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Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

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Cover: The breathtakingly beautiful SIlver Jubilee cover of JoTT is done in color pencils and ink by the 13-year old darling, Elakshi Mahika Molur.

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ARTICLE

Identifying plants for priority conservation in Samar Island Natural Park forests (the Philippines) over limestone using a localized conservation priority index

Inocencio Escoton Buot, Jr.[1], Marne Ga Origenes[2], Ren Divien Del Rosario Obeña[3], Jonathan O. Hernandez[4], Noba F. Hilvano[5], Diana Shane A. Balindo[6] & Edelyn O. Echapare[7]

[1,2,3] Institute of Biological Sciences, College of Arts and Sciences, [4] Forest Biological Sciences, College of Forestry and Natural Resources, University of the Philippines Los Baños, College, Batong Malake, Los Baños, Laguna 4030, Philippines.
[5] Eastern Samar State University, Maypangdan, Borongan City, Eastern Samar 6800, Philippines.
[6,7] Science Department, College of Education, Samar State University, Guindapunan, Catbalogan City, 6700, Philippines.
[1] iebuot@up.edu.ph (corresponding author), [2] mgorigenes@up.edu.ph, [3] rdobena@up.edu.ph, [4] johernandez2@up.edu.ph, [5] noba.hilvano@essu.edu.ph, [6] dianashane.balindo@ssu.edu.ph, [7] edelyn.echapare@ssu.edu.ph

Abstract: The escalating degradation of ecosystems and the consequent reduction in critical services essential for human communities are global concerns. This study aimed to identify top-priority plants for conservation using a localized conservation priority index (LCPI), customized for the locality. The LCPI, a point scoring method, ranked 50 evaluated species based on criteria such as harvesting risk, economic and cultural use, species distribution, and frequency value. Thirteen species were classified as high priority, requiring stringent harvesting regulations, while the remaining 37 were designated at a medium priority level, allowing specific quotas for harvesting. Notably, all 13 high-priority species exhibited higher harvesting risks. These include *Caryota rumphiana* Mart., *Aquilaria cumingiana* (Decne.) Ridl., *Cycas riuminiana* Regel, *Dracaena angustifolia* (Medik.) Roxb., *Oncosperma tigillarium* (Jack) Ridl., *Oreocnide rubescens* (Blume) Miq., *Kleinhovia hospita* L., *Diospyros blancoi* A.DC., *Codiaeum sp*., *Gymnostoma rumphianum* (Miq.) L.A.S.Johnson, *Caryota cumingii* Lodd. ex Mart., *Artocarpus rubrovenius* Warb., and *Palaquium* sp. Local communities engage in harvesting all parts of certain plant species. Following the identification of priority plants, geotagging was employed to enhance targeted in situ conservation efforts, providing valuable guidance for local leaders in initiating localized conservation of threatened biodiversity.

Keywords: Biodiversity, conservation approaches, endemics, forest ecosystem services, geotagging, habitat protection, karst landscape, priority levels, species distribution, threatened plants.

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INTRODUCTION

Destruction of natural landscapes has been rampant all over the world. This has been one of the triggering bases for the proposed new conservation science by Kareiva & Marvier (2012). Both observed that conservation has been failing and it is until now. A huge track of forests of all types (lowland, lower montane, upper montane, mangroves) dominated by economically and ecologically important tree species (Brown 1921; Ohsawa 1984; Fernando et al. 2008; Buot 2020; Buot et al. 2022; Martinez & Buot 2022) had been destroyed all through these years (Santiago & Buot 2018; Cadiz & Buot 2009, 2010; Caringal et al. 2019; Obeña et al. 2021; Villanueva & Buot 2018; Villanueva et al. 2021a,b; Buot & Osumi 2011; Magcale-Macandog et al. 2022). This massive forest degradation was very prominent during the anthropocene when human activities tended to prevail, aggravating the serious impacts of the global climate change problem (Kamiohkawa et al. 2021; Malhi et al. 2014; Pulhin et al. 2010; Steffen et al. 2007, 2011). The result had been far from what has been expected by humanity: biodiversity loss (FAO 2015), food insecurity (National Research Council 2006; Frongillo 2023), water insecurity (Young et al. 2021; Frongillo 2023), air pollution (National Institute of Environmental Science 2020), eutrophication of water bodies (Yang et al. 2008; Yang 2022), diseases and the subsequent reduction of critical ecosystem services (Anyanwu et al. 2016; Buot et al. 2022) direly needed by the human communities. If this trend is sustained, a remarkable decrease in the community well-being index will be imminent (Buot 2017; Buot et al. 2017; Buot & Cardenas 2018; Buot & Dulce 2019; Buot et al. 2020; Buot & Buot 2022, 2023).

Ecosystem degradation has also been observed in Samar Island Natural Park (SINP) forests over limestone located in central Philippines triggered by both natural and anthropogenic causes. Being located along the Pacific, Samar Island is visited yearly by destructive and fatal typhoons. SINP has one of the most extensive forests over limestone not only in the Philippines but in the southeast Asian region as well. Forests over the limestone of Samar (locally known as 'kaigangan') are characterized by the abundance of calcium due to limestone dissolution, contributing to irregular geomorphology. It has high mineral and aquifer resources, aesthetic, cultural, and tourism value (Fernando et al. 2008; Patindol 2016; Tolentino et al. 2020). Kaigangan is a critical ecosystem serving as a habitats of unique flora and fauna (Obeña et al. 2021; Villanueva et al. 2021a,b; Tolentino et al. 2020) and microorganisms as well. Phase 1 of CONserve-Kaigangan, a research program led by the University of the Philippines Los Baños (UPLB) in collaboration with Samar State University (SSU) and Eastern Samar State University (ESSU), discovered and described new species of science inhabiting the canopy of the forests over limestone. These new species are *Decaisnina tomentosa* MD Angeles, Tandang, Carab.-Ort., & Buot (Tandang et al. 2022), *Corybas kaiganganianus* Tandang, A.S.Rob. & MD Angeles (delos Angeles et al. 2022a), *Begonia normaaguilariae* MD Angeles, Rubite, & Tandang (delos Angeles et al. 2022b), and *Schismatoglottis minuta* Tandang and MD Angeles (delos Angeles et al. 2023). Several new records have been documented too (Fernandez et al. 2020; Obeña et al. 2021; Villanueva et al. 2021a,b). Owing to these unique endemics and indigenous plant and animal diversity, coupled with the beautiful limestone hills and rocks, SINP has been nominated as a UNESCO World Natural Heritage Site.

The nomination of SINP for UNESCO listing should not be the end of conservation action. Rather, it should be the start of a well-meant conservation practice planning. There is a need to localize and prioritize conservation in Samar's kaigangan forests. This is essential in biodiversity conservation since not all plant species have been assessed yet by the IUCN and by the National Committee on Threatened Species in the Philippines. Prioritizing plants helps identify the taxa that need to be targeted for conservation with local communities taking active participation.

The paper aims to generate a list of top-priority plants for conservation at Samar Island Natural Park (SINP) using a localized conservation priority index (LCPI) (Villanueva & Buot 2020; Chanthavong & Buot 2019). Specifically, it determines the identity of plants and their levels of priority, discusses the uses of these plants by the locality, and geotags the occurrences of these priority plants in the plots to enhance in situ conservation.

The paper addresses UN Sustainable Development Goals 5 (Gender equality), 6 (Clean water), 11 (Sustainable cities and communities), 12 (Responsible consumption and production), 13 (Climate Action), 15 (Life on land), and 17 (Partnership to achieve goals).

METHODOLOGY

The Localized Conservation Priority Index (LCPI)

The *Localized Conservation Priority Index* is a point-scoring method used to rank species by the level of priority considering harvesting risk, economic

use, cultural use, species distribution, and frequency value. These criteria make up the environmental and socio-cultural aspects of each species. The sources of information were sourced from surveys, websites to literature sources.

The score ranges from 1 (lowest) to 5 (highest) for each criterion, where a higher score indicates a higher conservation priority. For harvesting risk, economic use, and cultural use, each plant part and use is equivalent to 1 point. Two plant parts and uses are equivalent to two points and so on. In the case of more than five plant parts (roots, leaves, stems, flowers, and fruits) and uses, the score is still 5. Data were gathered from the field plots, literature reviews, and local key informants. For the species distribution, we gathered data from the floras (Merrill 1923–1926; Pelser et al. 2011-onwards; Rojo 1999) and online databases like the International Plant Name Index (IPNI 2020) and World Flora Online. The more restricted the distribution of a species, the higher the score owing to rarity and the likelihood of the species becoming extinct in the future. If the species is only found in Samar, it receives a score of 5. Four (4) if found in Visayas, three (3) if found in Visayas and Mindanao, two (2) if found in the Philippines, and one (1) if found in Asia and the world (Cosmopolitan). The frequency value has been based on the plot data, referring to the occurrence value of each plant in the study site. A score of 5 for frequency values ranging 0–20, indicates vulnerability to risk. Frequency values of 21–40, 41–60, 61–80, and 81–100 will have scores of 4, 3, 2 and 1, respectively.

The formula that is used in this study is a modification from Villanueva & Buot (2020):

Localized Conservation Priority Index (LCPI) = *Harvesting Risk (HR) + Economic Use (EU) + Cultural Use (CU) + Species Distribution (SD) + Frequency Value*

A guide in categorizing the conservation priority levels for each plant and the appropriate action to take has been prepared as adopted by Villanueva & Buot (2020).

Geotagging of the priority plants

After identifying the priority plants at SINP, the top 20 priority plants with the highest conservation priority scores were geotagged to enhance in situ conservation. Geotagging was done manually within the 18 sampling plots in SINP using the Google Earth application to determine the latitude and longitude coordinates of each of the top 20 priority plants.

RESULTS AND DISCUSSION

Determining the localized conservation priority scores of plants at Samar Island Natural Park

Samar Island forests over limestone are one of the largest limestone formations in the Philippines, serving as a habitat for unique flora and fauna (Tolentino et al. 2019, 2020). Existing data available from the floral assessment of CONserve-KAIGANGAN in Paranas, Samar, and Taft, Eastern Samar support a high level of floral diversity and endemism of Samar kaigangan.

The evaluation of 50 plant species across 24 families in our study plots (see Table 2) utilized the LCPI, modified from Villanueva and Buot (2020), to identify the top 20 plants for priority conservation. The LCPI results categorized 13 plant species with high priority levels, scoring between 17 and 20, while the remaining 37 were classified with medium-priority levels (refer to Table 2). Notably, all 13 high-priority species scored 5 points for the harvesting risk criterion, indicating that all plant parts—roots, stems, leaves, flowers, and fruits—are susceptible to harvesting at any time. These high-priority species, such as *A. cumingiana, C. rumphiana, G. rumphianum, O. rubescens, Codiaeum* sp., and *K. hospita*, are primarily used for medicinal purposes by residents of Samar (see Table 3). Ornamental and landscaping uses are also common, with cultural applications noted for species like *C. rumphiana, C. cumingii*, and *A. cumingiana* employed in religious and festival activities, including church ornaments and decorations in Samar. Geographically, these high-priority species exhibit a mostly cosmopolitan distribution in SINP (Table 3), indicating their presence beyond the Philippines. Additionally, most priority species scored 5 points and exhibited frequency values ranging 1–20, signifying a sparse occurrence in the study plots. Given the extensive uses of these 13 high-priority species, with scores ranging 17–20, there is a critical need for strict regulation to prevent overexploitation.

Table 1. Priority scores and priority levels for each plant and the corresponding recommended action to take.

Score	Priority level	Decision
1–8	Low	Suitable for high-impact harvesting
9–16	Medium	Can be harvested with specific quotas
17–25	High	Require strict regulation in harvesting

Image 1. Top 5 priority plants in SINP: a—*Caryota rumphiana* | b—*Aquilaria cumingiana* | c—*Cycas riuminiana* | d—*Dracaena angustifolia* | e—*Oncosperma tigillarium*. © CONserve-KAIGANGAN project.

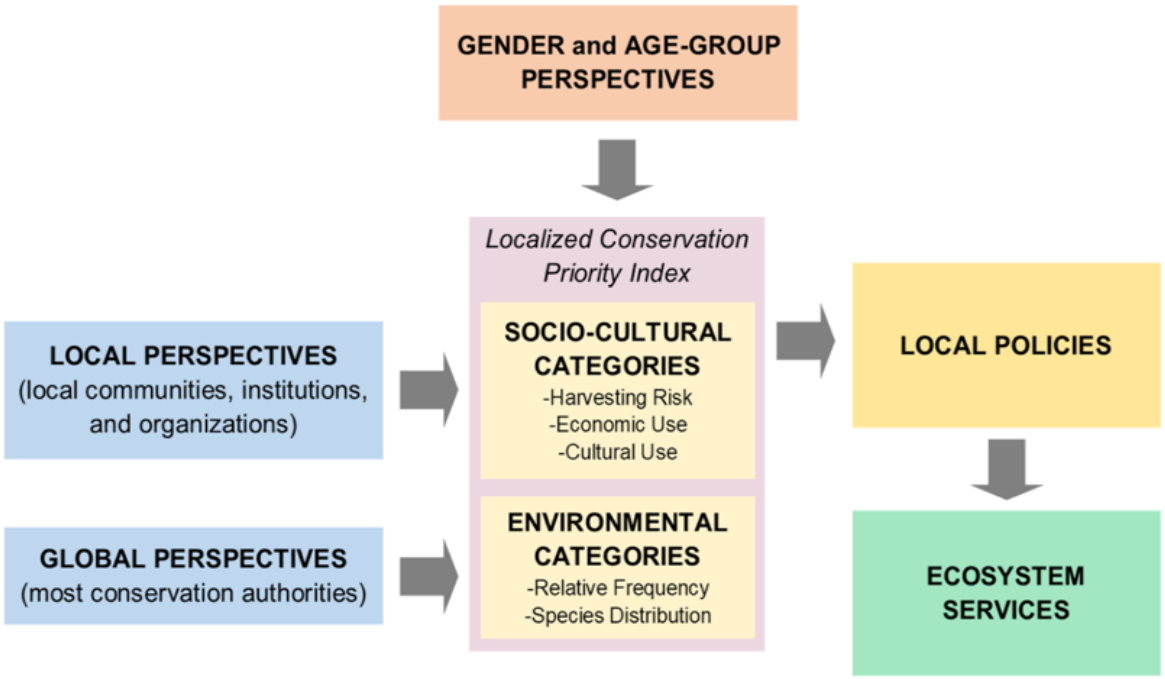

Figure 1. Framework for localized conservation for sustained ecosystem services.

Some Notes on the top 20 plants for priority conservation

Overall, the top 20 priority plants in SINP are composed of 17 species from Paranas, Samar, and eight species from Taft, Eastern Samar.

As seen in Table 3, there are a few high-priority level species that are considered threatened on a national and global scale. At the national level, among the top 20 priority plants in SINP, six are vulnerable species (*A. cumingiana, C. riuminiana, O. tigillarium, D. blancoi, S. negrosensis,* and *S. contorta*), and three belonging to other threatened species (*G. rumphianum, A. rubrovenius* and *A. rimosa*) (DAO 2017–11). On the other hand, at the global scale, IUCN (2022) identified one critically endangered species (*H. wenzeliana*), one endangered species (*C. riuminiana*), one vulnerable species (*A. cumingiana*), seven least concern species (*C. rumphiana, O. rubescens, K. hospita, C. hirsutum, P. nodosa, S. negrosensis,* and *S. contorta*), one near threatened species (*A. rimosa*), and one data deficient species (*C. cumingi*). It's noteworthy that the majority of priority plants in SINP lack recorded conservation status on both national and global scales. Surprisingly, many of these crucial plants, extensively utilized at the local level for various purposes, remain largely unexplored. The application of LCPI becomes crucial in documenting locally threatened biodiversity. These priority plants, under threat, hold immense economic significance, serving purposes such as food, medicine, timber, handicrafts, building materials, and ornamental use, as highlighted by Medecilo-Guiang et al. (2021).

***Caryota rumphiana* Mart.**

Caryota rumphiana is the top-ranking species, with an LCPI score of 20 points (Table 2). It is edible and can be used to make a variety of dishes, as well as raw material for furniture (Tropical Plants Database 2022). The fiber of this species is used for fish traps, for sewing, for kindling fires, and as wadding (Tropical Plants Database 2022). It is also used as an ornamental plant. In Samar Island, the leaves are used for church and for fiesta as decoration. The locals also reported that the roots are utilized for herbal medicine. *C. rumphiana* is distributed in the areas of Bismarck Arch, Moluccas, New Guinea, Solomon Island, and Sulawesi. In the Philippines, it was recorded in the province of Samar (Pelser et al. 2011 onwards).

***Aquilaria cumingiana* (Decne.) Ridl.**

Rank 2 is *A. cumingiana* obtaining a score of 19-points in SINP. This species is commonly known as agarwood and is valued for its highly priced resins extracted from the bark. The expensive resins are used to make perfume and aromatics, which are commonly used for ceremonial incense of rituals and other religious activities. Additionally, this species is used for furniture and traditional medicine (Tawan 2003; Persoon 2008). The locals in Samar Island also utilized the leaves and roots as an ingredient to make a coffee. It is distributed in Borneo, Moluccas, and the Philippines (Pelser et al. 2011 onwards).

***Cycas riuminiana* Regel**

The third in rank is an endemic species used by the locals in Samar as herbal medicine and as ornaments for churches and fiestas. It is distributed in the provinces of Bataan, Batangas, Cagayan, Cavite, Ilocos Norte, Isabela, Laguna, Pampanga, and Mindoro (Pelser et al. 2011 onwards).

***Dracaena angustifolia* (Medik.) Roxb.**

This species is occupying the fourth rank. It is found all throughout the Philippines and in countries such as Andaman Islands, Australia, Bangladesh, Bismarck Arch, Borneo, Cambodia, China, India, Java, Laos, Lesser Sunda Islands, Malay Peninsula, Moluccas, Myanmar, New Guinea, Nicobar Islands, Solomon Islands, Thailand, and Vietnam (Pelser et al. 2011 onwards). The plant is used as ornamental and fodder. The roots and leaves of this species can be used for medicine and the sap is used as a dye (POWO 2022; Tropical Plants Database 2022).

***Oncosperma tigillarium* (Jack) Ridl.**

The species is primarily used for housing and construction material particularly by Samar residents. Its leaves of can be a source of fiber and used as a raw material for making baskets and other weaving products (Tropical Plants Database 2022). Additionally, the buds and flowers of this plant are edible, while the roots are used as traditional medicine (Tropical Plants Database 2022). The other parts of this plant, such as sap and spines on stems are used as hunting instruments (Tropical Plants Database 2022). The whole plant is also ideal for landscaping (Fernandez et al. 1995). This species, the fifth in rank, is distributed in Borneo, Cambodia, Java, Malay Peninsula, Sumatra, Thailand, and the Philippines (Pelser et al. 2011 onwards).

***Oreocnide rubescens* (Blume) Miq.**

The leaves and shoots of this species are edible (Brink et al. 2003). The bast can produce fiber and the bark can be a source of dye (Brink et al. 2003). In Samar, the locals used the roots as herbal medicine. In other countries, it is utilized as a living fence (Brink et al. 2003). In the Philippines, this species occupying the 6th rank, is

Table 2. Conservation priority classification of plant species in Samar Island Natural Park.

Family/ Scientific name	Common name	HR	EU	CU	SD	FV	Total score	Priority level
Araliaceae								
Polyscias nodosa (Blume) Seem.	Bongliw	4	3	2	1	5	15	Medium
Arecaceae								
Caryota cumingii Lodd. ex Mart.	Karyota	5	3	2	2	5	17	High
Caryota rumphiana Mart.	Pugahan/ Tagabunga	5	5	4	1	5	20	High
Heterospathe intermedia (Becc.) Fernando	Banga	5	3	2	2	1	13	Medium
Oncosperma tigillarium (Jack) Ridl.	Anibong	5	5	2	1	5	18	High
Asparagaceae								
Dracaena angustifolia (Medik.) Roxb.	Tulang	5	5	2	1	5	18	High
Burseraceae								
Canarium hirsutum Willd.	Milipili	3	5	2	1	5	16	Medium
Casuarinaceae								
Gymnostoma rumphianum (Miq.) L.A.S.Johnson	Agoho del Monte	5	4	2	1	5	17	High
Clusiaceae								
Calophyllum soulattri Burm.f.	Pamintaogon	5	5	2	1	1	14	Medium
Garcinia rubra Merr.	Diis	2	1	2	2	5	12	Medium
Garcinia sp.	Madbad	2	1	2	2	5	12	Medium
Cornaceae								
Mastixia sp.	Tul-anan	4	2	2	2	4	14	Medium
Cycadaceae								
Cycas riuminiana Regel	Pitogo	5	2	4	2	5	18	High
Dipterocarpaceae								
Hopea philippinensis Dyer	Gisok	4	3	2	2	3	14	Medium
Shorea astylosa Foxw.	Yakal	4	4	2	2	1	13	Medium
Shorea contorta S.Vidal	White lauan	4	2	2	2	5	15	Medium
Shorea negrosensis Foxw.	Red lauan	5	5	2	2	1	15	Medium
Vatica mangachapoi Blanco	Bunguran Yakal	4	3	2	1	5	15	Medium
Ebenaceae								
Diospyros blancoi A.DC. syn.: *D. discolor* Willd.	Kamagong	5	5	2	1	5	18	High
Euphorbiaceae								
Codiaeum macgregorii Merr.	Marumanga	1	1	2	2	5	11	Medium
Codiaeum sp.	Dug-an	5	4	2	2	5	18	High
Hancea wenzeliana (Slik) S.E.C.Sierra, Kulju & Welzen	Apanang	4	3	2	2	5	16	Medium
Macaranga bicolor Müll.Arg.	Pailig	3	2	2	2	5	14	Medium
Tritaxis ixoroides (C.B.Rob.) R.Y.Yu & Welzen				2	2	5	9	Medium
Fabaceae								
Wallaceodendron celebicum Koord.	Banuyo/ Salukigi	5	2	2	2	4	15	Medium
Gnetaceae								
Gnetum gnemon L.	Bago	4	3	2	1	5	15	Medium
Lamiaceae								
Teijsmanniodendron ahernianum (Merr.) Bakh.	Kulipapa	3	3	2	1	5	14	Medium

Family/ Scientific name	Common name	HR	EU	CU	SD	FV	Total score	Priority level
Malvaceae								
Kleinhovia hospita L.	Tan-ag	5	5	2	1	5	18	High
Meliaceae								
Aglaia rimosa (Blanco) Merr.	Balubar / Bayanti	4	4	2	1	5	16	Medium
Vavaea amicorum	Nangka-nangka	3	3	3	1	5	15	Medium
Moraceae								
Artocarpus rubrovenius Warb.	Tugop	5	5	2	2	3	17	High
Ficus glandulifera var. camiguinensis	Katol	3	4	2	1	5	15	Medium
Ficus ampelas Burm.f.	Upling-gubat	2	3	2	1	5	13	Medium
Pandanaceae								
Benstonea copelandii (Merr.) Callm. & Buerki	Bariw	5	2	2	2	3	14	Medium
Phyllanthaceae								
Bridelia glauca Blume	Anislag	4	3	2	1	5	15	Medium
Rubiaceae								
Lasianthus trichophlebus Hemsl. ex F.B.Forbes & Hemsl.	Malabunot	5	3	2	1	5	16	Medium
Psychotria sp.		4	2	2	2	5	15	Medium
Neonauclea formicaria (Elmer) Merr.	Hambabalud	4	2	2	2	3	13	Medium
Salicaceae								
Flacourtia sp.	Hagupit	3	2	2	2	5	14	Medium
Sapotaceae								
Manilkara fasciculata (Warb) H.J.Lam & Maas Geest.	Patsaragon	4	5	2	1	1	13	Medium
Palaquium cf. *elongatum*	Long-leaved Nato	3	2	2	1	5	13	Medium
Palaquium sp.	Bagotambis	5	4	2	2	4	17	High
Pouteria velutina Elmer	Wakatan	3	1	2	2	4	12	Medium
Thymelaeaceae								
Aquilaria cumingiana (Decne.) Ridl.	Lapnisan/ Agar	5	5	3	1	5	19	High
Gonystylus reticulatus (Elmer) Merr.	Batuan			2	3	5	10	Medium
Urticaceae								
Oreocnide rubescens (Blume) Miq.	Lingatong	5	5	2	1	5	18	High
unidentified (Barit)	Barit	4	1	2	2	5	14	Medium
unidentified (Sumol)	Sumol	4	1	2	2	5	14	Medium
unidentified (Buskayan)	Buskayan			2	2	5	9	Medium
unidentified (Urukay)	Urukay			2	2	5	9	Medium

distributed in Laguna, Quezon, and Mindanao. It is also found in other neighboring islands of Java, Moluccas, and Sulawesi (Pelser et al. 2011 onwards).

***Kleinhovia hospita* L.**

The timber of this species is used for furniture and fuelwood, while the fiber is a raw material for rope (NRMC 1986). It has been used as an ornamental and the leaves are edible and have medicinal properties (NRMC 1986). Actually, the locals in Samar use this species which is in the 7th rank as herbal medicine. It is distributed in other countries such as Bangladesh, Caroline Island, Fiji, Hainan, Lesser Sunda Island, Malaya, Nansei-shoto, Samoa, Society Island, Solomon Island, Taiwan, Tonga, Vanuata, and Vietnam (POWO 2022).

Image 2. Geotagging of priority plants in the municipality of Paranas, Samar in SINP.

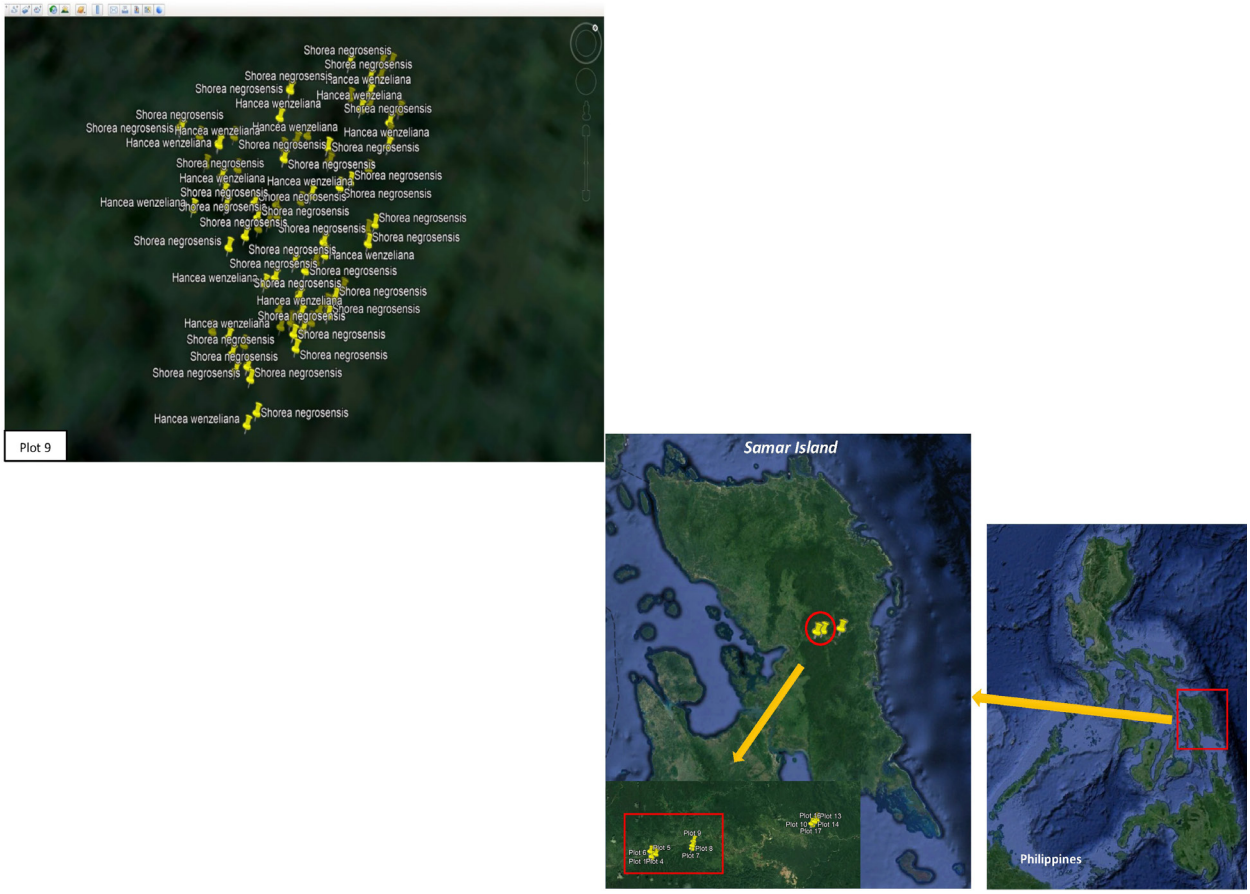

Image 2. Geotagging of priority plants in the municipality of Paranas, Samar in SINP. (cont.)

***Diospyros blancoi* A. DC.**

Like other species, it is used as a material for handicraft, furniture, and construction purposes (Tomas-Carig 2020). This species is ranked 8th and the fruit of this species is edible, and the bark, leaves, and seeds are also used as medicine (Coronel 1991; Tomas-Carig 2020). This species is native to the Philippines and is also distributed in Taiwan and Borneo (POWO 2022).

***Codiaeum* sp.**

This species ranked ninth in the LCPI and has not yet been identified at the species level. Samar residents used this species for medicine, building materials, firewood, and animal forage.

***Gymnostoma rumphianum* (Miq.) L.A.S.Johnson**

This species is used for housing material, fuelwood, and as an ornamental. It is ranked 10th and can also be utilized for pulp making (Sosef & van der Maesen 1997). It is native to the Philippines and is distributed in other countries such as Moluccas, New Guinea, and Sulawesi (Pelser et al. 2011 onwards).

***Caryota cumingii* Lodd. ex Mart.**

Ranked 11th, *Caryota cumingii*, is used as a raw material for weaving products. This species is edible and can be cooked as vegetables as well as ingredient to make sago starch, sugar, and alcoholic beverages (Tropical Plants Based 2022). The plant is also used as ornamental. It is endemic in the Philippines and is distributed in the Philippine provinces of Guimaras, Apayao, Ilocos Norte, La Union, Laguna, Nueva Ecija, Nueva Viscaya, Pangasinan, Quezon, Rizal, Mindoro, Palawan, Panay, Samar, and Tawi-Tawi (Pelser et al. 2011 onwards).

***Artocarpus rubrovenius* Warb.**

This species can be used for construction and as a material for wood carving (NRMC 1986). Its bark also has medicinal properties (NRMC 1986). This Philippine endemic is ranked 12th and is distributed in the provinces of Batan, Albay, Aurora, Bataan, Batangas, Camarines, Isabela, Laguna, Pampanga, Quezon, Rizal, Sorsogon, and Mindoro (Pelser et al. 2011 onwards).

***Palaquium* sp.**

In Samar, locals use this plant for construction material. It is in the 13th rank and the fruits are edible and observed to be eaten by birds, monkeys, wild pigs, and deer.

***Hancea wenzeliana* (Slik) S.E.C.Sierra, Kulju & Welzen**

The locals in Samar used the timber of this species for housing and construction material, as well as fuelwood or charcoal. It ranked 14th using the LCPI. In the Philippines, this endemic species is distributed in the province of Surigao del Norte in Mindanao (Pelser et al. 2011 onwards).

***Aglaia rimosa* (Blanco) Merr.**

Aglaia rimosa is used as a housing or building material (Widodo 2003). Additionally, it serves as a traditional medicine to treat swollen stomach and has the potential to have anti-cancer properties (Widodo 2003). It is classified as other threatened species (OTS) in the Philippines' DAO 2017–11. It is ranked 15th and is distributed in the provinces of Alabat, Babuyan Island, Batan, Cebu, Guimaras, Albay, Aurora, Bataan, Batangas, Benguet, Cagayan, Camarines, Cavite, Ilocos Norte, Isabela, Laguna, Nueva Ecija, Nueva Viscaya, Pangasinan, Quezon, Rizal, Sorsogon, Agusan, Davao, Mindoro, Negors, Palawan, Panay, Romblon, Sibutu, Sibuyan, Ticao, and Y'ami (Pelser et al. 2011 onwards).

***Canarium hirsutum* Willd.**

Canarium hirsutum is edible and is used as traditional medicine to treat stomach ailments (Tropical Plants Database 2022). It is ranked 16th and is harvested for its resin (Kochummen 1995). It has also traditionally been used to produce light and as adhesive (Tropical Plants Database 2022). The locals of Samar Island have also reported that they used the resin for lighting, the leaves and roots for herbal purposes, and the timber as firewood and charcoal. The species is widely distributed in the Philippines. It is also distributed in other areas including Bismarck Arch, Borneo, Java, Lesser, Sunda Island, Malay Peninsula, Moluccas, New Guinea, Pacific Ocean, Solomon Island, Sulawesi, and Sumatra (Pelser et al. 2011 onwards).

***Lasianthus trichophlebus* Hemsl. ex F.B. Forbes & Hemsl.**

Lasianthus trichophlebus has a medicinal property potential (Tan et al. 2020). This species is distributed in China, Java, Malay Peninsula, Sulawesi, Sumatra, Taiwan, Thailand, and Vietnam. In the Philippines, it is recorded in the provinces of Mindoro and Palawan (Pelser et al. 2011 onwards). It ranked 17th using the LCPI.

***Polyscias nodosa* (Blume) Seem.**

Polyscias nodosa is used as a housing and construction material. It is ranked 18th and has been reported as good raw material for handicrafts, weaving, and woodworking products (Gapido & Batoon 2009). This species is distributed in Australia, Java, Lesser Sundra Islands, Moluccas, New Guinea, Solomon Islands, and Sulawesi. In Philippines, it is distributed in the provinces of Basilan, Leyte, Bataan, Batangas. Benguet, Ilocos Norte, Laguna, Pangasinan, Quezon, Rizal, Sorsogon, Zambales, and Palawan (Pelser et al. 2011 onwards).

***Shorea negrosensis* Foxw.**

This species is primarily used for housing, construction, and furniture material (Garcia et al. 2013; Ghazoul 2016). The locals in Samar use it as fuelwood. They also observed that the fruits are eaten by birds and wild pigs. The species ranking 19th using LCPI is also known to have tumor-inhibiting properties (NRCM 1986). This endemic is distributed in the Philippine provinces of Basilan, Biliran, Cebu, Leyte, Albay, Aurora, Cagayan, Camarines, Isabela, Laguna, Nueva Ecija, Quezon, Polillo, and Samar (Pelser et al. 2011 onwards).

***Shorea contorta* S.Vidal**

The species is used in housing, construction, furniture, veneer, hardboard, and plywood making (NRMC 1986). It is endemic to the Philippines and distributed in the provinces of Babuyan Islands, Basilan, Leyte, Marinduque, Masbate, Agusan, Lanao, Zamboanga, Mindoro, Negors, Polillo, Samar, and Sibuyan (Pelser et al. 2011 onwards). It ranked 20th in terms of conservation priority.

Geotagging priority plants at Samar Island Natural Park

From the identified top 20 priority plants, we meticulously documented a total of 2,000 individual priority species within SINP. The municipality of Paranas, Samar, revealed 17 priority species and 834 individuals, while Taft, Eastern Samar, exhibited eight priority species with 1,169 individuals. Every one of these plants underwent geotagging to enhance in situ conservation efforts, as illustrated in Image 2 and 3. Geotagging, in this context, refers to the process of attaching geographical metadata to media, such as images and videos, to precisely record the location where the specific data point was captured (Luo et al. 2011). Typically executed using smartphones or GPS-enabled devices, this method involves assigning the media or data points with coordinates, including latitude, longitude, altitude, compass bearing, place names, and other optional fields (Amaral 2014). Demonstrated as cost-effective and secure, geotagging enables teams or

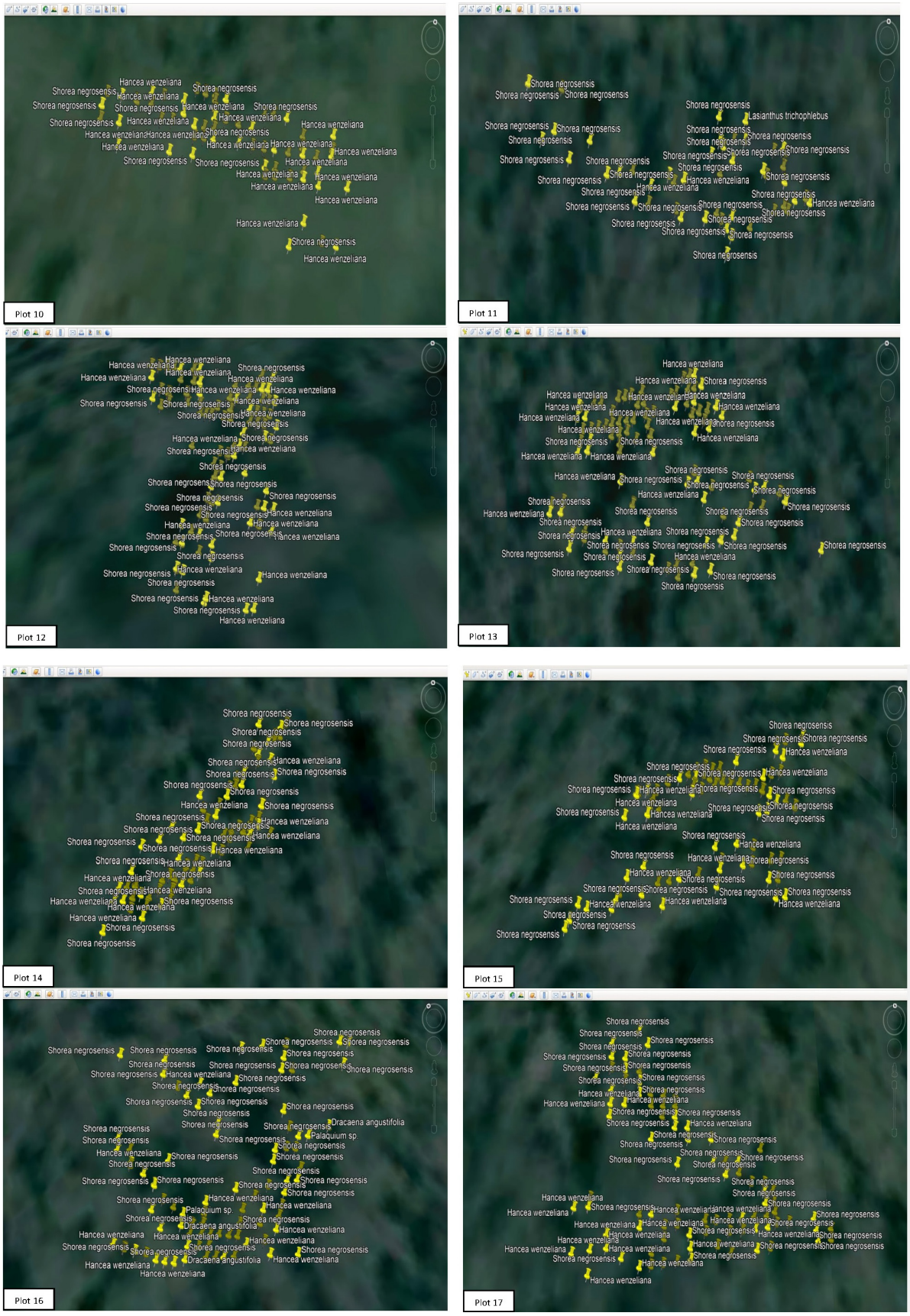

Image 3. Geotagging of priority plants in the municipality of Taft, Eastern Samar in SINP.

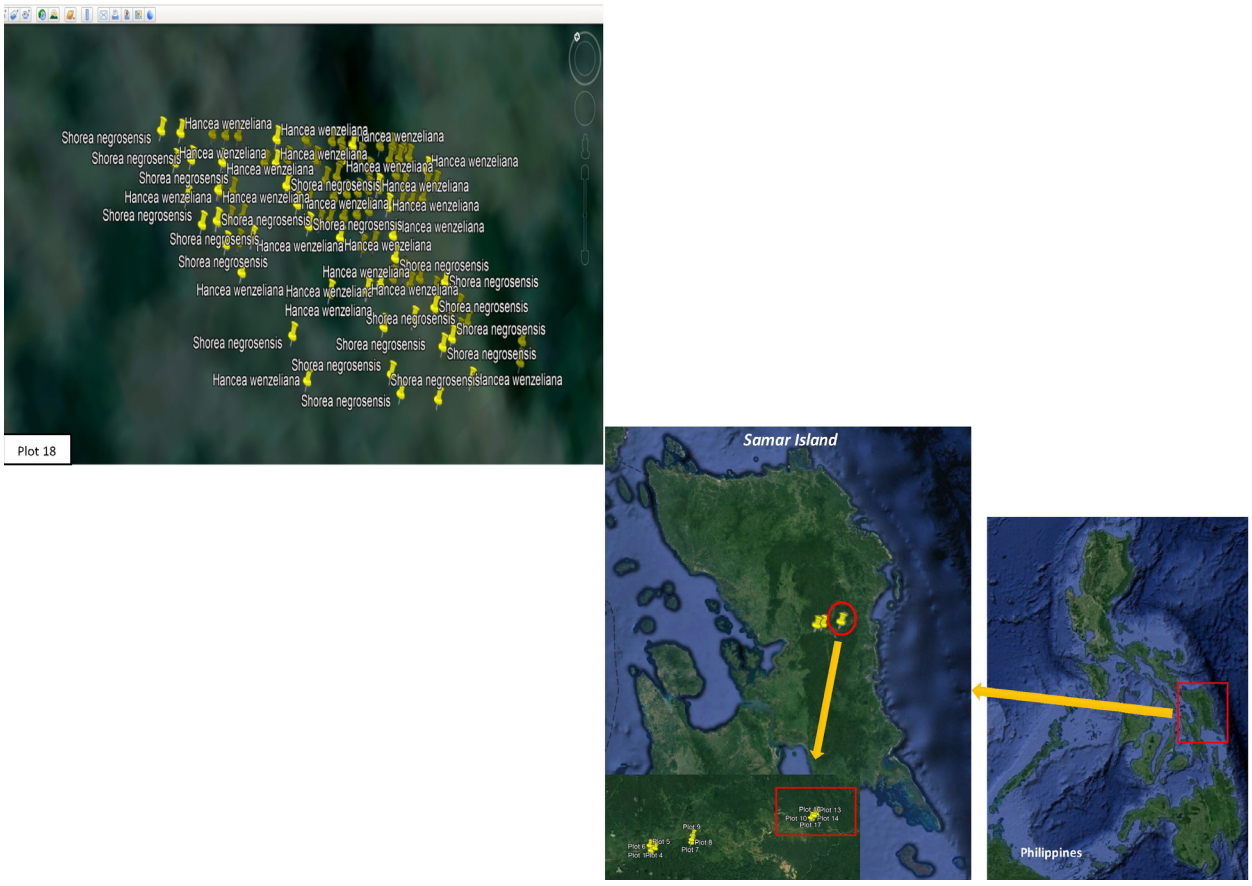

Image 3. Geotagging of priority plants in the municipality of Taft, Eastern Samar in SINP (cont.).

individuals to validate, monitor, and evaluate progress on the ground, thereby streamlining efforts and resources (World Bank 2013). The prevalent species within SINP, identified from the top 20 priority plants, *include S. negrosensis* and *H. wenzelinana*, as highlighted in Figures 2 and 3. Moreover, 89 individuals were meticulously documented from the top 13 species, categorized as high-priority, with 11 species predominantly found in Paranas plots and five in Taft plots. These high-priority species were observed across 10 plots within SINP (plots 1, 2, 3, 4, 5, 7, 8, 10, 13, and 16) (see Image 2 and 3). Noteworthy high-priority species common to both Paranas and Taft plots include *D. blancoi, A. rubrovenius*, and *Palaqium* species. Additionally, among the other high-priority plants, *A. rubrovenius* was exclusively identified in nine sampling plots within SINP, and this species remained the sole observation in plots 6, 7, 8, and 10, based on geotagged data. This underscores the resilience of *A. rubrovenius* in withstanding environmental and anthropogenic disturbances within SINP. Furthermore, two high-priority species, *G. rumphianum* and *C. riuminiana*, each accounted for a singular individual plant, with the former located in plot 4 and the latter in plot 16. Therefore, the essential tracking and monitoring in situ are imperative to safeguard and ensure the survival of these rare plants and their propagules within the protected area. The diminished number of species occurrences is attributed to human disturbances exacerbating agroclimatic anomalies on Samar Island, as outlined in Villanueva et al.'s recent study (2022). These factors significantly influence the physiological performance, encompassing survival, growth, and reproduction, as well as the resource distributions of these species (Bellard et al. 2012; Urban 2015; Howard et al. 2019; Kaspari et al. 2019).

A localized conservation priority framework for sustained ecosystem services

The LCPI serves as a straightforward point-scoring guide designed for local decision-making at the village level, particularly in prioritizing the conservation of locally threatened species. Its framework, depicted in Figure 1, is rooted in a multi-perspective approach to ensure inclusivity. This approach acknowledges the insights originating from local communities, institutions, and

Table 3. Uses, distribution, and conservation status of the species in Samar Island Natural Park.

Family/ Scientific name	Uses	Distribution	Conservation status	
			DAO 2017–11	IUCN
Araliaceae				
Polyscias nodosa (Blume) Seem.	Housing/ construction materials, handicrafts, fodder	Cosmopolitan	-	Least Concern
Arecaceae				
Caryota cumingii Lodd. ex Mart.	Food, handicrafts, plant selling (landscaping, ornamentals, seedling)	Within the Philippines	-	Data Deficient
Caryota rumphiana Mart.	Food, fiber, furniture, medicine, plant selling (landscaping, ornamentals, seedling), religious, festival	Cosmopolitan	-	Least Concern
Heterospathe intermedia (Becc.) Fernando	Fodder, housing materials, plant selling (landscaping, ornamentals, seedling)	Within the Philippines	-	Vulnerable
Oncosperma tigillarium (Jack) Ridl.	Food, medicine, furniture, housing and construction materials, handicrafts, accessories for tapping and hunting animals, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	Vulnerable	-
Asparagaceae				
Dracaena angustifolia (Medik.) Roxb.	Food, medicine, industrial material, fodder, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	-	-
Burseraceae				
Canarium hirsutum Willd.	Food, medicine, handicrafts, industrial materials, firewood	Cosmopolitan	-	Least Concern
Casuarinaceae				
Gymnostoma rumphianum (Miq.) L.A.S.Johnson	Firewood, charcoal, housing and construction materials, medicine, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	Other threatened species	-
Clusiaceae				
Calophyllum soulattri Burm.f.	Food, medicine, furniture, housing and construction materials, handicrafts, accessories for tapping and hunting animals, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	-	Least Concern
Garcinia rubra Merr.	Food	Within the Philippines	-	Near Threatened
Garcinia sp.	-	-	-	-
Cornaceae				
Mastixia sp.	Housing/ construction materials, furniture	-	-	-
Cycadaceae				
Cycas riuminiana Regel	Medicine, plant selling (landscaping, ornamentals, seedling), festival, religious	Within the Philippines	Vulnerable	Endangered
Dipterocarpaceae				
Hopea philippinensis Dyer	Housing/ construction materials, firewood, fodder	Within the Philippines	Critically endangered	Endangered
Shorea astylosa Foxw.	Medicine, furniture, housing/ construction materials, fodder	Within the Philippines	Critically endangered	Endangered
Shorea contorta S.Vidal	Furniture, housing/ construction materials	Within the Philippines	Vulnerable	Least Concern
Shorea negrosensis Foxw.	Medicine, furniture, housing/ construction materials, firewood, fodder	Within the Philippines	Vulnerable	Least Concern
Vatica mangachapoi Blanco	Housing/ construction materials, furniture, fodder	Cosmopolitan	Endangered	Vulnerable
Ebenaceae				
Diospyros blancoi A.DC. syn.: *D. discolor* Willd.	Food, medicine, furniture, handicrafts, housing/ construction materials, fodder, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	Vulnerable	-
Euphorbiaceae				
Codiaeum macgregorii Merr.	Medicine	Within the Philippines	-	-
Codiaeum sp.	Medicine, housing/ construction materials, firewood, fodder	-	-	-
Hancea wenzeliana (Slik) S.E.C.Sierra, Kulju & Welzen	Housing/construction materials, fodder, firewood	Within the Philippines	-	Critically Endangered
Macaranga bicolor Müll.Arg.	Medicine, firewood	Within the Philippines	-	Least Concern
Tritaxis ixoroides (C.B.Rob.) R.Y.Yu & Welzen	-	Within the Philippines	-	Vulnerable
Fabaceae				

Family/ Scientific name	Uses	Distribution	Conservation status	
			DAO 2017–11	IUCN
Wallaceodendron celebicum Koord.	Furniture, plant selling (landscaping, ornamentals, seedling)	Within the Philippines	Vulnerable	-
Gnetaceae				
Gnetum gnemon L.	Food, industrial materials, firewood and charcoal	Cosmopolitan:	-	Least Concern
Lamiaceae				
Teijsmanniodendron ahernianum (Merr.) Bakh.,	Housing/ construction materials, furniture, firewood, implements, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	-	Least Concern
Malvaceae				
Kleinhovia hospita L.	Food, medicine, furniture, housing/ construction materials, fiber, firewood, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	-	Least Concern
Meliaceae				
Aglaia rimosa (Blanco) Merr.	Medicine, housing/ construction materials, fodder, firewood	Cosmopolitan	Other threatened species	Near Threatened
Vavaea amicorum Benth.				Least Concern
Moraceae				
Artocarpus rubrovenius Warb.	Food, medicine, housing/construction materials, handicrafts, fodder, firewood, accessories for tapping and hunting wildlife	Within the Philippines	Other threatened species	-
Ficus glandulifera var. camiguinensis	Food, medicine, furniture, industrial, handicrafts, for implements, housing materials, fodder	Cosmopolitan	-	-
Ficus ampelas Burm.f.	Food, medicine, industrial use	Cosmopolitan	-	Least Concern
Pandanaceae				
Benstonea copelandii (Merr.) Callm. & Buerki	Fabric and fiber, plant selling (landscaping, ornamentals, seedling)	Within the Philippines	-	Least Concern
Phyllanthaceae				
Bridelia glauca Blume	Food, housing/construction materials, firewood	Cosmopolitan	-	Least Concern
Rubiaceae				
Lasianthus trichophlebus Hemsl. ex F.B.Forbes & Hemsl.	Medicine, housing/ construction materials, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	-	-
Psychotria sp.	Fodder, housing/ construction materials			
Neonauclea formicaria (Elmer) Merr.	Medicine, housing/ construction materials	Within the Philippines	-	Least Concern
Salicaceae				
Flacourtia sp.	Medicine, handicrafts			
Sapotaceae				
Manilkara fasciculata (Warb.) H.J.Lam & Maas Geest.	Food, fodder, furniture, housing/ construction materials, implements	Cosmopolitan	-	Vulnerable
Palaquium cf. *elongatum*		Cosmopolitan	-	Endangered
Palaquium sp.	Food, fodder, housing/ construction materials, plant selling (landscaping, ornamentals, seedling)			
Pouteria velutina Elmer			-	Near Threatened
Thymelaeaceae				
Aquilaria cumingiana (Decne.) Ridl.	Food, medicine, industrial, fodder, plant selling (landscaping, ornamentals, seedling)	Cosmopolitan	Vulnerable	Vulnerable
Gonystylus reticulatus (Elmer) Merr.		Within the Philippines	-	-
Urticaceae				
Oreocnide rubescens (Blume) Miq.	Food, medicine, industrial, fiber, housing/construction materials	Cosmopolitan	-	Least Concern
unidentified (Barit)	Housing/ construction materials	-	-	-
unidentified (Sumol)	Housing/ construction materials	-	-	-
unidentified (Buskayan)	-	-	-	-
unidentified (Urukay)	-	-	-	-

organizations in Samar Island, specifically in Paranas and Taft, where the Samar Island Natural Park is situated. Additionally, the LCPI integrates global perspectives by incorporating conservation concepts and principles from various conservation authorities. Gender and age group perspectives further enrich the framework by incorporating views from diverse age groups and genders, crucial in the decision-making process. The pluralistic lens employed aims to scrutinize both sociocultural and environmental (ecological) aspects of the LCPI, striving for a balance between anthropocentric and ecocentric viewpoints. While this remains an ongoing quest for the development of better tools in the future, the current iteration stands as a valuable interim resource. We remain optimistic that the insights garnered from LCPI can contribute to the refinement of local policies, ultimately leading to the sustained ecosystem services of the limestone forests in Samar Island Natural Park, benefiting both humans and nature.

CONCLUSION AND RECOMMENDATION

A total of 50 plant species had been screened for priority conservation at Samar Island Natural Park using the localized conservation priority index (LCPI). Thirteen have high-priority levels and 37 have either medium or low-priority levels, respectively. The top 20 plants have been prioritized as the focus of conservation action in the next 5–10 years. These are *Caryota rumphiana* Mart., *Aquilaria cumingiana* (Decne.) Ridl., *Cycas riuminiana* Regel, *Dracaena angustifolia* (Medik.) Roxb., *Oncosperma tigillarium* (Jack) Ridl., *Oreocnide rubescens* (Blume) Miq., *Kleinhovia hospita* L., *Diospyros blancoi* A.DC., *Codiaeum* sp., *Gymnostoma rumphianum* (Miq.) L.A.S. Johnson, *Caryota cumingii* Lodd. ex Mart., *Artocarpus rubrovenius* Warb., *Palaquium* sp., *Hancea wenzeliana* (Slik) S.E.C.Sierra, Kulju & Welzen, *Aglaia rimosa* (Blanco) Merr., *Canarium hirsutum* Willd., *Lasianthus trichophlebus* Hemsl. ex F.B.Forbes & Hemsl., *Polyscias nodosa* (Blume) Seem., *Shorea negrosensis* Foxw. and *Shorea contorta* S.Vidal. Furthermore, these top 20 plants had been geotagged in situ to enhance protection through intensive monitoring by park management. We are recommending village-level conservation policies to enhance both habitat and plant protection. Minimizing unnecessary roads or footpaths within the park can contribute to habitat protection. Plant protection can be done through ex situ conservation. Locals can collect scattered propagules under the canopy for backyard and home gardening. Conservationists are encouraged to undertake additional research aimed at refining the LCPI employed in this study. Furthermore, there is a need to explore more practical conservation options that align with sustainable development goals. This endeavor holds the potential to bring about tangible benefits for multiple stakeholders in the locality.

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Author details: Inocencio E. Buot, Jr. is a professor of botany, ecology, and systematics at the Plant Biology Division, Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños (PBD-IBS-CAS-UPLB) and is the Project Leader of CONserve-KAIGANGAN research project. Marne G. Origenes is an MS graduate fellow under the Career Incentive Program of the Department of Science and Technology – Science Education Institute (DOST-SEI), deployed at IBS-CAS, UPLB as part of the CONserve-KAIGANGAN Project. Ren Divien R. Obeña is the previous university research associate of the CONserve-KAIGANGAN project. Jonathan O. Hernandez is an assistant professor of Forest Biological Sciences, College of Forestry and Natural Resources, University of the Philippines Los Baños (FBS-CFNR-UPLB). Noba F. Hilvano is an associate professor and Dean of the College of Science, Eastern Samar State University (ESSU). Diana Shane A. Balindo and Edelyn O. Echapere are associate professors from Samar State University (SSU).

Author contributions: Inocencio E. Buot, Jr., the paper's main author, led the study, conceptualized the paper, formulated the objectives, developed the methodology, provided framework and direction on the flow of the manuscript discussion and overseeing the revision and review of the paper until publication. Marne G. Origenes contributed to the data analysis, discussion of results, conclusion, and revision of the paper after everyone's comments. Ren Divien R. Obeña assisted in the fieldwork, data analysis, and paper discussion. Jonathan O. Hernandez, Noba F. Hilvano, Diana Shane A. Balindo and Edelyn O. Echapere provided feedback and comments to improve the manuscript discussion.

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