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The Five Endemic Species of Philippine Ironwoods (Mangkono)

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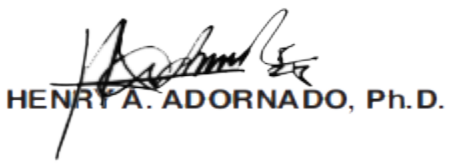
Foreword

This issue features the five (5) species of Ironwoods that are endemic to the Philippines and considered as threatened under the DENR Administrative Order. No. 2017-11 (Updated National List of Threatened Philippine Plantsa and their Categories, under Republic Act no. 9147 and by Section 6 of DAO No. 2007-01 (Establishing the National List of Threatened Philippine Plants and their Categories and the List of other Wildlife Species). These species are bagoadlau (*Xanthostemon philippinensis* Merr.), mangkono (*Xanthostemon verdugonianus* Naves), mapilig (*Xanthostemon bracteatus* Merr.), Palawan mangkono (*Xanthostemon speciosus* Merr.) and Sierra Madre mangkono (*Xanthostemon fruticosus* Peter G. Wilson & Co.) which belonged to Family *Myrtaceae*. This is a large family of plants that contains some of the hardest wood-producing trees. Among the mentioned endemic species, three (3) of them are considered critically endangered such as bagoadlau, mapilig and Sierra Madre mangkono.

Moreover, these five species of *Xanthostemon* have been assessed by the International Union for Conservation of Nature (IUCN). Among the five, three species were categorized as Vulnerable which include bagoadlau, mangkono, and mapilig. Palawan mangkono was categorized as "*Near Threatened*" while Sierra Madre mangkono falls under "*Endangered*" status (IUCN Version 2018-2).



HENRY A. ADORNADO, Ph.D.

The Five Endemic Species of Philippine Ironwoods (Mangkono)

Compiled by :

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A. MANGKONO

1. Taxonomic Classification:

Common Name	:	Mangkono, Mancono
Local Name	:	Mangkono (Babatngon, Leyte and Dinagat in Surigao)
Familiar Names	:	Philippine lignum vitae, Philippine ironwood, Palo de heiro
Scientific Name	:	*Xanthostemon verdugonianus* Naves.
Family Name	:	Myrtaceae
Order	:	Myrtales
Class	:	Magnoliopsida
Phylum	:	Tracheophyta
Kingdom	:	Plantae

2. Description:

Among the Philippine ironwood trees, mangkono is the most widely distributed. It is a medium-sized tree that attains a diameter-at-breast height (dbh) of up to 180cm with an average mechanical height of 13m. The bole is irregular, fluted, and bent and frequently with epidermic branches.

Flower of mangkono. Photo by Mark Anthony Carranza

The leaves are simple, alternate, relatively thick, and obovate, which measure 8-12 cm long and 3-5 cm wide with short acuminate or obtuse apex and reticulately pinnate venation with 6-10 lateral veins. It looks like a santan shrub when as early as one (1) year old it can already produce flowers and fruits. The inflorescence is color red with compound umbel form and located at terminal branches. It has an average measurement of 32 by 23 mm. The size of the inflorescence varies due to the irregular number of flowers in a peduncle. There are several peduncles per inflorescence bearing

3-6 florets in a peduncle forming a beautiful cluster with a total of about 13 to 20 complete flowers. It is said to be polyandrous since it has several stamens. Each flower has an average of 17 anthers with an average filament length of 18mm. It has dehiscent fruits with 2-3 lobes that split into 2-3 sections when ripe containing small half-moon shaped seeds. It grows abundantly in its locality of distribution despite being considered an endangered species in the Philippine Red List of Threatened Plants.

3. Geographic Distribution:

In the Philippines, this species is known to have a very limited habitat which occurs only in the islands of Sibuyan (Mt. Guiting-guiting, along Gaong river, Tampayan, Magdiwang and Romblon), Leyte (Babatngon), Samar (Homonhon island), Surigao del Norte (Dinagat, Bucas Grande and Siargao) and Hinatuan, Surigao del Sur. These areas of distribution are collectively known as the *"Mangkono Triangle"*, because of their positions on the Philippine map.

4. Distribution Status:

Endemic to the Philippines

5. Habitat and Ecology:

It is almost exclusively found in an ultramafic forest formation. The species grows very slow as suppressed by the nutrient deficient and heavy metal-riched soil in its natural habitat. In the Philippines, most ultramafic soils, more especially in Mindanao and Dinagat were covered by mining operations. Hence, the natural habitat of the species declined drastically in the last 100 years. This species thrives well in areas with an elevation of not more than 900m and with a wide range of soil conditions. It is a shade-intolerant or light-loving species and found growing in steep slopes about 45° along the shore on rocky or sandy soil.

6. Economic Importance and Uses

Mangkono is mainly valued for its excellent wood that is extremely hard, very heavy, and probably the most durable wood of the Philippines. It has been long recognized as suitable substitute for the world- famous Lignum vitae (*Guaiacum officinale L.*) due to its sheer hardness and high density. The wood is used for posts for houses, tool handles, novelties, shears, excellent material for bearing or stern bushing of a steamship's propeller shaft, saw guide blocks, rollers, poles and piles for wharfs and bridges.

7. Wood characteristics

A. Direction	=	grain is always crossed
B. Texture	=	extremely fine and dense
C. Color	=	yellowish brown heartwood, turning dark bronze or nearly black with age
D. Green Specific Gravity	=	1.043
E. Wood Density (g/cm^3)	=	1.04

8. Phenology

At an early age of 2.5 years from field planting, mangkono profusely bears flowers which occur annually and takes 22-29 days from bud formation to flower opening. While it takes about two (2) weeks from flower opening to fruit set and 77-81 days from fruit set to seed fall on the average. Anther dehiscence lasts from 5-7 days and almost of the same duration with stigmatic receptivity period. In some areas like in Busay, Babatngon, Leyte flowering is observed all-year round. Peak month for flower reproduction varies depending on daytime air temperature. In some cases, September and October are peak months of flowering. On the other site, in Nabungkagan, Babatngon, Leyte bud formation was observed in June or July until September or early October and fruiting occurs regularly from March to November.

9.Conservation Status:

Endangered (DAO 2017-11);
Vulnerable (IUCN Red List of Threatened Species, 2018)

B. BAGOADLAU

1. Taxonomic Classification:

Common Name	:	Bagoadlau
Scientific Name	:	*Xanthostemon philippinensis* Merr.
Family Name	:	Myrtaceae
Order	:	Myrtales
Class	:	Magnoliopsida
Phylum	:	Tracheophyta
Kingdom	:	Plantae

Flower of bagoadlau (Photo credit: http://www.raindeocampo.com/2018/08/06/96-threatened-native-tree-species-in-the-philippines-found-and-rescued/)

2. Description:

Among the Philippine ironwoods, bagoadlau is the hardest and the densest. Its unique stunning flowers make it distinguishable from the rest of the Philippine ironwood trees. The flowers exhibit yellow color with used petals and stamens that resemble rays of the early morning sun which is derived from its common name bago-adlau or new sun (bagong araw).

3. Geographic Distribution:

In the Philippines, this species can be found in Luzon particularly in Isabela (Dinapigue), Aurora, and Camarines Norte (Paracale, Mt. Cadig Labo, Capalonga Sitio Kabibirok) ; In Visayas, particularly in Samar (Giporlos); and in Mindanao, particularly in

Surigao del Sur (Bislig and Lianga).

4. Distribution Status:

Endemic to the Philippines.

5. Habitat and Ecology:

Found on ultramafic forest formation. In its natural habitat, the species grows very slow as suppressed by the nutrient deficient, heavy metal-riched soil. Due to mining activities, some of the known populations of the species were drastically reduced, particularly in Samar and Camarines Norte. This caused a drastic decline in the natural habitat of the species in the last 100 years. bagoadlau has a longer reproduction cycle unlike other *Xanthostemon spp.* On the other hand, matured trees are very prolific seeders, and even in the vicinity of mining areas, seedlings and saplings are profusely growing. Moreover, some newly discovered populations of the species, particularly in Aurora and Surigao del Sur can be a good seed production area.

6. Uses:

Wood is used for general construction, building ship, high-quality pieces of furniture (chairs and tables), telegraph poles, house framing and implements. Though total log ban is being implemented in the Philippines, illegal poaching is still very common.

7. Conservation Status

Critically Endangered (DAO 2017-11);

Vulnerable (IUCN Red List of Threatened Species, 2018)

Young Shoots/Leaves of bagoadlau. Photo by Mark Anthony Carranza.

C. MAPILIG

1. Taxonomic Classification:

Common Name	:	Mapilig
Scientific Name	:	*Xanthostemon bracteatus* Merr.
Family Name	:	Myrtaceae
Order	:	Myrtales
Class	:	Magnoliopsida
Phylum	:	Tracheophyta
Kingdom	:	Plantae

2. Description:

Its white flower makes mapilig distinguishable from the rest of the Philippine ironwood species. It has experienced declines due to timber extraction, river erosion and mining.

Flower of mapilig (Photo credit: Guiller Opiso. 2013. Available from http://phytoimages.siu.edu/imgs/pelserpb/r/Myrtaceae_Xanthostemon_bracteatus_77212.html

3. Geographic Distribution:

In the Philippines, this species occurs in the provinces of Aurora, Nueva Ecija, Camarines Norte (Paracale, Mambulao), Albay, Catanduanes, Samar (Basey; Mt. Sohoton and Mt. Tinatigan), Dinagat, Leyte (Ormoc and Kananga) and Surigao del Sur.

4. Distribution Status:

Endemic to the Philippines

5. Habitat and Ecology:

It also thrives well in ultramafic soils that are rich in hea metals. However, it is a riparian species that occurs abundantly

along the riverbanks up to a few meters away. In Western Samar and Eastern Samar, the river systems had found bordered and decorated by the large canopies of *X. bracteatus.*

6. Uses

The wood is used for making mallets, caulking hammers and other articles requiring an extremely hard and heavy, tough wood. Wood is best used in making high quality furniture (chairs and tables).

7. Conservation Status:

Endangered (DAO 2017-11);
Vulnerable (IUCN Red List of Threatened Soecies, 2018)

Photos provided by Nina Castro at EDC Binhi mini arboretum: (Left) Mapilig flowers starting to bloom and (right) close up photo of the mapilig flowers. source: https://www.facebook.com/theateneowild/photos/pcb.3003401939896099/3003401679896125/?type=3&theater

Adult mapilig tree. Photo by Mark Anthony Carranza

D. PALAWAN MANGKONO

1. Taxonomic Classification:

Common Name	:	Palawan Mangkono
Local Name	:	Limbutan
Scientific Name	:	*Xanthostemon speciosus* Merr.
Family Name	:	Myrtaceae
Order	:	Myrtales
Class	:	Magnoliopsida
Phylum	:	Tracheophyta
Kingdom	:	Plantae

2. Description:

Palawan Mangkono is usually a tree of 5m or more. It has broader disk shaped hyponthium with distinct vesicles. it has longer fruits, more persistent carpels and darker red flowers compared to mangkono.

Photo of Palawan mangkono flowering by Mark Anthony Carranza

3. Geographic Distribution:

Palawan mangkono has restricted distribution in the province of Palawan including nearby islands of Busuanga, Culion and Manamoc.

4. Distribution Status:

Endemic to the Philippines

5. Habitat and Ecology:

Restricted to the province of Palawan and almost exclusively found over ultramafic soil. It is the most dominant species in the province both in size and numbers since a majority of the Palawan soil is composed of ultramafic soil where it thrives. Same with most ironwood species, Palawan mangkono grows very slow as

suppressed by the nutrient deficient and heavy metal-riched soil. Also, it is a very prolific seeder with a very short reproduction cycle. It produces flowers a very early age, as a short shrub.

6.Uses

The wood is used for salt-water piling and as a substitute for lignum vitae.

7.Conservation Status:

Vulnerable (DAO 2017-11);
Near Threatened (IUCN Red List of Threatend Species, 2018

E. SIERRA MADRE MANGKONO

1.Taxonomic Classification:

Common Name	:	Sierra Madre Mangkono
Scientific Name	:	*Xanthostemon fruticosus* Peter G. Wilson & Co
Family Name	:	Myrtaceae
Order	:	Myrtales
Class	:	Magnoliopsida
Phylum	:	Tracheophyta
Kingdom	:	Plantae

Photo of Sierra Madre mangkono leaves by Mark Anthony Carranza

2.Description:

Sierra Madre mangkono is shrubby, occurring on ultrabasic substrate with large bright red flowers. They have simple broad leaves and capsule fruit. Individuals can grow to 1 meter.

3.Geographic Distribution:

In the Philippines, it can only be found in Luzon particularly in the province of Isabela (Divilacan, Palanan, and Dinapigue).

4.Distribution Status:

Endemic to the Philippines

5.Habitat and Ecology:

It can be found near the coast in a low scrub community occuring on exposed sites on soils derived from an ultrabasic substrate. it is the dominant componet of this community type at Lanay which also includes a number of other genera of spreading on erect shrub (Co & Tan 1992; Wilson & Co 1998).

6.Uses:

The wood is used for posts for houses, tool handles, novelties, shears, excellent material for the bearing or stern bushing of a steamship's propeller shaft, saw guide blocks, rollers, poles, and piles for wharves and bridges.

7.Conservation Status:

Critically Endangered (DAO 2017-11)
Endangered (IUCN Red List of Threatened Species, 2018)

SEED TECHNOLOGY

A. Seed Collection:

Seeds are available three months from bud formation. In Babatngon, Leyte, the availability of seeds is from May to early December. the collection is done when the fruit starts to dehisce. Indication of maturity is when the seeds change in color from green to brown.

B. Seed Processing and Storage:

Air dry the seeds for two days after collection. Seed storage behavior is recalcitrant. The viability of the seeds lasts only for two (2) months, thus it is advisable to sow the seeds within one month of collection. For its storage, polyethylene bag or in an air-tight container with or without fungicide dressing at room temperature can be used.

PROPAGATION AND MANAGEMENT

Propagated through seeds and wildlings. Even without pre-treatment, seeds can easily germinate. Wildlings of mangkono are easy to transport with minimum mortality. During collection, see to it that the soil is soft or moist before pulling to avoid severing the roots from the stem. Collected wildlings are mud-puddled and wrapped with moist jute sacks before transporting them to the nursery. On the other hand, some of the problems encountered while growing seedlings in the nursery are seed sources scarcity and lower quality of planting stocks resulting in a high percentage of mortality.

A. Sowing

Make sure that a one-meter radius is kept free from other vegetation. Dig a plant hole with dimensions of at least 20 x 20

cm. Plant the seedling at the proper depth. Root collar should be at level with or a little below the ground surface with the seedling oriented upward. Fill the hole with top or garden soil and press soil firmly around the base of the seedling.

B. Transplanting and care of seedling

Remove grass and other unwanted vegetation and cultivate the soil around the base of the seedling (50cm radius) once in every quarter for two to three years. Place mulch around the base of the seedling (maintaining the 50 cm radius and using cut grass, eaves and other suitable materials as mulch base). Prune the branches at most 50 percent of the crown depth, preferably during dry season, and ensure that you do not injure the bark when pruning. Remove infected or infested vegetation nearby to stop plant diseases from spreading and contaminating your seedling. Monitor regularly the growth of the seedling for presence of pests and diseases. Wildlings of mangkono are easy to transport with minimum mortality. During collection, see to it that the soil is soft or moist before pulling to avoid severing the roots from the stem.

C. Pests and Diseases

Common diseases like fungal infestation, mainly cause root diseases of nursery seedlings. Also, defoliators are very common, both on seedlings and mature trees.

PLANTATION ESTABLISHMENT, MAINTENANCE, AND PROTECTION

A. Site Preparation

Clear brushing of grasses is done in an area that is brushland or mixed with grasses and trees or shrubs to leave behind patches of shrubs or trees that will serve as nurse trees for newly planted mangkono seedlings or wildlings.

B. Distance of Planting

The recommended planting distance is 2 x 2 m. However, a close distance of 1 x 1m is advisable to discourage too much branching.

C.Weeding

It is advisable to ringweed the area to prevent weeds from competing with the newly-planted mangkono especially at the early stage of seedling/wildling development.

D. Pest and Disease Control

No known pest or disease has been reported to significantly cause damage to mangkono.

E. Fire

During summer, regular patrolling of the area is advised to monitor the plantation site for fire detection. Fire control measures include the establishment of greenbelts and the construction of firebreaks.

MAJOR THREATS

These species of ironwoods yield the hardest of Philippine timbers. The sheer hardness of the wood gives the tree some protection against felling, however, local people continue to cut the trees primarily for piles and posts particularly those with small diameter. Mining activities, illegal logging, illegal poaching and river erosion are some of its major threats. Primarily, mining activities are considered major threats since they are ultramafic species. For instance, some of the populations of Bagoadlau in Camarines Norte and Samar were already gone from now mined-out areas. Also, significant portions of the ultramafic soil in Palawan were covered by mining operations threatening the Palawan mangkono. Hence, this caused the drastic decline in their natural habitat in the last 100 years. On the other hand, this threat can now be lessened or avoided, since the Philippine government is now strictly regulating mining operations in the country and does not allow new applications. In addition, river erosion can be considered the greatest cause of the population reduction of mapilig, being a riparian species.

CONSERVATION ACTIONS

Due to the increasing recognition of its ornamental value, these species of Ironwoods are now becoming more popular in urban landscaping. For instance, Energy Development Corporation (EDC), a renewable energy company, is using mangkono as one of its flagship species for conservation. Seedlings of mangkono are now planted in more than 150 partner institutions (mostly schools and parks) of EDC all over the country. Moreover, the protection and conservation of these species are covered by Philippine laws, rules and regulations, as follows: DENR Administrative Order no. 2017-11, Republic Act no. 9147, (Wildlife Resources Conservation and Protection Act), Republic Act no. 7586 (National Integrated Protected Areas System Act),

and Executive Order no. 2011-23 (Declaring a Moratorium on the Cutting and Harvesting of Timber in the Natural and Residual Forests and Creating the Anti-illegal Logging Task Force).

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