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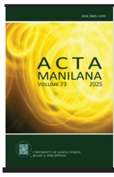

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An updated checklist of the genus *Amorphophallus* Blume ex Decne. (Araceae) in the Philippines

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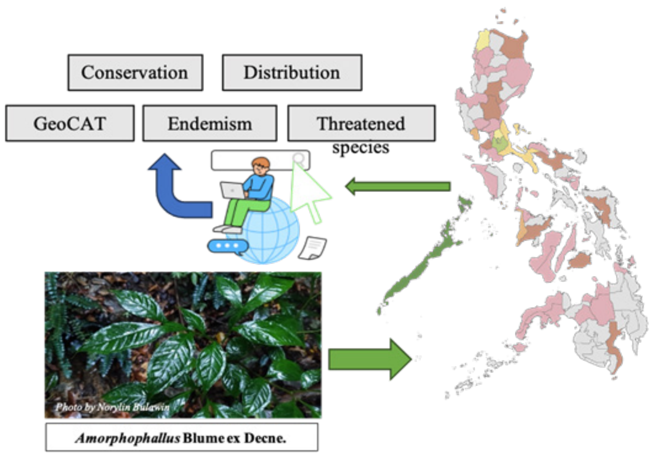
Graphical Abstract



Abstract

With the increasing number of species and incomplete conservation status, this study aimed to provide an updated information on the distribution and preliminary conservation of the enigmatic genus *Amorphophallus* Blume ex Decne. (Araceae) in the Philippines. The ArcMap v10.8.2 and GeoCAT were utilized for mapping and conservation assessment. Combined online herbaria, field collection, and protologue data yielded 108 total occurrences and a total of 22 *Amorphophallus* species is recognized, of which 20 are endemic. The species with the highest occurrences are *A. paeoniifolius* (Dennst.) Nicolson (31%), followed by *A. longispathaceus* Engl. & Gehrm. (13%), *A. rostratus* Hett. (7%), *A. konjac* K. Kock (6%), and *A. urceolatus* Hett. et al. (4%). Luzon has the highest species diversity (18 spp., nine restricted endemics), followed by Visayas (10 spp., three restricted species) and Mindanao (5 spp.). Preliminary conservation status for 11 *Amorphophallus* species with no current IUCN assessment is here provided. GeoCAT assessments, combined with existing IUCN data, indicate 66% of *Amorphophallus* species are potentially threatened (10 CR, 3 EN, 1 VU). Luzon has the highest number (71% or 10 spp.) of threatened species (six CR, three EN, and one VU). Data limitations hindered a comprehensive assessment and further research is needed, especially for less understood species.

Keywords: conservation, distribution, endemism, GeoCAT, Threatened species

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Introduction

Araceae are one of the most species-rich plant families having 144 genera and 3645 published species [1], showing highly diverse morphology amongst the land-plant families [2] of which the enigmatic genus *Amorphophallus* Blume ex Decne. belongs. *Amorphophallus* is widely distributed paleo-tropically in Africa, Madagascar, Asia, the Malay Archipelago, Melanesia, and Australia [3, 4, 5]. It is a large and diverse genus that emerged approximately 30-25 million years ago [2,6] and its center of diversity is in Southeast Asia [1, 7, 8] Currently, the World Checklist of Vascular Plants [9] recognizes 241 *Amorphophallus* species [10,11], although estimates suggest over 300 species may exist across Africa, Asia, and Australia, occupying diverse ecological niches [12].

Recognized as a global megadiverse country with high biodiversity and endemism [13, 14], the Philippines boasts significant botanical diversity, estimated at 10,000-11,000 plant species [15]. The archipelago is home to 22 recognized *Amorphophallus* species 20 of which are endemic, notable for their unique inflorescences and leaf structures [15]. These enigmatic plants have become subjects of interest for both botanists and nature enthusiasts contributing significantly to the nation's botanical diversity.

This study focuses on the distribution of Philippine *Amorphophallus*. Merrill [16] initially listed six species: *A. campanalatus* (now *A. paeoniifolius* (Dennst.) Nicolson), *A. rivieri* (now *A. konjac*), *A. variabilis*, *A. longispathaceus* Engl. & Gehrm., *A. luzoniensis* Merr., and *A. merrillii* K. Krause. Bogner & Hetterscheid [17] added *A. palawanensis* Bogner & Hett., followed by Hetterscheid [18] with four more, including Palawan endemics (A. *dactylifer* Hett., *A. rostratus* Hett., *A. declinatus* Hett., *A. salmoneus* Hett.). Subsequent discoveries include *A. adamsensis* Magtoto et al. [19, 20] and numerous other endemics (*A. fornicatus* Hett. et al., *A. cidarioides* J.R.Callado et al., *A. rayongii* Hett. & Medecilo., *A. urceolatus* Hett. et al., *A. yaoi* A.Galloway et al., *A. caudatus* R.Bustama*nte et al., A. calcicola M.N.Tamayo et al., A. minimus R.Bustamante et al.,* A. flammeus Calaramo et al., *A. fontarumii* Bulawin et al., *A. samarensis* Fontarum-Bulawin et al.). Furthermore, the rediscovery of the lost herbarium type of *A. longispathaceaus* by Bustamante et al. [21] led to synonymizing of *A. dactylifer* Hett. to *A. longispathaceus* Engl. & Gehrm, with additional distribution, offered hope to two other taxa (*A. luzoniensis* Merr., and *A. merrillii* K. Krause.) whose designated holotypes were lost and destroyed during WWII. On the other hand, *A. samarensis* Bulawin et al. was recently described [22]. Currently, 22 species are recognized: 20 endemic, and two non-endemic, *A. paeoniifolius* (Dennst.) Nicolson (native to Asia, also in Cuba, North America [23], and Australia [3, 24]) and A. konjac K.Kock (cultivated, not naturalized [15]).

Several Philippine *Amorphophallus* species are IUCN red-listed due to anthropogenic and natural causes: critically endangered (*A. calcicola* M.N.Tamayo et al., *A. caudatus* R.Bustamante et al., *A. fontarumii* Bulawin et al., *A. minimus* R.Bustam et al., *A. natolii* Hett. et al., *A. palawanensis* Bogner & Hett., *A. samarensis* Bulawin et al.), near threatened (*A. adamsensis* Magtoto et al.), and vulnerable (*A. flammeus* Calaramo et al.) [25].

This paper proposes preliminary conservation statuses using GeoCAT for unassessed species and presents an updated distribution record of all known Philippine *Amorphophallus* species (scientific name, biogeographic distribution from online databases, field collections, and protologues). This study aims to present an updated floristic inventory of *Amorphophallus* species in the Philippines and elucidate its distribution patterns based on the available recorded collections. This study will serve as a preliminary representation for country-level investigations of *Amorphophallus* species to answer questions concerning the distribution in its mainly ecological context. Additionally, this study aims to gather crucial, evidence-based information to drive effective conservation and sustainable management strategies for *Amorphophallus* species on a broader scale in the future.

Materials and methods

This paper provides an updated distribution record of the recognized Philippine *Amorphophallus* species (Figure 1), including their conservation status, and their ecological habitat information. The importance of this updated record cannot be overstated, as it underlines the urgency of conservation efforts. All the acquired information on Philippine *Amorphophallus* species came from protologues, online herbaria, and public access databases on biodiversity data. Only the taxonomically accepted species of *Amorphophallus* recorded within the Philippines was included in this paper. The checklist also incorporated species described by Merrill [16] whose original herbarium collections were destroyed during World War II [21] and tagged as lost however data on their locality and distributions were available online.

The scientific names of accepted species of *Amorphophallus* were obtained from the Co's Digital Flora of the Philippines (CDFP) [15] and verified using the World Checklist of Vascular Plants (WCVP 2022), International Plant Names Index [26], and other online herbaria. Herbarium code, institution, and location were checked using the database of NYBG Steere Herbarium [27] (Table 1). For the species' geographic coordinates, data were source out from actual field collections, and protologues, while records of additional occurrences were obtain using Global Biodiversity Information Facility (GBIF) [28]. These records were meticulously checked to remove duplicated data, taxa with doubtful taxonomic status, and generalized or unspecific places of collection, In some cases, ensuring the reliability of the data when published records contain no coordinates. but include a textual description of their area of collection, Georeferencing was performed.

Updated distribution and species richness maps were plotted using ArcMap v10.8.2 for geoprocessing. Data on preferred ecological habitat were based on the protologue of each species. NR was used for species with no recorded data. The IUCN Global Red List Category provides conservation status but almost 50% of the total Philippine *Amorphophallus* species were not included. To ensure data reliability, IUCN guidelines were followed. Geospatial Conservation Assessment Tool (GeoCAT) analysis was performed to support IUCN data by calculating extent of occurrence (EOO) and area of occupancy (AOO) using the default 2km2 (4km2) cell size [29] to determine threat level.

Table 1. Herbaria used as a repository for the herbarium collection of Philippine *Amorphophallus* species.

Institution	Location	Herbarium code
The National Research and Innovation Agency (BRIN)	Indonesia. West Java. Cibinong	BO
University of the Philippines Los Baños	Philippines. Laguna. Los Banos	CAHUP
Central Mindanao University	Philippines. Bukidnon. Musuan	CMUH
De La Salle University-Dasmariñas	Dasmariñas, Cavite, Philippines	DLSU-DH
Northwestern University Inc.	Philippines. Ilocos Norte. Payas-Samac, San Nicolas	HNUL
Royal Botanic Gardens	U.K. England. Kew	K
Naturalis Biodiversity Center	The Netherlands. Leiden	L
Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB)	Germany. München	M
University of the Philippines Baguio	Philippines. Baguio City	NLUH
The New York Botanical Garden	U.S.A. New York. Bronx	NY
Philippine National Museum	Philippines. Manila	PNH
University of the Philippines	Philippines. Quezon City	PUH
National Parks board Singapore.	National Parks board Singapore. Singapore. Singapore	SING
Smithsonian Institution	U.S.A. District of Columbia. Washington	US
University of Santo Tomas	Philippines. Manila	USTH

Moreover, the following abbreviation was used for the conservation status of *Amorphophallus* species: NE - Not Evaluated, LC – Least Concern, NT – Near Threatened, V – Vulnerable, EN – Endangered, and CR – Critically Endangered, and NR – No Record was used for those *Amorphophallus* species with no recorded data. Meanwhile, information about the distribution status was obtain using the abbreviation EC for endemic *Amorphophallus*, NA for native species and C for cultivated *Amorphophallus*.

Furthermore, Philippine forest cover loss data was retrieved from the University of Maryland's GLAD laboratory. Following Hansen et al. [30], GLAD produced a 30m spatial resolution global database using Landsat images. The global forest change maps show forest cover loss (forested to non-forested state) from 2000–2023 [31]. After downloading the relevant 10x10 degree granules, data preprocessing and mapping were performed using ArcMap v10.8.2.

Results and Discussion

Species Diversity and Distribution of Amorphophallus in the Philippines. There are 22 recognized species recorded inhabiting the Island of Philippines and 108 total occurrences were accumulated from combining the records obtained using online herbarium repositories, field collections and protologues data. The species with the highest occurrences was *A. paeoniifolius* (31%), followed by *A. longispathaceus* (13%), *A. rostratus* (7%), *A. konjac* (6%), and *A. urceolatus* (4%) (Figure 2) Two (*A. paeoniifolius* and *A. konjac*) of these taxa are common across Asian countries while the remaining others were endemic in the Philippines (Table 2).

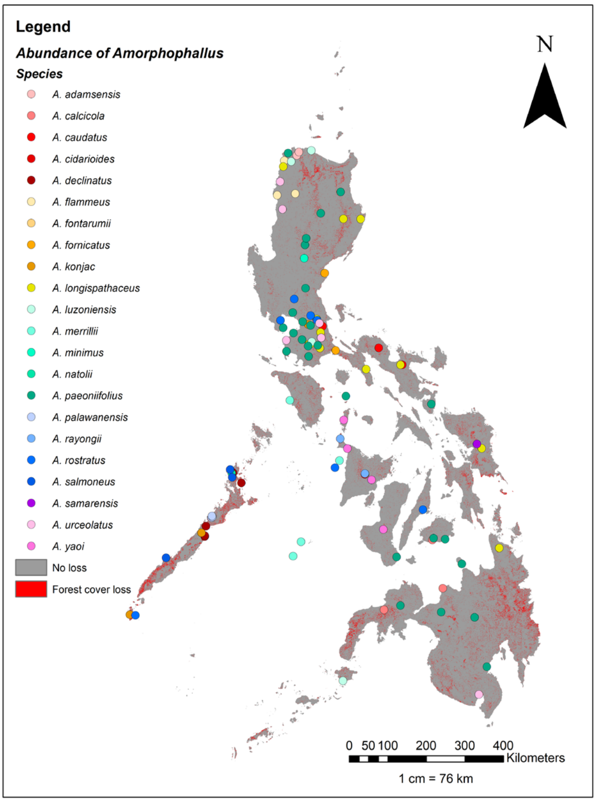

Figure 1. Updated species distribution map of *Amorphophallus* and forest cover loss during the year 2001-2023 gradient in the Philippines mapped by P.C Rivera.

A. paeoniifolius had the highest occurrences comprising 31% of the total species occurrences and widely distributed among all the recorded species in the Philippines, possibly due to its getaway cultivation and widely grown in Southeast Asia [10, 32]. The species also occurred in the three major islands of the Philippines suggesting that this species may also have an effective dispersal mechanism and/or have high habitat adaptability.

While island restricted *Amorphophallus* species (e.g., *A. adamsensis*, *A. cidarioides*, *A. declinatus*, *A. fontarumii*, *A. minimus*, *A. natolii*, *A. palawanensis*, *A. salmoneus*, *A. samarensis* and *A.rayongii*) represent the least abundant taxa of less than 2% of the total collections (Figure 3) these could be correlated with their preferred ecological habitat consisting of wet and dense forest [19], watery areas, limestone cliffs or karst [33] and, montane forest [34] (Table 2).

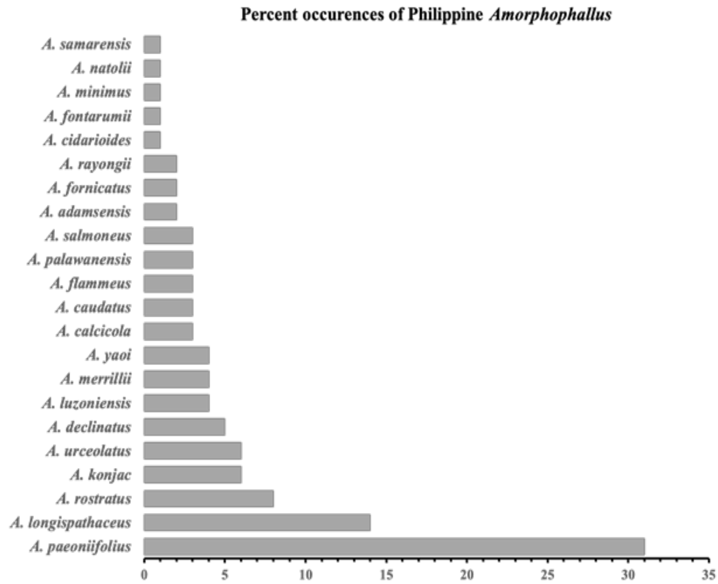

Figure 2. Percent occurrences of recognized *Amorphophallus* species in the Philippines.

Luzon has the highest *Amorphophallus* species diversity in the Philippines (18 spp., nine restricted endemics), followed by Visayas (10 spp., three restricted species) and Mindanao (five spp.) (Table 2). Most Philippine *Amorphophallus* (18 spp. of 22 spp.) are found in Luzon and extending southward to MIMAROPA (Mindoro, Marinduque, Romblon, and Palawan) including Palawan, a major biogeographic region based on the PAIC (Pleistocene Aggregate Island Complex) [15, 35], has seven *Amorphophallus* species (*A. palawanensis*, *A. declinatus*, *A. salmoneus*, *A. natolii*, *A. merrillii*, *A. rostratus*, and *A. konjac*) (Figure 1), with four (*A. palawanensis*, *A. declinatus*, *A. salmoneus*, and *A. natolii*) restricted to the island. *A. rayongii*, *A. cidarioides*, and *A. samarensis* are exclusive to Visayas, while *A. calcicola* occurs in both Visayas and Mindanao (Table 2).

The differences in the distribution and number of species (total number of species richness) within each of the major island groups could be explained with different biogeographical factors [36] in this case by the PAIC theory [37], habitat specificities such as climates and forest type [38, 39] . Endemism and biodiversity in the Philippines were explained by the PAIC theory stating that spontaneous speciation events via vicariance were permitted during a series of isolation and reconnection of greater islands in the Philippines along the Pleistocene epoch allowing these ancient islands to be a common ground for unique set of species [15, 37]. Furthermore, Luzon Island is the center of endemism, the largest and oldest of the oceanic islands [39]. Luzon also explain why several endemic species of *Amorphophallus* were nested in Luzon.

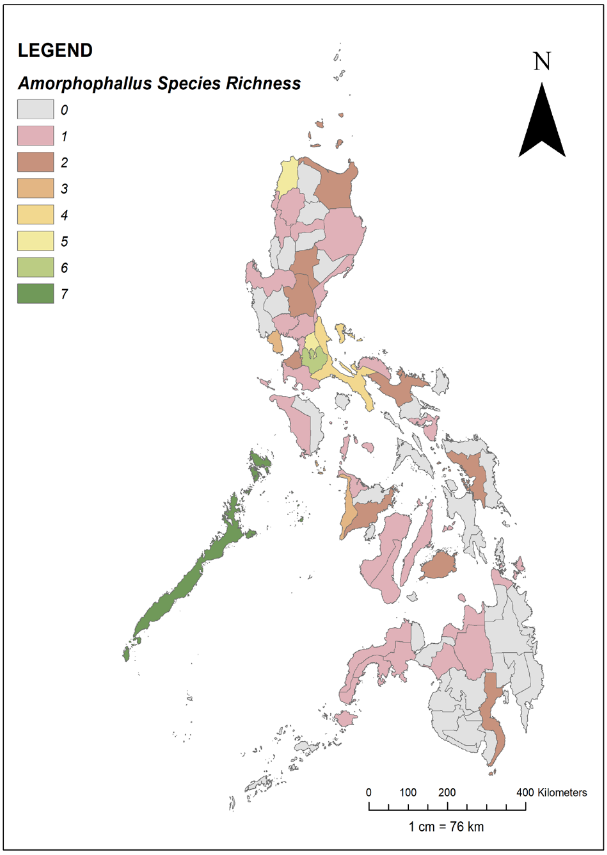

Figure 3. Species richness of *Amorphophallus* across the provinces of the Philippines mapped by P.C Rivera.

Additionally, by understanding the dispersalist paradigm Dickerson et al. [40] proposed four colonization routes explaining the story behind the dispersal event of Philippine biota. These are the Borneo-sulu route, Palawan – Mindoro route, Taiwan – Batanes – Northern Luzon route and the Sulawesi – Eastern Mindanao route, these routes could potentially explain why *Amorphophallus* species are abundant in the Luzon Islands, particularly to Palawan Island, which is known to have a shared biotic community with Borneo [41, 42, 43]. Moreover, investigating Bornean *Amorphophallus* species and comparing them with the Palawan species by their morphology and molecular characters could further elucidate their relationships.

The Philippines displays significant geomorphology with the Indonesian Archipelago and it was discovered to have connections via submarine land bridges from Palawan-Sulu to Borneo [44], Merrill [16] also observed that majority of the Philippine flora showed high affinity to Indo-Malayan community, with exception of the cordillera part, which was assumed to be more connected to Taiwan flora by having similar climate conditions. Interestingly, 70% of various species of *Amorphophallus* can be found in Southeast Asia [45] under the Indo-Malay biogeography.

Table 2. List of *Amorphophallus* in the three major island groups in the Philippines based on field collection, herbaria, GBIF repositories and CDFP databases in the Philippines.

Name of species	L	V	M	Location	Endemicity	Ecological habitat
A. adamsensis Magtoto et al.	x			NT	E	Wet forest
A. calcicola M.N. Tamayo et al.		x	x	CR	E	Forest over karst
A. caudatus R.Bustamante et al.	x			CR	E	Low land forest with loamy substrate
A. cidarioides J.R.Callado et al.		x		NE	E	Watery areas
A. declinatus Hett.	x			NE	E	Light forest at low altitudes
A. flammeus Calamaro et al.	x			VU	E	Limestone forest with loamy substrate
A. fontarumii Bulawin et al.	x			CR	E	Shared area on limestone rock
A. fornicatus Hett et al.,	x			NE	E	Secondary forest
A. longispathaceus Engl. & Gehrm.	x	x	x	NE	E	Limestone forest and Dry lowland areas
A. luzoniensis Hett.,	x		x	NE	E	Limestone ledges at low altitude
A. merrillii K.Krause	x	x		NE	E	Primary forest
A. minimus RBustamante et al.,	x			CR	E	Montane secondary forest
A. natolii Hett.	x			CR	E	Limestone cliffs
A. paeoniifolius (Dennst.) Nicolson	x	x	x	LC	N	Secondary forest
A. palawanensis Bogner & Hett.	x			CR	E	Limestone cliffs with humus deposit
A. rayongii Hett. & Medecilo		x		NE	E	Beach forest
A. rostratus Hett.,	x	x		NE	E	Low land forest
A. salmoneus Hett.,	x			NE	E	Karst forest
A. samarensis Bulawin et al.		x		CR	E	Karst forest
A. urceolatus Hett et al.,	x		x	NE	E	Secondary forest or in exposed lowland forest
A. yaoi A. Galloway et al.	x	x		NE	E	Montane forest
A. konjac K.Kock.	x	x		NE	N	Cultivated
Total	18	10	5			

Legend: Three major Islands: L- Luzon Island, V-Visayas Island, M-Mindanao Island; IUCN: CR-Critically Endangered, EN-Endangered, VU-Vulnerable, NT-Nearly Threatened, LC-Least Concern, NE-Not Evaluated; Endemicity: E-Endemic, NE-Not Endemic.

Aside from biogeographical factors, habitat preference of a taxon is also a determinant for endemism and species richness [39]. Palawan exhibits many habitats, including limestone karst formations, rainforests, and diverse elevation gradients [46]. This habitat heterogeneity provides a variety of ecological niches, supporting a rich diversity of *Amorphophallus* species, which some species often have specific habitat preferences. According to the data gathered, Palawan species were observed thriving in limestone karst formations (Table 2), which could indicate that endemic Palawan species preferred and adapted to a specialized environmental condition that the island exhibits.

Conversely, regarding the widespread distribution of endemic *A. longispathaceus*, *A. rostratus*, and *A. urceolatus*, according to Anil et al. [47], generally, *Amorphophallus* had a broader extent of endemism due to their large scope of geographic adaptation that made them a diverse species. On the other hand, it is possible that the ongoing botanical research in the Philippines, particularly in areas like Palawan, which is known for its high biodiversity could tell us that other islands also have a higher level of diversity than is currently known.

Conservation and Endemicity of Amorphophallus in the Philippines. Using an open-source tool intended for conservation assessment that performs a rapid geospatial analysis by following IUCN metrics, the GeoCAT or Geospatial Conservation Assessment Tool was utilized to assess the initial conservation status of selected Philippine *Amorphophallus*. This browser-based tool provides a red list threat rating to a taxon according to its extent of occurrence (EOO), which is the measure of the geographic range size and area of occupancy (AOO) that measures the area in which a species occurs (48). These values allow a crucial step in preliminary assessment of a species' conservation status [25]. Detailed investigation of factors on the ground and how they change over time is required for final assessments [49].

To date, 11 of the recognized Philippine *Amorphophallus* species were not evaluated under the IUCN Red list of Threatened Species (Table 2). GeoCAT analysis of 21 species resulted in 9 CR, 5 EN, 1 VU, 4 LC, and 2 NT ratings (Table 3). *A. konjac*, widespread across Southeast Asia and introduced for cultivation, [15] was excluded. Potential preliminary conservation status is proposed for 11 species with no current IUCN assessment: *A. cidarioides*, *A. fornicatus*, and *A. rayongii* (CR); *A. declinatus*, *A. salmoneus*, and *A. yaoi* (EN); *A. longispathaceus*, *A. rostratus*, and *A. urceolatus* (LC); and *A. luzoniensis* and *A. merrillii* (NT). The non-endemic *A. paeoniifolius* and *A. konjac* are widespread across the three major Philippine islands. Most widespread *Amorphophallus* occur in disturbed habitats, highlighting the importance of disturbance for their occurrence and diversity (Table 2).

According to Mott [50], species adaptable to diverse environments, including anthropogenic disturbance, have higher survival chances. A. longispathaceus, A. rostratus, and A. urceolatus thrive in wide biogeographical settings, supporting their proposed IUCN status (Table 2). Species with high habitat restriction, such as A. fontarumii (Rizal), A. minimus (Nueva Ecija), the four Palawan species, and those restricted to Samar (A. samarensis), Boracay to Panay Island (A. rayongii), and Iloilo (A. cidariodes), may face a higher extinction risk, correlating with their threatened status (Table 3).

Luzon Island, particularly Palawan (7 spp.) and Laguna (6 spp.) (Figure 3), exhibits high *Amorphophallus* species richness likely due to its diverse tropical forests [51]. However, these areas face habitat degradation and biodiversity loss from agricultural expansion and land-use change [52, 53.] Philippine tropical forest cover has drastically decreased from 90% to 23% due to human activities [52]. Forest cover loss data (2001-2023) [30] indicates increasing deforestation across the Philippines (Figure 1), potentially impacting *Amorphophallus* populations, as observed in Palawan where limited endemic occurrences coincide with forest loss. Notably, some *Amorphophallus* species (*A. fornicatus*, *A. minimus*, *A. paeoniifolius*, *A. urceolatus*, *A. yaoi*) are recorded from secondary forests, suggesting adaptation to disturbed habitats (Table 2).

Threatened species (Vulnerable, Endangered, Critically Endangered) [25] are most concentrated on Luzon Island, accounting for 71% (10 spp.) of the Philippines' total 14 threatened *Amorphophallus* species (six CR, three EN, one VU) (Table 3). Increased extinction risk leads to species homogenization and biodiversity loss [54, 55].

Table 2. List of *Amorphophallus* in the three major island groups in the Philippines based on field collection, herbaria, GBIF repositories and CDFP databases in the Philippines.

Species	EOO		AOO	
	Values (km²)	IUCN rating	Values (km²)	IUCN rating
A. adamsensis	0.000	CR	8.000	CR
A. calcicola	10,047.259	VU	12.000	EN
A. caudatus	1,416.886	EN	12.000	EN
A. cidarioides	0.000	CR	4.000	CR
A. declinatus	3,397.258	EN	20.000	EN
A. flammeus	1,931.566	EN	12.000	EN
A. fontarumii	0.000	CR	4.000	CR
A. fornicatus	0.000	CR	8.000	CR
A. konjac	62,624.173	LC	24.000	EN
A. luzoniensis	34,673.718	NT	16.000	EN
A. merrillii	24,783.624	NT	16.000	EN
A. minumus	0.000	CR	4.000	CR
A. natolii	0.000	CR	4.000	CR
A. paeoniifolius	353,610.397	LC	112.000	EN
A. palawanensis	3.174	CR	12.000	EN
A. rayongii	0.000	CR	8.000	CR
A. rostratus	251,526.307	LC	32.000	EN
A. salmoneus	2,221.500	EN	12.000	EN
A. samarensis	0.000	CR	4.000	CR
A. urceolatus	94,720.750	LC	24.000	EN
A. yaoi	4,561.042	EN	16.000	EN

Moreover, anthropogenic disturbance leading to endemic species decline can be followed by the proliferation of adaptable, non-endemic species, potentially masking endemics and increasing their extinction risk [56]. As observed with *A. paeoniifolius* and *A. konjac*, these two species were both non-endemic in the Philippines. Their distribution in the country is abundant and encompassing, primarily found in disturbed areas (Figure 1).

Comparison to species with complete assessments. Our analysis included ten IUCN-assessed *Amorphophallus* species (Table 2), with six receiving the same GeoCAT risk rating: five CR (*A. fontarumii*, *A. minimus*, *A. natolii*, *A. palawanensis*, *A. samarensis*) and one LC (*A. paeoniifolius*), suggesting potential need for updated IUCN assessments (Table 3). Conversely, GeoCAT assigned different ratings to four IUCN-assessed species: *A. adamsensis* and *A. flammeus* were estimated at higher risk, while *A. caudatus* and *A. calcicola* at lower risk than their current IUCN status.

Data limitations for some species (*A. adamsensis* and *A. caudatus*) resulted in differing GeoCAT ratings from their IUCN status, suggesting a need for enhanced collecting and collaborative surveys, similar to that reported by Danila & Alejandro [57] for *Callicarpa* species, in which current collections of Callicarpa species in the Philippines decreased by 50% from 2000-2023. Furthermore, three species (*A. paeoniifolius*, *A. rostratus*, and *A. urceolatus*) are likely not globally threatened, but regional analyses may be needed.

These discrepancies likely arise because Red List assessments include detailed threat and population decline data not typically captured in rapid geospatial analyses [49]. Red List assessments require substantial resources and may face logistical constraints and biases [58, 59, 60]. However, rapid preliminary methods are crucial for addressing the extinction crisis [49]. These assessments provide valuable information for experts and stakeholders to; validate preliminary conservation statuses, offer expertise on threats and population status, and prioritize conservation efforts [49]. Combining the IUCN data with our GeoCAT assessments, we suggest 66% (Ten CR, Three EN, one VU) of assessed *Amorphophallus* species may be threatened.

Conclusion and Recommendations

This checklist reveals the current distribution and potential conservation ratings for Philippine *Amorphophallus*, highlighting biodiversity loss due to human and environmental disturbances. Luzon (30%) is the most species-rich island with the highest number of endemics (18 spp. of 22 spp. species), including four strictly endemic to Palawan. *A. paeoniifolius* is the most widespread (31%), and 66% of the total species are threatened. The karst forests, the primary habitat for Philippine *Amorphophallus* species, warrant for highest importance in maintaining the native biodiversity in the country due to the diverse endemic *Amorphophallus* flora found here. This study is a step towards *Amorphophallus* conservation, especially for threatened species, encouraging further research. However, data limitations hinder a comprehensive checklist, necessitating further investigation into the distribution and conservation of less-understood Philippine *Amorphophallus* species.

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Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

MNM and GJDA conceptualized the study and designed the methodology; MNM and NFB collected the data; MNM, NFB, and GJDA analyzed and interpreted the data, and contributed to the review and editing of the manuscript; MNM wrote the original draft.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

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