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Initial Assessment of Distribution Patterns of Pitcher Plant (*Nephentes Bellii)* in Northern Mindanao, Philippines

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Abstract

If the goal of conserving plant diversity is seen from a global perspective, it is enormous, but a well-designed and well-managed protected area system can help. We value plants significantly more since they give our animals, our food, and a wide range of other goods and services, such as clean water, textiles, and various building materials. This study aimed to evaluate the distribution patterns of the pitcher plant (Nephites Belli) in Northern Mindanao, particularly in Cantilan and Carrascal, Surigao del Sur, Philippines. The geological Position System (GPS) was utilized to locate the exact position of the pitcher plant. The GPS points gathered were then illustrated as the precise positions of the sampling sites using the Geographic Information System (GIS). Further, a hand-held Global Positioning System (GPS) receiver (Gamin GP 12 Personal Navigator) was employed to get coordinates of acceptable boundaries, such as administrative boundaries of the municipal and barangay level, streets, and water sources within the area of study.

Results show that the Pitcher plant (*Nephentes bellii*) can be found in all three locations. Various patterns were identified in every place, and gaps were observed.

Keywords: Initial Assesmant, Distribution Patterns, Pitcher Plant (*Nephentes bellii),* North Eastern Mindanao

I. Introduction

Different species' abundance and distribution patterns can provide insight into how community functions. Understanding these patterns has crucial practical consequences for topics like reserve selection and projecting extinction risk [(10)]. Worldwide, it is estimated that one-third of all plant species are threatened with extinction [(7)]. In a report by the International Union for Conservation of Nature (IUCN), *Nephentes bellii*, a species of pitcher plant, is now considered endangered and threatened with extinction due to habitat loss caused by human activities [(6)]. Pitcher plants are diverse carnivorous plants with modified leaves known as pitfall traps—a prey-trapping mechanism and a deep cavity filled with digestive liquid. The traps considered specialized leaves to form "true" pitcher plants. It attracts and drowns its prey with nectar [(4)]. The plant has two families-*Nepenthaceae*, which consists of a single genus *Nepenthes*, with some 140 species of tropical pitcher plants, and *Sarraceniaceae*, which consists of three genera of the pitcher [(8)].

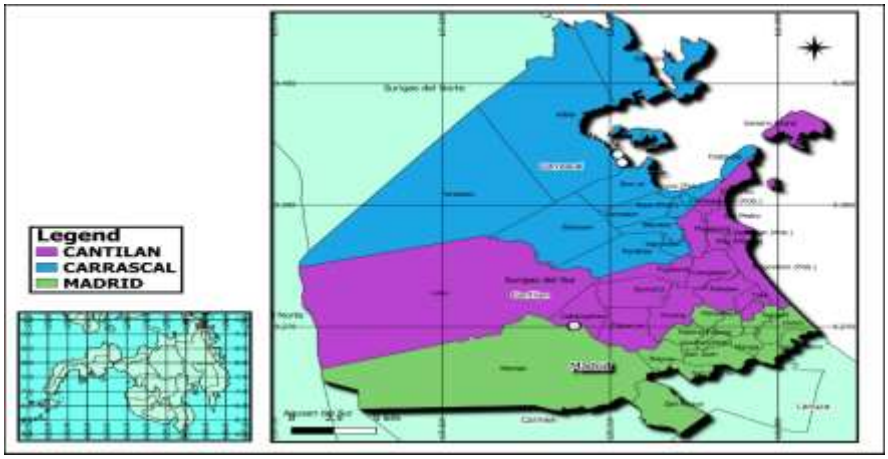
In the Philippines, particularly in the Northern part of Mindanao, various pitcher plants are identified; one among them is *Nepenthes bellii*. Hara-Hara, as it is locally known, is an endemic specie of pitcher plant. It is first found in the islands of Mindanao within the Municipality of Hayanggabon and Carasscal. Nepenthes bellii is a climbing plant growing to a height of 2.5 m and occasionally even 10 m. The stem, which may be branched, often ascents through vegetation but may also grow prostrate along the ground [(3)]. *Nephentes bellii*, along with other known species of the *Nephentes* genus, has been used as a traditional medicine to treat ailments such as fluid retention, urinary tract difficulties, digestive disorders, and constipation [(2)].

Due to natural and human activities, the plant became vulnerable to habitat loss, resulting in possible extinction. Hence, this paper would like to assess the distribution and abundance status of *Nephentes bellii* in the northern part of Mindanao to have initial data on its position based on its distribution pattern. This evaluation will lead to the development of a protection and conservation program to save an endemic specie.

II. Materials and Methods

The Study Site

The study was conducted in Brgy. Cabangahan in the Municipality of Cantilan and classified as site A. Sitio, Gango, Bon-not classified as site B and Adlay, Carrsacal Surigao del Sur as site C.



Map of Cantilan and Carrascal, Surigao del Sur

Collection of GPS points

The researcher utilized the Geological Position System (GPS) device to locate the exact position of the pitcher plant within the 100 meters parameter transect as a sampling area with the (+ and - 1-meter radius of the location). The GPS points gathered were then illustrated as the locations of the sampling sites using the Geographic Information System (GIS). The datasets utilized in the study include (1) political boundaries (geoportal.gov.ph0 (2) Open Street map (osm.org.) (3) waterways (4) Ph16, barangay boundaries) of which are all secondary data imported from data sites as clustered data.

QGIS 3.4 was used to map the collected GPS points. First, the researcher imported the Philippine map, where administrative and political boundaries can be obtained. Second, the researcher overlaid the GPS points from the attribute table in excel form so that the locations of the points were displayed on the corresponding barangays where the samples were gathered. Third, overlay the street maps so the relative distance and position of the sampling sites could be expressed in terms of accessibility to road networks.

GIS Mapping

A hand-held Global Positioning System (GPS) receiver (Gamin GP 12 Personal Navigator) was used to obtain coordinates of appropriate boundaries, such

as administrative boundaries of the municipal and barangay level, streets, and water sources within the area of study. The geological characterization of the study area was obtained by incorporating the existing spatial data and Geographic Information System (GIS) QGIS 3.2. software. The use of geographical information system allowed overlapping of the spatial location of road networks and water sources and the generation of microbial analysis maps for the study area. The study utilized the 100-meter perimeters transect for the sightings of the pitcher plant per study area. The hand-held GPS was then used to collect points for every plant and plot it in the QGIS 3.2. for the location. Each perimeter has a maximum of 20 GPS points collected and a minimum of 10 GPS points. The data were then overlaid on the barangay boundaries.

III. Results and Discussion

Figure 1 shows the details of the GPS points collected in samplings from site A (Barangay Cabangahan, Cantilan, Surigao del Sur); the sampling code assigned to the areas contains the initial barangay name with its corresponding sampling site number. The latitude and longitude show the exact location of the pitcher plants within the 100-meter perimeter transect conducted.

The area where the transect was conducted in Site A is a low-lying area along the Carac-an river flowing towards the Municipality of Madrid. It can be observed that pitcher plants are present in the area and duly represented by the white dots seen in figure 3 above. The pitcher plant in site A is somewhat adequate since the overlapping of plants is observed. The number of species always increases with area up to the point where the entire world has accumulated [(11)]. On the contrary, it is not enough to conclude that the pitcher plant is increasing since there is poor documentation on the actual number of pitcher plants *(Nephentes bellii)* due to the conflict of natives in the area [(6)]. Hence, no baseline data can be utilized in determining the increase or decrease of the actual number of pitcher plants in Site A. Thus, this result can give an idea to government offices and agencies concerned about the environment and preservation that valuable plant species still need to be appropriately recorded and documented for their number and abundance.

Figure 2 shows where the transect was conducted in Site B. It has an elevation of 67.3 meters or 220.8 feet above sea level and is commonly bordered by Barangay Adlay and Barangay Gamuton. Results in figure 3 revealed the presence of gaps between the pitcher plant similar to site A. But generally, they are clumped since the species gather together in the same area. This result shows coherence to the claim of the International Union for Conservation of Nature that the pitcher plant *(Nephentes bellii)* is endangered in its status. Threatened species are more likely to be grouped together on a phylogeny. Since similar taxa are frequently found within the same large geographic or habitat categories where human-induced threats are concentrated, they are assumed to share features that make them more vulnerable to extinction [(9)].

Additionally, site B's area is at a lower elevation than site A's. Which, because of its accessibility, has a high percentage of natural habitat distraction. The lowland deforestation rate is significantly higher than the deforestation rate in mountain areas [(1)]. Because of this factor, it increases the risk of the plant species decreasing its number.

Figure 3. shows the details of the GPS points collected in sampling site C. of barangay Adlay, Carrascal, Surigao del Sur. The latitude and longitude show the exact location of the pitcher plants within the 100-meter parameter transect conducted. Only 16 actual sightings of the pitcher plant were recorded in this sampling site. The area where the transect is conducted is situated along a national road traversing directly to Surigao del Norte. The sampling site is the last barangay of the Municipality of Carrascal bordered by barangay Bon-ot and barangay Cagdianao, Claver, Surigao del Norte.

Pitcher plants are arranged longitudinally at Site C; this distribution is mainly regular or consistent. Plants of all kinds also display this type of dispersion [(4)]. Conflict for a resource, such as moisture or nutrients, or direct social interactions between individuals within a population, frequently necessitates optimizing species spacing [(12)].

As mentioned above, Site C is situated alongside a national road, which poses a significant threat to the plants since they thrive in a lowland area. With that, they are prone to distraction and disturbance from their natural habitation. In a way, the arrangement is an adaptation process of the pitcher plants to minimize competition in the nutrients from its surroundings and possible struggle in catching their prey.

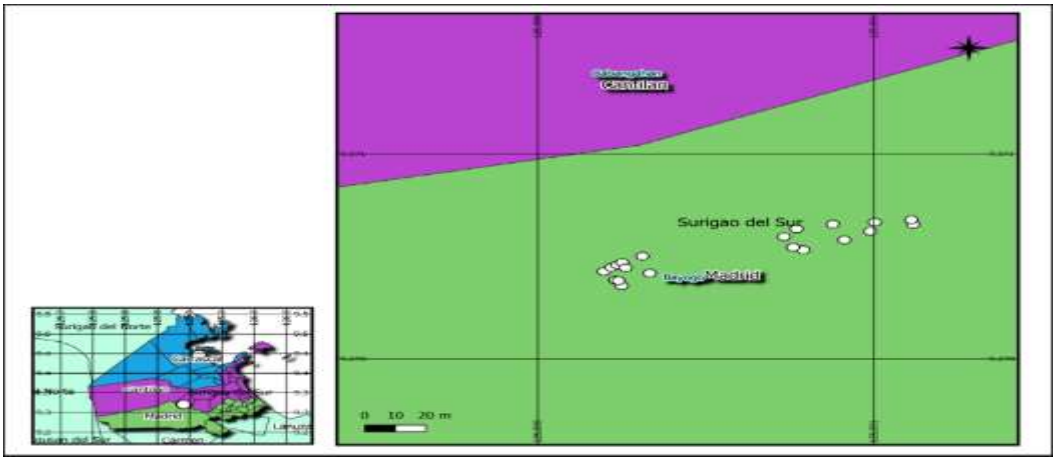


Figure 1. Sampling details of Site A. Barangay Cabangahan, Cantilan Surigao del Sur

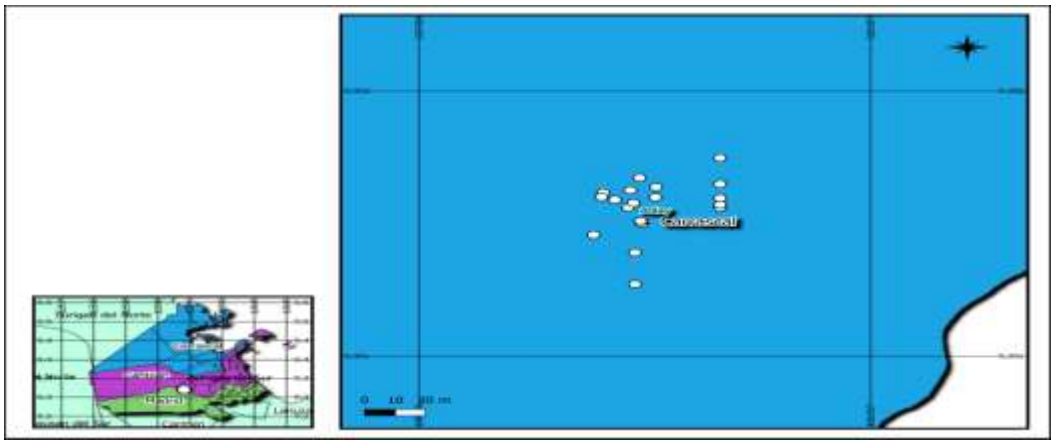


Figure 2. Sampling details of Site B. Barangay Bon-ot, Carrascal, Surigao del Sur

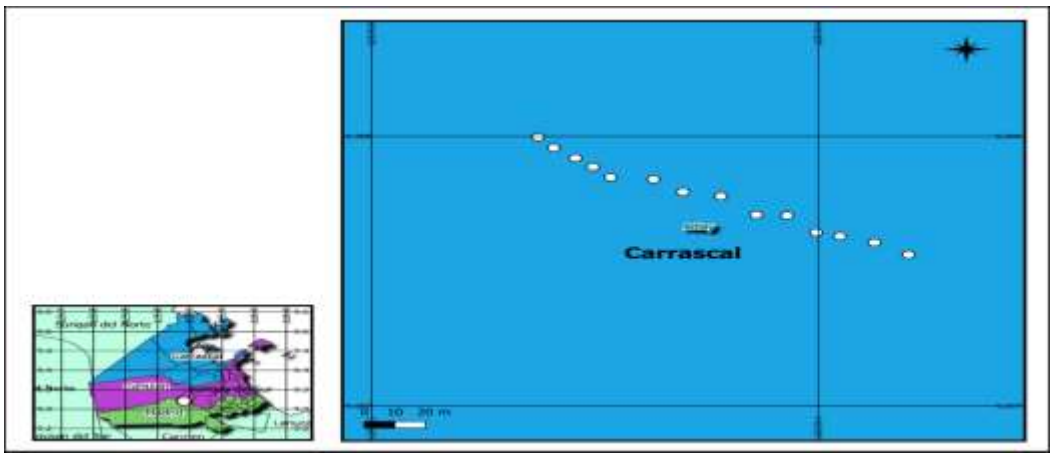


Figure 3. Sampling details of Site C. Barangay Adlay, Carrascal, Surigao del Sur

Conclusion

In the current study, the Pitcher plant *(Nephentes bellii)* can be found in all three locations. However, various patterns were identified in every area; gaps were observed, implying a significant decrease in the number of species in the region. Further, strengthening the enactment of the current laws on the protection, preservation, and conservation of plant species, especially those of medicinal and economic relevance, could help save the plant species from extinction.

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