management framework for *R. magnifica* in Maragusan.

DISCUSSION

The population of this critically endangered species in Maragusan is showing a worrying trend, especially in Barangay Mapawa and Barangay New Panay. The number of healthy buds in Barangay Mapawa drastically decreased from 13 in 2022 to just two in 2024 (a reduction of 84.6%) between 2022 and May 2024. The decline in healthy buds and the presence of dead buds indicate that several environmental and anthropogenic factors, including habitat degradation, soil disturbance, agricultural expansion, and increased human activity

near the sites, may be impeding the species' ability to reproduce and thrive, even though the number of blooming buds remained relatively constant, with four blooms observed in both 2023 and 2024. This pattern reflects a larger global trend among Rafflesia species, which are seriously threatened by habitat loss and fragmentation resulting from road construction, agricultural expansion, and increased human access. These processes are also seen in Maragusan, where forest areas have been turned into farm plots and banana plantations (Malabrigo Jr. et al., 2025; Obico et al., 2024). The situation is even more concerning in Barangay New Panay. There were three bloom buds in 2022, but by 2023, none had opened, and as of May 2024, only one blooming bud was visible. The population's sharp decline is alarming because, if the trend continues, it could lead to local extinction in this area (Dirzo et al., 2022). Considering that *R. magnifica* is endemic to this area, the long-term survival of the species may be significantly impacted by the decline of such populations.

The Knowledge, Attitudes, and Practices (KAP) survey's findings demonstrate the disconnect between awareness and proactive participation in conservation initiatives. 93.3% of respondents were aware, indicating a comparatively high level of awareness regarding the species' existence. Little is known about its habitat and the ecological significance of protecting it. The low mean score of 1.65 in the Knowledge category confirms this. Although 73.3% of respondents are aware that the species is critically endangered, a sizable portion of the population (40%) does not believe that habitat protection is required for the species to thrive, indicating a lack of understanding of the delicate balance between habitat quality and the species' capacity to survive. Furthermore, the low levels of active participation in conservation practices, as reflected in the Practices category, which received a score of 1.76, indicate that although the local population may understand the significance of Rafflesia, they are not taking sufficient action to protect it. The general level of participation in conservation programs is still low, despite some encouraging results, such as the fact that 93.3% of respondents are willing to report illicit activities that affect Rafflesia. This suggests the need for targeted educational campaigns that highlight the actionable steps individuals can take to protect the species (Gregg et al., 2022).

R. magnifica management has advanced significantly with the launch of a formal conservation program in Maragusan, by the Local Government Unit (LGU) in partnership with the Municipal Environment and Natural Resources Office (MENRO), and guided by DENR conservation frameworks and regional biodiversity management practices. There has been a discernible shift from the species' initial lack of official protection to the establishment of the *Rafflesia magnifica* Conservation and Management Program, which includes the creation of the *Rafflesia magnifica* Management Team, following the International Union for Conservation of Nature's (IUCN) classification of the species as critically endangered in 2008. This group is essential to the species' monitoring and conservation efforts. There are still significant obstacles, however. Long-term conservation success is hindered by the absence of a formal recovery plan and the fact that the species does not reside in a protected area, despite the establishment of systematic monitoring in accessible areas. The absence of a thorough, region-specific management strategy for *R. magnifica* exacerbates the situation, as habitat fragmentation resulting from human activity remains a significantissue. The lack of these management measures makes it difficult to comprehensively safeguard the species' habitat, particularly as human encroachment on rainforest areas continues (Okosodo and Ogidi, 2023).

With 100% of respondents agreeing that the flower should be conserved and its locations designated as protected areas, local attitudes toward *R. magnifica* show a willingness to preserve the species. Gaining support for conservation efforts requires acknowledging the flower's significance. Although the community may support conservation ideologically, the gap between expressed attitudes and actual conservation efforts, as indicated by the low score for the Practices category, suggests that their actual participation in actions such as opposing illegal collection or supporting habitat protection may be constrained by a lack of funding or inadequate education. Furthermore, more than half of the survey participants frequently visit and record the blooms, indicating a high level of interest in visiting Rafflesia sites. Only when well-defined procedures and eco-friendly tourism practices are in place to mitigate the adverse effects of human activity on the species' habitat can this interest be leveraged for conservation. As long as sufficient opportunities for education and involvement are made available, the high interest in attending conservation training and awareness programs is encouraging and suggests potential for increasing active participation in conservation efforts (Ardoin et al., 2020).

Several suggestions for enhancing the conservation status of *R. magnifica* are presented in light of the study's findings. First, targeted education initiatives should be implemented to increase locals' awareness of *R. magnifica's* ecological significance, the dangers it faces, and the importance of preserving its habitat (Altamira and Koestoer, 2024). The knowledge gap should be addressed through educational programs, particularly in terms of how human activities, such as habitat destruction and illicit collection, impact the species' ability to survive (Torrance and Tomlinson, 2025; Yang and You, 2025). The second is that the creation of *R. magnifica*-protected areas ought to be given priority. The establishment of an area-based management plan can support more comprehensive conservation strategies, while formal protection can mitigate habitat loss caused by human activity (Bhola et al., 2021; Hoffmann, 2022; Urbina-Cardona et al., 2024). To support these initiatives, the government should also explore ways to secure national or international funding (Cosma et al., 2023). Third, despite the considerable interest in visiting Rafflesia sites, it is essential to ensure that tourism does not negatively impact the species or its habitat. It is essential to adopt sustainable ecotourism practices, including controlled tourism and the establishment of explicit guidelines (de Grosbois and Fennell, 2022; El Moslem Badr, 2022; Yadav, 2023). This would minimize the adverse environmental impact and enable public engagement (Baloch et al., 2023; Pathmasiri et al., 2025; Svitlichna et al., 2024). Fourth, to track trends in the species' abundance and identify new threats in real-time, the population must be continuously monitored (Moussy et al., 2022). extending surveillance activities to more isolated regions where *R. magnifica* may exist, as well as incorporating residents into monitoring activities, would enhance data collection and conservation outcomes (Mosoh et al., 2024; Stephenson et al., 2022). Finally, engaging local communities in conservation efforts through training programs and volunteer opportunities is crucial (Leyshon et al., 2021; Wong et al., 2021). The local community can play a more active role in protecting *R. magnifica* by equipping locals with the necessary information and skills to monitor, report, and participate in awareness campaigns (Van Vliet et al., 2025; Rivera et al., 2024).

CONCLUSION

The study's conclusions draw attention to the alarming drop in *R. magnifica's* population. *Magnifica* in Davao de Oro's

Maragusan, highlighting the pressing need for more robust and ongoing conservation initiatives. The number of healthy buds and blooming flowers has significantly decreased, according to population monitoring data from Barangays Mapawa and New Panay. This decrease reflects the species' growing vulnerability. Nevertheless, there have been positive advancements in conservation efforts and local awareness. Even so, the understanding of *R. magnifica* is still scarce. However, locals have shown a willingness to take precautionary measures, such as attending awareness events and adhering to conservation guidelines, as well as generally positive attitudes.

By establishing the *Rafflesia magnifica* Conservation and Management Program, the Maragusan Local Government Unit (LGU) has made impressive strides. Comparing data from 2008 and 2024, however, suggests that some crucial tactics, such as formal protected area designation and systematic species monitoring across all possible sites, require improvement. To ensure the long-term survival of *R. magnifica*, the LGU is urged to establish a regular monitoring system in collaboration with the MENRO, DENR, and academic partners, as well as to strengthen habitat protection by incorporating Rafflesia sites into municipal land-use plans as locally managed conservation zones. Furthermore, capacity-building programs that educate residents to become biodiversity stewards and monitoring volunteers should be implemented to increase community involvement. To strike a balance between rigorous conservation measures that minimise habitat disturbance and visitor engagement, sustainable ecotourism practices should also be encouraged. Lastly, to maintain long-term conservation initiatives, research partnerships, and barangay-level awareness campaigns, the LGU should allocate specific funds and provide policy support. *Rafflesia magnifica's* ecological and cultural significance will be preserved for future generations thanks to these coordinated efforts.

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AUTHOR CONTRIBUTIONS

J. T. E: Conceptualized the study, led the field data collection, performed data analysis, and wrote the initial draft of the manuscript. J. M. B: Contributed to the study design, facilitated community coordination in Maragusan, assisted in field data gathering, and provided critical revisions to the manuscript. F. B: Supported ecological assessments in the field site, provided local environmental insights, and assisted in verifying conservation-related and other quantitative data. P. N. C: Contributed to data interpretation, improved the structure of the manuscript, and assisted in the refinement of graphical and textual outputs. E. M. V: Supervised the overall research process. All authors reviewed and approved the final version of the manuscript.

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DECLARATION

Informed consent statement

Ethical considerations in this study focused on ensuring the protection of both the participants and the endangered species, *R. magnifica*. Informed consent was obtained from all residents involved in the survey, with clear explanations provided regarding the study's purpose, the voluntary nature of participation, and the confidentiality of their responses. Efforts were made to ensure that the study did not disrupt the local community or their environment, particularly given the sensitive nature of the species' habitat. Additionally, Key Informant Interviews were conducted with respect for local knowledge, allowing interviewees to express their views freely without coercion. The research adhered to ethical guidelines by promoting awareness and encouraging positive conservation behaviours, while avoiding any actions that could further endanger the species or harm the local community. The study also ensured that data collected from both residents and local authorities were used solely for conservation-related purposes and to support sustainable development practices in the region.

Conflict of interest

The authors declare no conflict of interest.

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