



**REVIEW ON THE TAXONOMY, BIOLOGY, ECOLOGY, AND THE STATUS,  
TREND AND POPULATION STRUCTURE AND DYNAMICS OF *DALBERGIA  
OLIVERI* IN VIETNAM**

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## **Abbreviation**

|           |  |
|-----------|--|
| a.s.l     | Above sea level  |
| CPC       | Center for Plant Conservation                              |
| CCD       | Center for Nature Conservation and Development             |
| CITES     | Convention on International Trade in Wild Fauna and Flora  |
| DBH       | Diameter at Breast Height (at 1.3 m from the ground level) |
| <i>D.</i> | <i>Dalbergia</i>   |
| EN        | Endangered   |
| FPD       | Forest Protection Department                               |
| GPS       | The Global Positioning System                              |
| IUCN      | International Union for Conservation of Nature             |
| MARD      | Ministry of Agriculture and Rural Development              |
| MOST      | Ministry of Science and Technology                         |
| ND-CP     | Decree of the government                                   |
| VAST      | Vietnam Academy of Science and Technology                  |
| VUSTA     | Vietnam Union of Science and Technology Associations       |

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## 1. Background

Asian rosewood (*Dalbergia oliveri* Gamble ex Prain) was announced in 1897 on the Journal of the Asiatic Society of Bengal (J. Asiat. Soc. Bengal, pt. 2, Nat. Hist. 66 (1): 451 (1897), originating from Bengal. Asian rosewood is widely distributed in Vietnam, Thailand, Laos and Myanmar. This is a hard, beautiful, durable rosewood species containing aromatic essential oils and, free from termites. Therefore, *Dalbergia oliveri* has high economic value and is high risk of extinction due to uncontrolled exploitation. *Dalbergia oliveri* is listed in the Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Group IIA of Vietnamese Decree 06/2019/ND-CP on management of endangered, precious, and rare wild plants and animals and the implementation of the CITES.

There are very few studies on taxonomy, biology, and ecology of this species. Recently, a general study on the biological and ecological characteristics, and bioactivity of some species of the *Dalbergia* genus was conducted in Vietnam (Pham et al., 2011). The lack of up-to-date information on taxonomy, exploitation, use and trade of rosewood species has caused challenges and difficulties in management and conservation of these species. This report will provide scientific data and information to assess the taxonomy, biology, ecology, conservation status, and recommendations of conservation and sustainable thriving of *Dalbergia oliveri* in Vietnam.

## 2. Assessment of taxonomy, distribution, biology, and conservation status

### 2.1. Nomenclature

*Dalbergia oliveri* Gamble ex Prain was derived from Bengal (Prain, 1897). This species has been widely distributed in Vietnam, Thailand, Laos, Cambodia and Myanmar. The rosewood is hard, beautiful, durable and termite-free. It is of high economic value and under threat of extinction. The followings are nomenclatures of Asian rosewood:

- *Dalbergia oliveri* Gamble ex Prain., J. Asiat. Soc. Bengal, pt. 2, Nat. Hist. 66 (1): 451 (1897); Gagnep., Fl. Gen. Indochine 2:493 (1916); Pham Hoang Ho, An illustrated flora of Vietnam. Volume 1:887. Fig. 3555 (1999); C. Niyomdham, Pham Hoang Ho, P. Dy Phon, J. E Vidal In Ph. Morat, Flore Camb. Laos et Vietnam. 29: 30. Pl.5: fig. 9-12 (1997) (**Figure 1**).
- *D. bariaensis* Pierre, Fl. For. Cochinchinensis 5(24). Tab. 380B (1898); Gagnep., l.c.:496 (1916); Pham Hoang Ho, l.c. : 887. Fig. 3556 (1999). **Syntype**. *L. Pierre 1711 (7/1866)*. Cochinchina, prope Cho ben ad Baria in prov. Bien hoa (P) (*Syn.*) (**Figure 2**) (Muséum National d’Histoire Naturelle, 2014).
- *D. dongnaiensis* Pierre, l.c.: Tab. 382A (1898); Gagnep., l.c.:492 (1916); Pham Hoang Ho, l.c. : 888. Fig. 3558 (1999). **Holotype**. *L. Pierre 1705 (19/3/ 1877)*. Viet Nam, Pho Qua, Song Cai (P). (*Syn.*) (**Figure 3**) (Muséum National d’Histoire Naturelle, 2014).
- *D. duperreana* Pierre, l.c.: Tab. 381B (1898); Gagnep., l.c.:497 (1916); Pham Hoang Ho, l.c.: 888. Fig. 3559 (1999). **Holotype**. *L. Pierre 1039 (4/1870)*, Cambodge (P). (*Syn.*) (**Figure 4**) (Muséum National d’Histoire Naturelle, 2014).

- *D. mammosa* Pierre, l.c.: Tab.380A (1898); Pham Hoang Ho, l.c.: 888. Fig. 3557 (1999). **Holotype.** *L. Pierre 1711 bis (7/1866)*. Cochinchine, Choben, Baria (P). (*Syn.*) (**Figure 5**) (Muséum National d'Histoire Naturelle, 2014).

## 2.2. Common names

- Vietnamese: Cẩm lai, Cẩm lai Bà Rịa, Cẩm lai đồng nai, Cẩm lai bông, Cẩm lai mật, Cẩm lai vú, Nênh, Pa dong đeng, Cẩm lai lai;
- Cambodian: Neang Nuon;
- Thai: Mai Ching Chan;
- Laos: Mai Kham Phii;
- Myanmar: Tamalan;
- English: Asian rosewood, Burmese rosewood, Laos rosewood.

## 2.3. Biological characteristics

### a) Description:

A large tree, 15 – 30m in height and 60 – 90cm in diameter. Bark is grey; branches are stout and slightly pubescent. Leaves are pinnately compound, 15 – 25 cm in length with from (9 –) 10 –15 leaflets and caducous. Petiole is 3 – 5 cm long and rachis is 10 – 18cm long and glabrous. Leaflet is brittlely soft to slightly coriaceous, oval, oblong to lanceolate, 4 – 8 cm long, 1.5 – 3 cm wide, glabrous, apex obtuse or subacute, often acute, rounded at base; lateral veins are 9 – 12 pairs and venule is prominently reticulate on both sides; petiolule 3 – 4 mm long. Leaves are sparsely pubescent.

Inflorescence is corymbose-paniculate at or nearly terminal, 10 – 15 cm long. Bracts and bracteoles are caducous. Pedicel is 1.5 mm long and pubescent. Flower is bright mauve or purple inside, 12 mm long; calyx tube is 4 – 5 mm, glabrous or pubescent at base; upper calyx lobes are obovate, outer calyx lobes are obtuse oval and nearly the same length, inner calyx lobes are oval, acute and slightly longer than other calyx lobes or nearly as long as calyx tube. Stamens are 10; filaments are diadelphous; ovary is 2 – 3 ovules and pubescent.

Fruit is lanceolate, 9 – 14 cm long, 2.4 – 4 cm wide, glabrous, sometimes coriaceous, and bright brown. Seed is from 1 – 2 (rarely 3), globose or reniform with a size is 12.5 x 9 mm, and red brown. Flowering from April to May. Fruit is from September to December (**Figure 6, Figure 7, Figure 8**).

**b) Holotype:** (Typus). *Oliver s.n.* (1892). Tamalan, U. Burma (ex Birmanie) (Kew- K).

## 2.4. Distribution

In Vietnam, *Dalbergia oliveri* distributes in the following provinces: Da Nang (Son Tra district), Quang Tri (Huong Hoa district), Kom Tum (Chu Mom Ray national park in Sa Thay and Dak To districts), Gia Lai (Krong Pa, Ia Grai, Duc Co and Chu Prong districts), Dak Lak (Ea Kar, Krong Nang and Lak districts, and Yok Don national park), Dak Nong (Dak Mil and Cu Jut districts), Lam Dong (Lang Biang and Di Linh districts), Dong Nai (Cat Tien national park and Dong Nai cultural nature reserve), Phu Yen, Khanh Hoa, Ninh Thuan (Ca Na commune of Thuan Nam district and Song Pha commune of

Ninh Son district), Binh Thuan (Ham Thuan Bac district), Binh Phuoc (Bu Gia Map district), Tay Ninh and Ba Ria-Vung Tau provinces (Xuyen Moc district).

In the world, *Dalbergia oliveri* distributes in Myanmar, Thailand, Laos, and Cambodia.

## 2.5. Ecology

*Dalbergia oliveri* is found in the mixed evergreen broadleaf forests and lowland tropical monsoon Dipterocarpaceae deciduous forests with altitudes from 100 to 700 m, and up to 1,200 m a.s.l. (**Figure 9**) or lowland tropical monsoon evergreen broadleaf forests (**Figure 10**). In the forest structure, *Dalbergia oliveri* joins the main forest canopy, which plays important role in covering the surface soil layer, preventing soil erosion, and keeping soil humidity.

## 2.6. Studied specimens

In order to determine exact scientific name of the species, we referred to highly valuable original scientific documents of plant taxonomy and studied the following specimens: photos of holotypes of *Oliver s.n.* (1892), *L. Pierre 1711* (7/1866), *L. Pierre 1705* (19/3/1877), *L. Pierre 1039* (4/1870), and *L. Pierre 1711 bis* (7/1866) collected from French National Museum of Natural History, and new specimens collected from the following visited provinces:

- **Binh Phuoc province:** Bu Gia Map national park in Bu Gia Map district. Coordinate: 12°05'13.7"N, 107°09'24.6"E. Altitude: 405 m, collected on October 9, 2019), *CPC 8565*.
- **Dong Nai province:** Cat Tien national park, Cat Tien district. Coordinate: 11°25'21.1"N, 107°25'43.2"E; Altitude: 146 m, collected on October 9, 2019), *CPC 8563*.
- **Dak Lak province:** Yok Don national park, collected on September 13, 2019), *CPC 8559*.
- **Binh Thuan province:** Da Gu Ri Village, Da Mi commune, Ham Thuan Bac district. Coordinate: 11°16'56.1"N, 107°52'18.5"E; Altitude: 481 m, collected on October 8, 2019), *CPC 8562*.

## 2.7. Assessment of taxonomy

The official scientific name of this species is recognized as *Dalbergia oliveri* Gamble ex Prain of the Fabaceae family. The species was published by Gamble (1847 – 1925), a British botanist, and Prain (1857 – 1944) in 1897 based on holotypes that *Oliver s.n.* (1893) collected in Myanma in 1893 (Prain, 1897). Later, during the 20<sup>th</sup> century and until now, the species has not changed its name as *Dalbergia oliveri* and popularly distributed in Vietnam, Laos, Cambodia, Thailand, and Myanmar (Craib & Kerr, 1928; Gagnepain, 1916; Niyomdham et al., 1997; Pham, 1999). However, in 1898, based on many specimens collected in Vietnam, Laos, and Cambodia from 1866 to 1870, a French botanist – Pierre, Jean Baptiste Louis (1833 – 1905) published four new species in the “Flore forestière de la Cochinchine Fasc. 24, 1898”. Those are:



1. Asian rosewood – *Dalbergia bariaensis* Pierre (1898) based on the holotype *L. Pierre, 1711 (07/1866)*. Cochinchina, prope Cho ben ad Baria in prov. Bien Hoa, Vietnam (Pierre, 1898).
2. Dongnai rosewood – *D. dongnaiensis* Pierre (1898) based on the holotype *L. Pierre 1705 (19/3/ 1877)*. Pho Qua, Song Cai, Vietnam (Pierre, 1898).
3. Cambodia rosewood – *D. duperreana* Pierre (1898) based on the holotype *L. Pierre 1039 (4/1870)*. Cam Chay, Cambodge (Pierre, 1898).
4. Baria rosewood – *D. mammosa* Pierre (1898) based on the holotype *L. Pierre 1711 bis (01/7/1866)*. Cochinchine, Choben, Baria, Vietnam (Pierre, 1898).

During nearly 20<sup>th</sup> century, all four new species were also recognized as independent species by botanists, who deeply researched on the flora of India, Burma, Thailand, Laos, and Cambodia (Brandis, 1906; Craib & Kerr, 1928; Gagnepain, 1916; Prain, 1897).

Thus until 1997, the group of Asian rosewood was identified as five independent species, included *Dalbergia oliveri* Gamble ex Prain (1897), Baria rosewood – *Dalbergia bariaensis* Pierre (1898), Dongnai rosewood – *D. dongnaiensis* Pierre (1898), Cambodia rosewood – *D. duperreana* Pierre (1898) và Cẩm lai vú – *D. mammosa* Pierre (1898). In 1997, Niyomdham et al. (1997) reclassified this group of Asian rosewood of Vietnam, Laos and Cambodia based on a large set of holotypes of five nomenclatures of *Dalbergia oliveri*, *D. bariaensis*, *D. dongnaiensis*, *D. duperreana* and *D. mammosa* together with hundreds of specimens of 53 different specimen ID numbers collected from Vietnam, Laos, Cambodia, Thailand and Myanmar during 1886 and 1970. In 1997, the names of four species of *Dalbergia bariaensis*, *D. dongnaiensis*, *D. duperreana* and *D. mammosa* were changed into four synonym names of *Dalbergia oliveri* Gamble ex Prain (Niyomdham et al., 1997). Since then, the nomenclature *Dalbergia oliveri* Gamble ex Prain (1897) was officially recognized for the Asian rosewood, which widely distributed in Vietnam, Laos, Cambodia, Thailand, and Myanmar because this name was published in 1897 earlier than the name of four species published by Pierre in 1898, according to the international nomenclature law of plants. Other nomenclatures such as *Dalbergia bariaensis* Pierre (1898), *D. dongnaiensis* Pierre (1898), *D. duperreana* Pierre (1898) and *D. mammosa* Pierre (1898) are only synonym names of *D. oliveri*. In fact, the four new rosewood species mentioned above having the number of leaflets variable and inconsistent, usually from (9–) 10 – 15. Their morphology and size of fruits and seeds, and convexity of seeds also vary but they have the same characteristics, namely fruits are lanceolate, 9 – 14 cm long, 2.4 – 4 cm wide, glabrous, sometimes coriaceous, and bright brown; seed is from 1 – 2, reniform, more convex than fruit septum in one or two sides. The distinct morphological characteristics on leaflets, fruits, and seeds of the four new species above are corresponding to morphological characteristics of the *Dalbergia oliveri*.

Considering to the relationship amongst taxon, genus (*Dalbergia*), about 100 species in the world, mainly distributed in tropical and sub-tropical regions. About 29 species of the total are distributed in Indochina (Laos, Vietnam and Cambodia). In Vietnam, this genus includes about 47 species with some high valuable species such as *Dalbergia oliveri*, *Dalbergia cochinchinensis* and *Dalbergia tonkinensis*. At a higher taxonomic classification, the genus (*Dalbergia*) is under the tribe Dalbergieae Bronn ex De

Candolle (1825), which was published by a Swiss botanist – Augustin Pyramus de Candolle in 1825. This tribe has 22 genera and distributes in the tropical regions of the two hemispheres. There are only two genera of *Dalbergia* and *Pterocarpus* in Vietnam, Laos and Cambodia.

## **2.8. Conservation status**

In Vietnam, *Dalbergia oliveri* is listed as Endangered (EN A1a,c,d) in the Red Data Book of Vietnam (MOST & VAST, 2007). The basis of category is that *Dalbergia oliveri* is a precious rosewood species and therefore is target for exploitation; the number of mature individuals has been significantly decreased. Deforestation has caused serious damage to its habitat.

In the IUCN Red List of Threaten Species, *Dalbergia oliveri* is classified as Endangered (Nghia, 1998).

## **2.9. Use and scientific values**

Wood of *Dalbergia oliveri* is pink and hard with fine grain. Timber is valuable in making furnitures and ornament (processing fine art products). Sapwood is yellowish combined with dark – brown heartwood. The heartwood is very hard and heavy. Lumber is internationally traded under the names Burmese rosewood, Laos rosewood and Asian rosewood used in trade.

## **3. Current status, trend and population dynamics of *Dalbergia oliveri* in Vietnam**

According to published documents during 19<sup>th</sup> and 20<sup>th</sup> centuries and information collected from recent field visits, *Dalbergia oliveri* historically distributed in 14 provinces of Vietnam. Those are Quang Tri, Kom Tum, Gia Lai, Dak Lak, Dak Nong, Lam Dong, Dong Nai, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan, Binh Phuoc, Tay Ninh, Ba Ria – Vung Tau provinces. The *Dalbergia oliveri* population trend is decreasing in both Vietnam and in the world. The number of mature individuals has been significantly declined. Moreover, deforestation has seriously compromised to the occupation of the species. In fact, wild populations of *Dalbergia oliveri* in previous distribution locations such as Trang Bom district (Dong Nai province) and Ca Na commune (Ninh Thuan province) may be now exterminated due to the urbanization.

Results of interviews and preliminary assessment of the CITES management authority of Vietnam, CCD and CPC in Kon Tum, Gia Lai and Dak Lak provinces (from 9 – 14 September 2019) and Binh Thuan, Dong Nai and Binh Phuoc provinces (7 – 12 October 2019) showed that *Dalbergia oliveri* still exists in the wild in the Central Highland, South Central and Southeast provinces. However, the area, populations and number of mature individuals have been significantly reduced due to over-exploitation and habitat destruction.

In Kon Tum province, this species may exist in Dak Ha and Dak To districts and Chu Mom Ray national park of Ngoc Hoi and Sa Thay districts (adjacent to Cambodia).

In Gia Lai province, *Dalbergia oliveri* distributes in the Ia Rsai and Nam Song Ba protection forests of Krong Pa district.

In Dak Lak province, *Dalbergia oliveri* still exists in Ea Kar, Krong Pong, Ea Sup, and Yok Don district, Ea So Nature Reserve, and Krong Nang protection forests.

In Binh Thuan province, before 1996, *Dalbergia oliveri* distributed in almost all upland communes. In 1998, due to the large market demand, *Dalbergia oliveri* was vastly exploited. Currently, there is a population of this species, which is well naturally regenerated in the watershed protection forest of Ham Thuan – Da Mi hydro power plant. *Dalbergia oliveri* is seen to be purely growing in some forest patches of Ham Thuan – Da Mi hydro power plant, along the road (**Figure 11**). In addition, *Dalbergia oliveri* was reported to exist in the area adjacent to Di Linh district.

In Dong Nai province, *Dalbergia oliveri* is abundant and well regenerates in the some forest stands of Dong Nai cultural nature reserve, Tan Phu protection forests and Cat Tien national park (**Figure 12, Figure 13**).

In Bu Gia Map national park of Binh Phuoc province, there are many *Dalbergia oliveri* trees distributing scatteredly in the forests.

In general, the rapid assessment of status, trend, population structure and dynamics of *Dalbergia oliveri* through desk review, quick interviews, and short field visits to the six provinces, found that the number of individuals, especially large-sized *Dalbergia oliveri* trees and its occupancy areas have been reduced due to over-exploitation or habitat destruction. Nevertheless, there are still large-sized trees existing, flowering, and regenerating well in the visited provinces (except for Binh Thuan province). An example is in Bu Gia Map national park (**Figure 14**).

#### **4. Management and conservation of *Dalbergia oliveri* in Vietnam.**

*Dalbergia oliveri* is listed in the Red Data Book of Vietnam (2007) and IUCN Red List of Threaten Species (version 2.3) as Endangered. Rapid decrease of the population of this rosewood species in recent years led it to be placed in the group IIA of the Decree 06/2019/ND-CP dated on January 22, 2019 on the management of rare and endangered wildlife and implementation of CITES. According to group IIA of this Decree, wild plants and animals which have not been immediately threatened to be extinct but are at high risk of extinction if the exploitation and trade of these species are not strictly managed.

##### **4.1. Protected by laws**

*Dalbergia oliveri* is listed in the Red Data Book of Vietnam (2007) and IUCN Red List of Threaten Species (version 2.3) as Endangered. Rapid decrease of the population of this rosewood species in recent years led it to be placed in the group IIA of the Decree 06/2019/ND-CP dated on January 22, 2019 on the management of rare and endangered wildlife and implementation of CITES. According to group IIA of this Decree, wild plants and animals which have not been immediately threatened to be extinct but are at high risk of extinction if the exploitation and trade of these species are not strictly managed.

In the distributed areas of *Dalbergia oliveri*, MARD and Provincial FPDs have implemented some actions to manage the exploitation, trade, and conservation of *Dalbergia oliveri* in accordance to provisions of laws.

##### **4.2. In situ conservation**

It is necessary to take measures of in-situ conservation of populations of *Dalbergia oliveri* in the special-use forests/protected areas such as Cat Tien national park, Bu Gia Map national park, Yok Don national park, Dong Nai Cultural nature reserve, Tan Phu

protection forests, Ia Rсай protection forests, Nam Song Ba and Ham Thuan – Da Mi watershed protection forests.

In Cat Tien national park, Bu Gia Map national park and Tan Phu protection forests, many *Dalbergia oliveri* trees with diameter at breast height (DBH) over 20 cm have been inventoried and identified geographical coordinates to improve the management and protection of this species (**Figure 15, Figure 16**). Although the management boards of these forests have not been able to inventory all individuals with DBH larger than 20 cm, it has shown their interest and efforts to conserve *Dalbergia oliveri* in such important distribution areas.

#### **4.3. Local nursery system for *Dalbergia oliveri***

Field visits indicated that nursery system for *Dalbergia oliveri* is not popularly established in the region. Few seedling provision facilities such as the Tropical forest research center in Pleiku city of Gia Lai province, Bu Gia Map national park, Cat Tien national park and some households in Trang Bom district of Dong Nai province provide seedlings of *Dalbergia oliveri* for programmes of scattered afforestation, and planting trees in offices, streets or local households and surrounding areas (**Figure 17**).

### **5. Proposed interventions for conservation and sustainable development of this species in Vietnam**

*Dalbergia oliveri* is precious, economically and scientifically valuable, and is subject for logging and international trade. The population trend of the species is sharply declining. At national level, *Dalbergia oliveri* is protected by the governmental decree 06/2019/ND-CP dated on January 22, 2019. To protect this species at provincial level, provinces should take the following actions:

#### **5.1. Develop and implement provincial policies**

- Develop operational management plan for protected areas where *Dalbergia oliveri* distributed and ensure that requirements of *in-situ* management and protection of *Dalbergia oliveri* are taken into account.
- Propose species conservation plan and budget to the Vietnam Forest Protection and Development Fund of Vietnam.
- Enforce the relevant laws and regulations to protect *Dalbergia oliveri*.

#### **5.2. Communication and education**

- Raise awareness of the public on species conservation by using mass media such as radio, television and newspapers.

#### **5.3. Law enforcement**

- Protected area management boards and FPD officials should carry out regular inspection and control of unprocessed and processed timber transport of this species at the entrances of the forests where the presence of *Dalbergia oliveri* has been known.

#### **5.4. Community-based interventions**

- Provide trainings to local villagers and local rangers on population survey and monitoring.
- Recruit local people to establish enforcement teams to perform forest patrolling and and deliver conservation actions.

#### **5.5. Species-based interventions**

- Undertake *in-situ* and *ex-situ* conservation.
- Conduct *in-situ* conservation of *Dalbergia oliveri* populations in protected areas.
- Build nurseries in protected areas where *Dalbergia oliveri* distributes to produce seedlings for *in-situ* and *ex-situ* conservation.
- Restore wild populations through natural regeneration.
- Get local communities involved in replanting *Dalbergia oliveri* seedlings in the historical areas where the species might have grown in the past.

#### **5.6. Research-based interventions**

##### **a. Carry on surveys on population and distribution**

- Conduct further field surveys on *Dalbergia oliveri* to confirm its distribution areas and identify its wood volume in prioritized areas of Central highland, South Central and Southeast regions.

##### **b. Ecological study**

- Conduct further research on ecology such as phenology, germination and seedling formation and growth rate, and regeneration to support both *In situ* and *Ex situ* conservation.

##### **c. Monitoring**

- Establish local conservation interest groups to attract people who are interested in conservation to monitor threats of this species like the model in Bu Gia Map National Park.
- Draw attention of local people in mapping and recording GPS coordinate, profile and inventory of each tree which has DBH above 10 cm in the protected area.

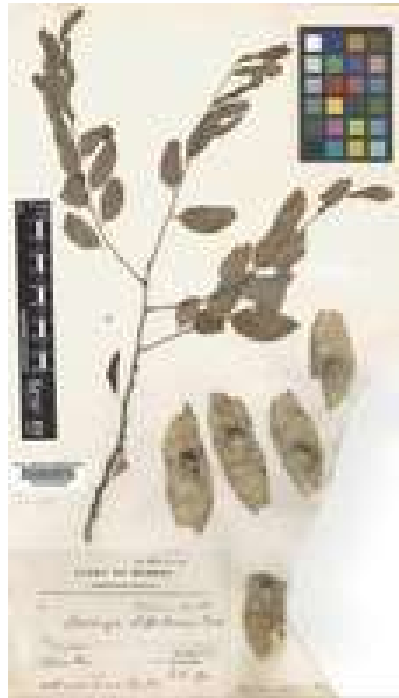
##### **d. Conduct socio-economic study with the participation of local communities**

- With the participation of local communities, conduct socio-economic research, identify potential human-induced threats, and study the use of *Dalbergia oliveri* to highlight the problems that relate to population growth, poverty, education, traditional and cultural activities, land use, crop structure, and dependence on forest resources.

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## Illustrations



**Figure 1.** *Dalbergia oliveri* Gamble ex Prain, **Holotype.** Oliver, J.W., s.n. (2/1892). Tamalan, U. Burma.



**Figure 2.** *Dalbergia bariensis* Pierre. **Syntype.** L. Pierre 1711 (7/1866). Cochinchina, prope Cho benad Baria in prov. Bien Hoa, Vietnam.

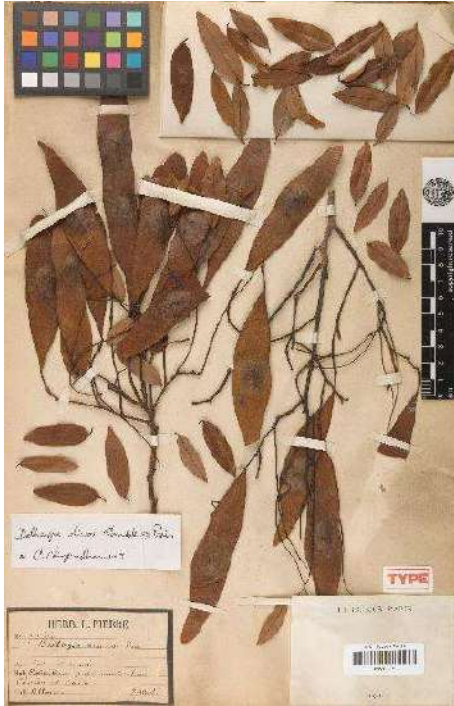


**Figure 3.** *Dalbergia dongnaiensis* Pierre, **Holotype.** L. Pierre 1705 (19/3/1877). Viet Nam, Pho Qua, Song Cai.



**Figure 4.** *Dalbergia duperreana* Pierre, **Holotype.** L. Pierre 1039 (4/1870), Cambodge.





**Figure 5.** *Dalbergia mammosa* Pierre, **Holotype.** L. Pierre 1711 bis (7/1866). Vietnam, Cochinchine, Choben, Baria.



**Figure 6.** *Dalbergia oliveri*. 08/10/2019, N.T. Hiep & N. M. Ha CPC 8562. Ham Thuan Bac – Da Mi, Binh Thuan.



**Figure 7.** *Dalbergia oliveri*, 09/10/2019, N.T. Hiep & N. M. Ha CPC 8562. Cat Tien national park, Cat Tien district, Dong Nai province. Photo by Nguyen Tien Hiep/CPC – 2019.



**Figure 8.** *Dalbergia oliveri*, 11/10/2019, N.T. Hiep & N. M. Ha CPC 8565. Bu Gia Map national park, Binh Phuoc province. Photo by Nguyen Tien Hiep/CPC – 2019.





**Figure 9.** The *Dalbergia oliveri* lives in the mixed evergreen forest and deciduous tropical monsoon forest on lowland in Yok Don national park. Photo by Nguyen Tien Hiep/CPC – 2019.



**Figure 10.** The *Dalbergia oliveri* (the tree with a small blue signboard on the right) lives in tropical monsoon evergreen broadleaf forest on lowland in Cat Tien national park. Photo by Nguyen Tien Hiep/CPC – 2019.





**Figure 11.** Population of *Dalbergia oliveri* is well regenerating in the watershed protection forests of Ham Thuan – Da Mi hydro power plant, Binh Thuan province. Photo by Nguyen Tien Hiep/CPC – 2019.



**Figure 12.** A mature individual of *Dalbergia oliveri* in Cat Tien national park. Photo by Nguyen Tien Hiep/CPC – 2019.



**Figure 13.** Seedlings of *Dalbergia oliveri* are being well regenerated under forest canopy in Cat Tien national park. Photo by Nguyen Tien Hiep/CPC – 2019.





**Figure 14.** A mature *Dalbergia oliveri* in Bu Gia Map national park. Photo by Nguyen Tien Hiep/CPC – 2019.





**Figure 15.** A mature *Dalbergia oliveri* in Cat Tien national park. Photo by Nguyen Tien Hiep/CPC – 2019.



**Figure 16.** A mature *Dalbergia oliveri* was inventoried and identified by geographic coordinates (GPS) at Cat Tien national park.





**Figure 17.** A nursery of Bu Gia Map national park is to produce seedlings of *Dalbergia oliveri* and others to serve scattered afforestation, plant trees in offices, streets or local households and surrounding areas to conserve indigenous trees.