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PRELIMINARY RESULTS OF GYMNOSPERM SPECIES INVENTORY IN CARAGA REGION XIII, PHILIPPINES

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Abstract

The study provides preliminary counts of gymnosperms in Caraga Region Region XIII. It aimed to provide information in determining the species of gymnosperms found in the region. The researcher used qualitative and interview methods in gathering the data. Findings revealed that there were 4 families of gymnosperms were found, namely: Araucariaceae (Cook Pine) endemic and (Almaciga) non-endemic, Cupressaceae (Cypress) endemic, Casuarinaceae (Mountain Agoho) non-endemic, (Agoho) endemic, (Agoho del Monte) endemic and Cycadaceae (Cica) non-endemic. They are rare and one of the vulnerable plants; four (4) of them are endemic (not really abundant) and three (3) are non-endemic.

Keywords: *Gymnosperms inventory, conservation, non-endemic, vulnerable*

Introduction

Philippines, despite its very small land area is one of the mega diversity countries in the world and considered as the most important country for conserving diversity on earth (Altoverros and Borromeo, 2007). The unique Philippine landscape consisting of a complex ecosystems and habitat types, attributed to varying exposures to shifting winds, great heights of numerous mountains and peculiar distribution of rainfall contributes to the surprising number of endemic plant in the country (Whitmore, 1984). Plant endemism in the Philippines ranges from 45% to 60% (Mittermeier et al., 1999). However, certain families and genera reach 70% to 80% endemism, especially those confined to primary forest (Merrill, 1923-26).

The mountains of Northern Luzon were sites of some of the first biological inventories conducted in the Philippines. However, these early inventories were mostly focused in faunal assessment and concentrated in the southern portion of the Central Cordillera. The Balbalasang-Balbalan National Park (BBNP) in Kalinga is one of the least biologically explored portions of the Central Cordillera. Despite its proclamation as a protected area in 1974, BBNP remained almost entirely unknown until the Haribon Foundation spearheaded a comprehensive survey that confirmed the existence of major tracts of evergreen forest.

According to De Laubenfels and Adema (1998), neither C. rumphii nor C. circinalis occur in the Philippines. They apply the name C. silvestris (Hill, 1992) to part of the widespread species, and C. edentata de Laub. to the remainder. They recognize C. riuminiana Porte ex Regel with a disjunct distribution in the Philippines and Sulawesi, and C. wadei Merr. as a Philippine endemic. Hill separated the specimens of C. silvestris from Palawan as C. curranii (Hill, 1995), the specimens of C. riuminiana from Sulawesi as C. falcata (Hill 1999) and restricts the name C. edentata for specimens from the Philippines (Hill 1998–2004). Cycas riuminiana and C. edentata are thus considered as Philippine endemics.

In an account of the gymnosperms of the Philippines, Zamora and Co (2012) recognized four (4) species including C. wadei and applied the name C. circinalis to the widespread C. rumphii. Moreover, Philippines has been identified as one of the world's biologically richest countries and also one of the most endangered areas – indeed, one of the world's biodiversity hottest hotspots (Myers et al., 2000). The estimated number of gymnosperm plant in the Philippines is 33% and the endemic is 6 % (Villareal and Fernando, 2000). Gymnosperms primarily plants of temperate habitats in the Philippines, being a tropic country, are expectedly a poor gymnosperm country. Throughout the world, there are about 730 species of gymnosperms, of which only 36 taxa occur in the Philippines (Guzman, Umali and Sotalbo, 1986). According to Gilbero (2017) of DENR – XIII, Macrosomatic Clonal Nursery Mindanao Tree Seed Center in Buod, Pinamanculan, Butuan City. Gymnosperm is rare and they found in high a elevated area that is considered as endemic (not very abundant) and non-endemic, therefore, this study aims to help initiate gymnosperm species inventory, determine the existence and conservation status in Caraga Region XIII.

Materials and Methods

This study is a table review of the findings of research in the initial inventory of gymnosperm species in Caraga Region XIII. The records examined consisted of Department of Environment and Natural Resources (DENR) journals and articles published in their websites. Telephone and e-mail forms have also been used to access information to other provinces. The information gathered from the aforementioned sources was supplemented with interviews from knowledgeable persons involved in forestry.

Meanwhile, the data and information on gymnosperm species in the region are discussed, where possible, to give the reader an idea and to highlight gaps in the knowledge of the existing gymnosperms in Caraga Region XIII. No statistics have been used in this study.

Research Locale

The site covered the 6 provinces of Caraga Region XIII, namely: Agusan del Norte, Agusan del Sur, Surigao del Norte, Surigao del Sur, Dinagat Island and Siargao Island.

Figure 1 shows the location of the research site. Where Gymnosperms plants such as the Agoho (*Casuarinaequisetifolia Linn*.), Agoho del Monte (*Gymnostomarumphianum*), Almaciga (Agathis Philippinensis) are located. The sampling site also has other plant species like Narra, Palawan cherry, falcata, malunggay, mangium and bagrass seeds which may have affected the potential growth of these trees.

Figure 1. The map shows the distribution of Angiosperms in Caraga Region.

Results and Discussion

Table 1 shows the total number of gymnosperm species in Caraga Region XIII based on local name, location, and conservation status.

Table 1. Distribution of gymnosperm species in Caraga Region, Philippines

Family Name	Scientific Name	Local Name	Location	Conservation Status
Araucariaceae	*Araucaria columnaris*	Cook Pine	Agusan del Norte	Endemic
	Agathis Philippinensis	Almaciga	Agusan del Norte	Non-endemic
Cupressaceae	*Cupressus sempervirens*	Cypress	Agusan del Norte	Endemic
Casuarinaceae	*Casuarina equisetifolia Linn.*	Agoho	Kitcharao Eco-Park	Endemic
	Gymnostoma rumphianum	Agoho del Monte	Bislig City	Endemic
	Gymnostoma sumatranum	Mountain Agoho	Surigao del Norte & Dinagat Island	Non-endemic
Cycadaceae	*Cycas revoluta*	Cica	Agusan del Sur/Norte	Non-endemic

As presented in Table 1, there were 7 gymnosperm species recorded from the Department of Environment and Natural Resources (DENR, 2017) in Region XIII, four species are found in Agusan del Norte, namely; Cook Pine (*Araucaria columnaris*), Cypress (*Cupressus sempervirens*), Agoho (*Casuarinae quisetifolia Linn*.), and Almaciga (*Agathis Philippinensis)*, and others are located in different areas in Surigao del Norte, namely; Mountain Agoho (*Gymnostoma sumatranum*) and Surigao del Sur and Bislig City is Agoho del Monte (*Gymnostoma rumphianum*). Three gymnosperm species are limited (Almaciga, Cica and Mountain Agoho) and the other four are endemic but not abundant in the region (Cook Pine, Arbor Vitae, Agoho and Agoho del Monte).

Based on the data gathered from the Department of Environment and Natural Resources (DENR, 2017), Almaciga (*Agathis philippinensis*) is an ancient plant and it is widely used in the Philippines as a development crop. Regardless of being rare by elevation constraints it is tolerant in most different soil densities, though it requires good sewerage according to DENR-13 (2017). The Almaciga tree prefers acidic soils and it has special tolerance for shallow and infertile soils. This tree is therefore operated to support regions which do not undergo acceptable crop development and it can be planted closely to existing plantations to replace existing trees.

Meanwhile, gymnosperms have variety of uses especially for timber in construction, obtaining resins as well as in paper manufacturing. Many gymnosperm trees also have medicinal properties and yield essential oils. Additionally, they are sources of starch, resins, essential oils, drugs, edible nuts etc. Many are cultivated as ornamental plants and are found in gardens all over the world while some of them are sold as Christmas Trees.

Moreover, they are sources of food to animals and human. The strong roots of gymnosperm prevent from soil erosion. Gymnosperm plants are also scientifically important because they provide lots of evidence about the past. Beside these points, gymnosperm is also used as lumber. They are also used to make perfume, oil, nail polish and many more.

Conclusion

Based on the findings of the study, it was concluded that four (4) families of seven (7) gymnosperm species were found in Caraga Region XIII namely; Cook Pine (*Araucaria columnaris*), Cypress (*Cupressus sempervirens*), Agogo (*Casuarina equisetifolia Linn*.), and Agoho del Monte (*Gymnostoma rumphianum*) are endemic. The Mountain Agoho (*Gymnostoma sumatranum*), Cica *(Cycas revoluta)* and Almaciga (*Agathis philippinensis*) are non-endemic. Protections from people and government are very important to proliferate their species in Caraga Region. Additionally, strengthen cooperation and research coordination on genetic conservation with environmental organizations, student enthusiasts, stakeholders and conservationists to determine gymnosperm species as conservation targets toward the future generations.

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Conflict of Interest: *None*

Physical Features of Gymnosperm Species in Caraga Region, Philippines

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Agoho del Monte *(Gymnostoma rumphianum)*

Taxonomy	
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fagales
Family	Casuarinaceae
Genus	Gymnostoma
Species	Rumphianum

Descriptions	Economic Importance
Agoho del Monte has about eighteen species of trees and shrubs, constituting one of the four genera of the plant family Casuarinaceae. It grows naturally in the tropics, including at high altitudes having temperate climates. Majority of the species grow in rainforests, in the habitats of open, sunny, long-term gaps, from river bank situations situations through to mountain top situations.	It is used for construction, shingles, gates and fencing. It yields a good quality pulp. Useful firewood, it also yields good quality charcoal.

Cypress (*Cupressus sempervirens*)

Taxonomy	
Kingdom	Plantae
Division	Pinophyta
Class	Pinales
Order	Fagales
Family	Cupressaceae
Genus	PlatycladusSpach
Species	P. orientalis

Descriptions	Economic Importance
It has a medium - sized coniferous evergreen tree to 35 m (115 ft) tall. The foliage grows in dense sprays, dark green in color. The leaves are scale-like, 2–5 mm long, and produced on rounded shoots. The seed cones are ovoid or oblong, 25–40 mm long, with 10-14 scales, green at first, maturing brown about 20–24 months after pollination.	It is very durable, scented wood, used most famously for the doors of St. Peter's Basilica in the Vatican City, Rome. It is used for distilleries as staves to hold mash ferments to make alcohol before the invention of stainless steel. It is used for cosmetics and astringent, firming, anti-seborrheic, anti-dandruff, anti-aging and as fragrance.

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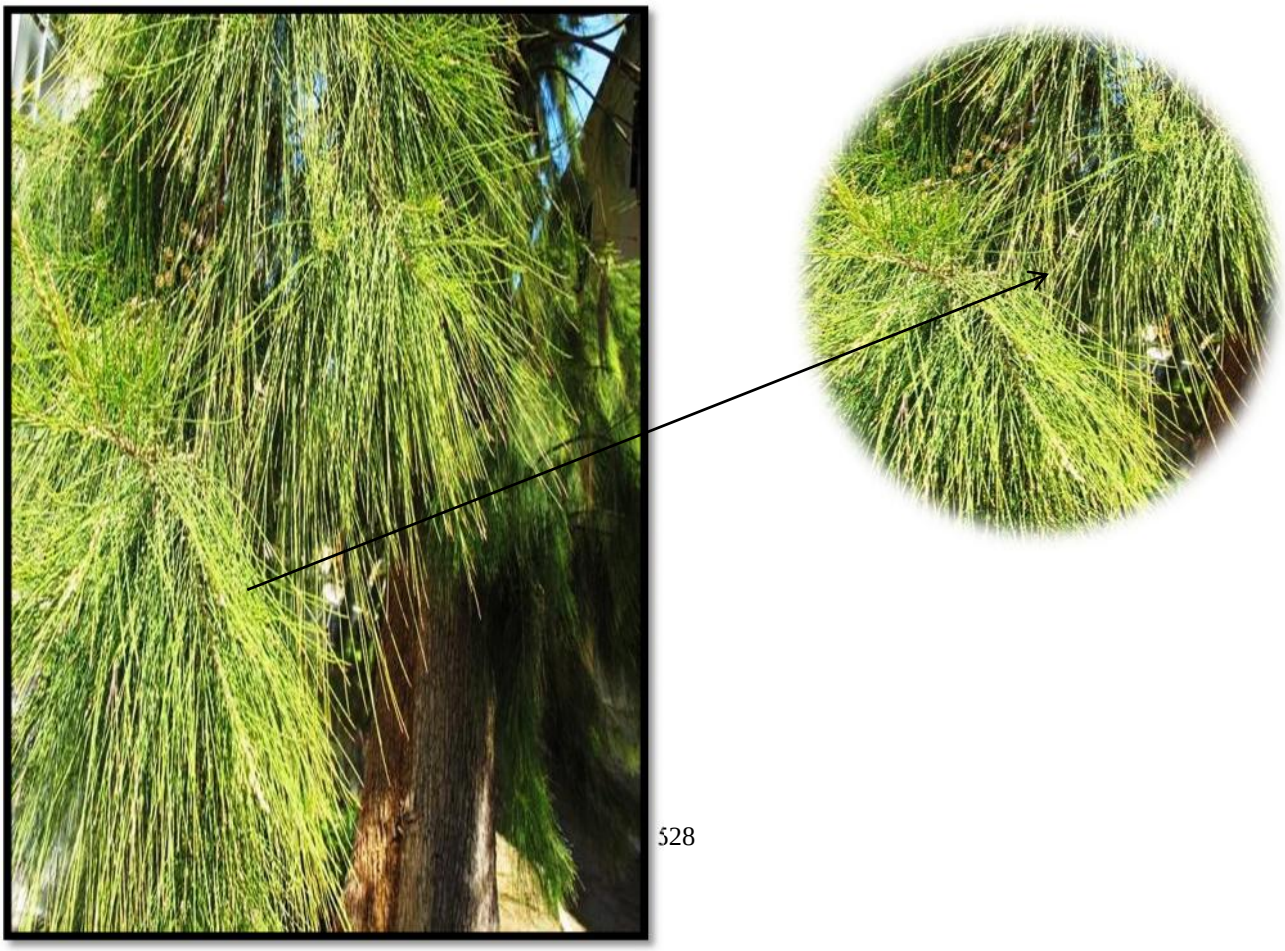
Cook Pine (*Araucaria columnaris*)

Taxonomy	
Kingdom	Plantae
Division	Pinophyta
Class	Pinales
Order	Fagales
Family	Araucariaceae
Genus	Araucaria
Species	Columnaris

Descriptions	Economic Importance
It is distinctive narrowly conical tree growing up to 60 metres (200 ft.) tall. It has slender, spire-like crown. The bark of the Cook Pine peels off in thin paper-like sheets or strips and is rough, grey, and resinous. The female seed cones are scaly, egg-shaped, and 10–15 cm. long by 7–11 cm. wide.	It is an ornamental tree and street tree in warm temperate climates. It is cultivated in gardens and public landscapes.



Agoho *(Casuarina equisetifolia Linn.)*

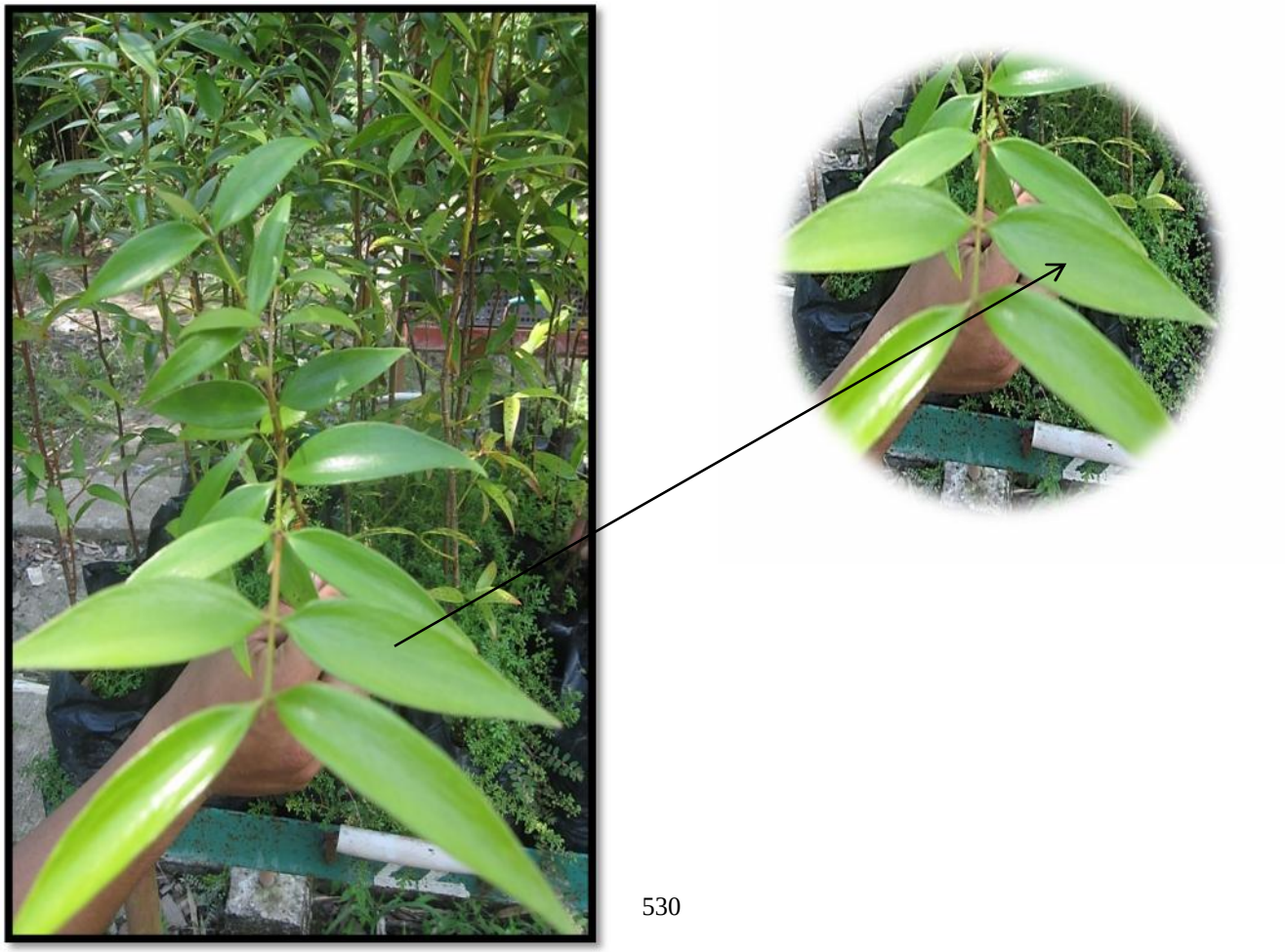
Taxonomy	
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fagales
Family	Casuarinaceae
Genus	Casuarina
Species	Equisetifolia

Descriptions	Economic Importance
It is an evergreen tree growing to 6–35 m (20–115 ft.) tall. The foliage consists of slender, much-branched green to grey-green twigs 0.5–1 mm (0.020–0.039 in) diameter. The fruit is an oval woody structure 10–24 mm (0.39–0.94 in) long and 9–13 mm (0.35–0.51 in) in diameter, superficially resembling a conifer cone made up of numerous carpels.	The wood is used for shingles, fencing, and is said to make excellent hot-burning firewood. It is use for erosion prevention, and in general as wind breaking elements.

Mountain Agoho *(Gymnostoma sumatranum)*

Taxonomy	
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fagales
Family	Casuarinaceae
Genus	Gymnostoma
Species	Sumatranum

Descriptions	Economic Importance
It has multiple rounded umbrella-shaped crowns. The roots have nitrogen-fixing nodules. The stems are angular or tetrahedal in cross section. It is typically grow in temperate climates. The stomata are not restricted to sunken grooves.	It is use for lumber and blood prevention. It is use also for Christmas decoration and garden tree.



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Almaciga *(Agathis philippinensis)*

Taxonomy	
Division	Pinophyta
Kingdom	Plantae
Class	Pinopsida
Order	Pinales
Family	Araucariaceae
Genus	Agathis
Species	A. philippinensis

Descriptions	Economic Importance
It grows up to 65m tall with smooth, grey coloured bark. The leaves are oval, 4–6 cm long and 1.5–2 cm broad on adult trees, slightly larger, up to 7 cm long and 3 cm broad. The seed cones are squat ovoid, 7–9 cm long and 12 cm diameter, spirally arranged scales 28–32 mm long and 35–45 mm broad.	It commonly used throughout the Philippines, as an enrichment crop. It is limited by altitude constraints it is tolerant of most different soil densities, though it requires good drainage and prefers acidic soils. It is use to support areas which do not experience adequate crop growth.

Cheiro de Cica *(Cycas revoluta)*

Taxonomy	
Division	Pinophyta
Kingdom	Plantae
Class	Cycadopsida
Order	Cycadales
Family	Cycadaceae
Genus	Cycas
Species	C. revoluta

Descriptions	Economic Importance
It has a crown of shiny, dark green leaves on a thick shaggy trunk that is typically about 20 cm (7.9 in) in diameter. The trunk is very low to subterranean in young plants. It is very slow-growing and requires about 50–100 years to achieve this height.	Promotes commercially as a landscape plant. The crowning leaves are used for making bouquet in pageant.

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