



Taxonomy and distribution of *Parashorea* (Dipterocarpaceae) in Vietnam

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Abstract

The paper provides an overview of the current knowledge of *Parashorea* (Dipterocarpaceae) in Vietnam with their taxonomy, ecology, distribution and conservation status.

Keywords:

Conservation, Dipterocarpaceae, *Parashorea chinensis*, *Parashorea stellata*, Vietnam.

INTRODUCTION

Dipterocarpaceae is one of the most economically and ecologically important families, its timber and non-timber products have long been recognized in South East Asia and other regions. The family is comprised of about 17 genera and 535 or more species worldwide (Pooma and Newman 2001). In Vietnam, 44 species belonging to 6 genera have been recorded and 11 species were listed in the Red Data book of Vietnam in 2007 which is a list of rare and endangered species of fauna and flora native to Vietnam (Hoang et al., 2013).

The genus *Parashorea* was described for the first time by Kurz in 1870. *Parashorea* Kurz is an entirely Asian genus, distributed in lowland tropical forests from South China to almost all countries of Southeast Asia. All species belonging to *Parashorea* are timber trees and most have high economic and conservation values. Vietnam has two species: *Parashorea chinensis* and *Parashorea stellata* (Hoang, 2005; Ho, 1999).

The *Parashorea* spp in Vietnam have been evaluated and were included in the 2015 IUCN Red List of Threatened Species and in the Red Book of Vietnam in 2007. Based on the Criteria (V2.3). *Parashorea stellata* was categorized as Vulnerable

(VU) in the Red Data Book of Vietnam (2007) and Critically Endangered (CR) in the IUCN Red List (2018; *Parashorea chinensis* was categorized as Endangered (EN) in the IUCN Red List (2018) but was not listed in the Red Data Book of Vietnam (2007). Here we present an overview of Vietnamese *Parashorea* based on the literature, the herbaria specimens held in Vietnam (VNF, VNM, CPNP, HNU, VFM), Leiden (L), Paris (P), South China Botanical Garden (SCBG) and especially specimens collected on field trips in Vietnam. The conservation status of *Parashorea* spp in Vietnam is analyzed and categorized based on land cover maps, the derived extent of occurrence and estimated number of populations

PARASHOREA KURZ

J. Asiat.Soc. Bengal. 39 (2): 65 (1870); Masamune, EPB (1942) 492; FTSB (1955) 126; Ashton, MDB (1964) 82, MDBS (1968) 38; Meijer & Wood, Sabah For. Rec. 5 (1964) 190; Burgess. TBS (1966) 140; Anderson, CLTS (1980) 118; PROSEA 5, 1 (1993) 325; Newman *et al.*, MDFB-LHW (1996) 66. Forest Fl. Burma 1: 117 (1877); PIERRE, Fl.For. Cochinch. 3 (14): pl.224 (1889); GUERIN, Fl. Gen. Indoch. 1:387 (1910); GILG, Nat.

Pflanzenfam., ed. 2, 21: 262 (1925); RIDLEY, Fl. Malay Penins. 1:234 (1925); SLOOTEN, Bull. Jard. Bot. Buitenzorg 3 (8): 370 (1927); FOXW., Malayan Forest Rec. 10:240 (1923). SYM., Malayan Forest Rec.16:97 (1943); TARD., Fl. Gén.Indoch., Suppl. 1 (3):352 (1943); SMITINAND *et al.*, Thai For. Bull. (Bot.) 12:54 (1980); ASHTON, Fl.Males., ser.1, 9 (2): 379 (1982). Hoang et al. Blumea. 49 (2 & 3). 2009.

These are Evergreen trees, with buttressed trunks; dense crowns which are hemispherical or dome shaped. Bark is grey to purplish brown, frequently with corky star-like lenticels at the base,

lobes narrower than the 3 inner ones. *Petals* free. *Stamens* 15, in 3-whorls, longer than ovary in bud; filaments joined at base; connectives mucronate, slightly exceeding anthers; anthers with 4 pollen sacs, narrowly oblong, tapering at both ends, 2 inner slightly smaller, minutely hairy; filaments compressed above, broadening toward base. *Ovary* small, ovoid, with or without stylopodium; style long, filiform. Fruits; pedicels short, mature calyx lobes valvate, all long, spatulate, equal or unequal, if unequal with 3 longer and broader than the 2 other. *Nut*: globose to ovoid; more or less pubescent and white corky lenticellate; style caducous. *Cotyledons* fleshy, unequal.

Distribution: The genus is comprised of about 14 species. It is widely distributed in Myanmar, South China, Thailand, Philippines, Malaysia, Lao, Cambodia and Vietnam. Two species in Vietnam (*Parashorea chinensis* and *Parashorea stellata*)

KEY TO THE SPECIES

1a. Young leaves are pinkish in colour. Stipules linear-lanceolate, 1 embracing the twigs. Petals whitish cream color; Stamens 15, filaments short 1-1.5 mm. Calyx lobes developing into 5 equal wings. Nut dense pubescent.

Parashorea stellata

1b. Young leaves are green in colour. Stipules ovate, cordate at the base, 2 embracing the twigs. Petals have a yellowish color; Stamens 12-15, filaments 2-4.5 mm long; Calyx lobes developing into 5 unequal wings, 3 are longer and broader than the other 2. Nut slightly pubescent. *Parashorea chinensis*

Parashorea stellata Kurz

J. Asiat. Soc. Bengal. 39: 66 (1870); Nat. Hist. 39: 66. 1870; Forest Fl. Burma 1: 117 (1877); PIERRE, Fl.For.Cochinch. 3 (14):pl.224 (1889); BRANDIS,

shallowly fissured then scaly; with inner bark fibrous. Sapwood is pale whitish to yellowish colour; heartwood is pale to grey-brown. *Stipules* scale-like, caducous. *Leaves* with waxy epidermis, drying brown-grey, undersurface greyish to silvery, juvenile leaves often peltate, blade oblong -ovate, often asymmetric, slightly asymmetrical at base; nervation pinnate, midrib evident above, basal nerves usually at an acute angle to the midrib; tertiary nerves densely scalariform. *Domatia* present. Petiole mostly weakly geniculate; Inflorescence paniculate, axillary or terminal. *Calyx lobes* imbricate at base, sub-equal, 2 outer

J.Linn.Soc.31:104, pl.11 (1895); GUERIN, Fl.Gén.Indoch. 1:388, fig.38 (1910); CRAIB, Fl.Siam.Enum.1:144 (1925); SLOOTEN, Bull.Jard.Bot.Buitenzorg 3 (8): 373, fig.2 (1927); FOXW., Malaysian Forest Rec. 10: 242 (1932); PHAM HOANG HO, Fl.III.S. Vietnam, ed. 2, 1:318, fig. 770 (1970); SMITINAND *et al.*, Thai For. Bull. (Bot.) 12:57. fig.3 (1980); ASHTON, Fl. Males., ser 1, 9 (2):383 (1982); Smitinand, J.E. Vidal and P.H. Hô, Fl. Cambodge, Laos and Vietnam 25: 106, t. 20, figs. 4-6. 1990; R. Pooma and M.F. Newman, Thai Forest Bull., Bot. 29: 154. 2001; VU VAN CAN *et al.*, Ess. For. Vietnam 6:50; Type: *Brandis* s.n. CAL (holotype).

Synonyms

- *Shorea stellata* (KURZ) DYER, Fl. Brit. Ind. 1:304 (1875).

- *Parashorea poilanei* Tardieu, Not. Syst. (Paris) 10: 136. 1942. Type: *Poilane* 6612 P (holotype); BKF!, E! (isotypes).

Diagnostic characteristics

These are big trees up to 40 m high and 1m in diameter. Trunks are cylindrical, not fluted; buttresses present, and concave. Bark is brownish grey with slight fissures, with inner bark slightly aromatic. *Young twigs* are almost glabrous. Stipules present, linear-lanceolate, with stellate hairs, 5-6mm. Leaves simple, alternate, oblong lanceolate, 7-15 by 4-6 cm, base wedge shaped, symmetrical, margin entire, apex shortly acuminate, glabrous on the upper surface, glabrous or sparse grey short hair on the lower surface; midrib glabrous, secondary veins with 8-14 pairs, straight, but arching just near margin, remaining separate, below prominent but slender, drying distinctly paler than lamina; tertiary nerves hardly visible, scalariform; Domatia usually absent, if present, pore-like and glabrous. Petiole 1-1.5 cm long, with stellate hairs or glabrous. Young leaves have a pinkish colour.

Inflorescences terminal or axillary panicles, 6–14 cm long; rhachis cylindrical, densely soft stellately hairy; bracts linear-lanceolate, caducous; Sepals imbricate, oblong, ca. 3.5–4 x 1.5–2mm, hairy on both sides; Petals ovate, whitish cream color colour, ca. 6–8 x 4–6mm, with whitish indument on both sides. Stamens 15, filaments short 1-1.5 mm, the inner whorl much longer, anthers 1.5 - 2 mm long,

apiculate, inner ones shorter, anther prolongation 1mm long. Ovary superior, ovoid, 3–5 by 2–2.5 mm, dense pubescent, 3-locular, ovules 2 in each locule, style glabrous or slightly hairy. Fruits ovoid, calyx 5 lobes developing into 5 wings, equal, 6-10 x 1-1.5 cm, 5–7 veins. Nut free from calyx, with dense pubescent, 1.5-2 x 1-1.5 cm.

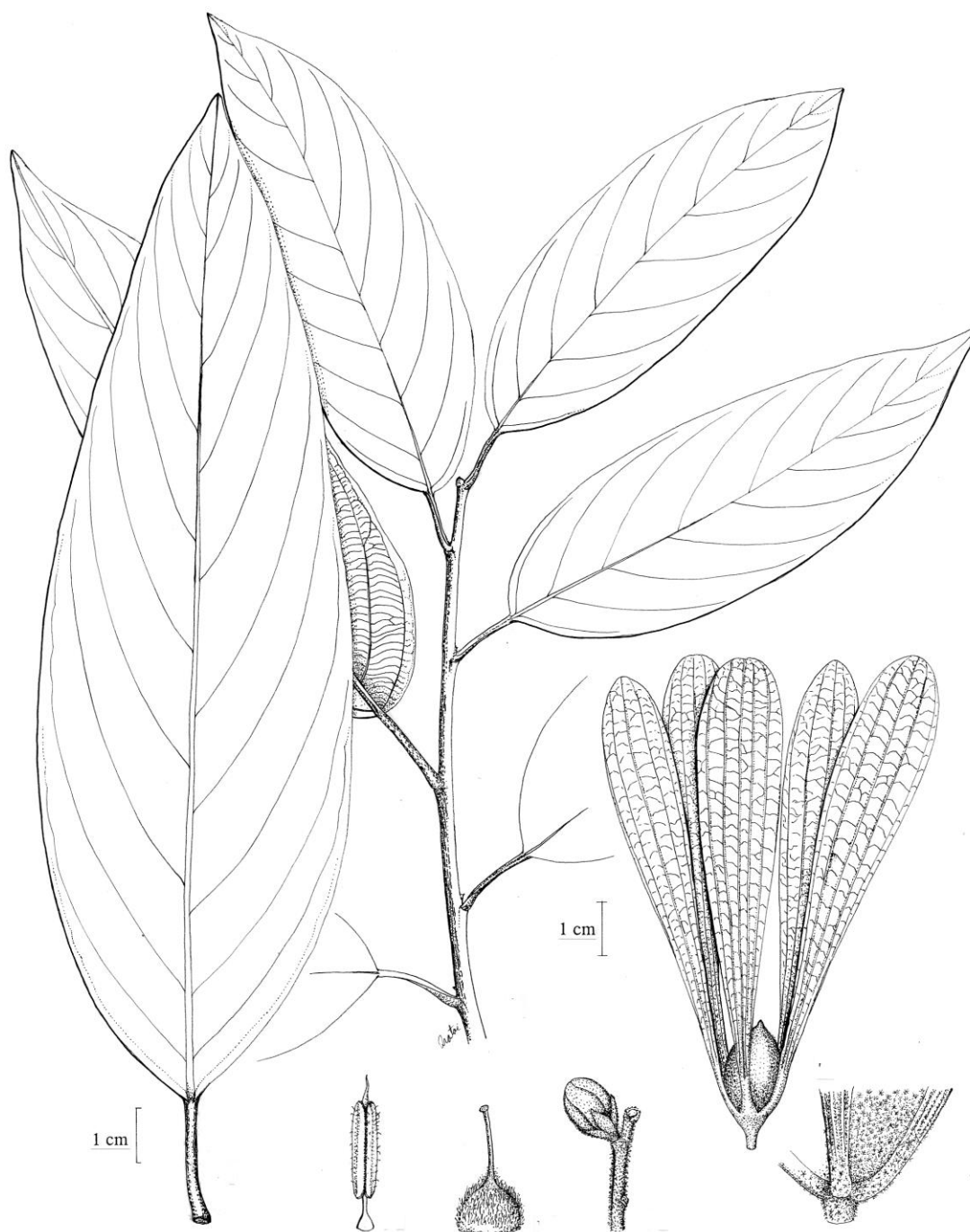


Fig. 01: *Parashorea stellata* Kurz

Habitat & Ecology: *Parashorea stellata* occurs from the lowlands to lower hill forests or dry evergreen forests, at 50-800 m altitude. Flowering: January-December; fruiting: January-November.

Distribution: *Parashorea stellata* widely distributed species from Myanmar, Malaysia and Thailand. In Vietnam *Parashorea stellata* is naturally distributed from the centre to the highland centre of Vietnam. During the field study we found this species in the Bach Ma National park, Thua Thien Hue province and in the Ba Na natural reserve, Da Nang city.

Conservation status: *Parashorea stellata* was categorized as Critically Endangered (CR A1cd, B1+2c) in IUCN Red List in 2018; and as Vulnerable (VU A1 b,c + 2b,c ; B1+2a,b,c) in Red Data Book of Vietnam (2007). However, based on the specimens and results of field surveys we suggest that this species should be categorized as EN A1ac, C2a both for IUCN and Vietnam Data Red Book of Vietnam.

Note: Most specimens of *Parashorea stellata* in VFM were identified as *Parashorea poilanei*. However, as mentioned above *Parashorea poilanei* is a synonym of *Parashorea stellata*, so specimens had to be corrected to *Parashorea stellata*.

According to Smitinand et al. (1990. *Parashorea lucida* (Miq.) Kurz is a synonym of *Parashorea stellata*. However, calyx lobes of *Parashorea stellata* is developing into 5 equal wings, while fruits of *Parashorea lucida* have 5 unequal wings (3 large wings and 2 other small wings). Additional *Parashorea lucida* so far have only been recorded in Malaysian regions and have not been found in Vietnam or in Laos and Cambodia.

Specimens examined: Bo 73, 6680 (VFM); Can 6577, 6683 (VFM); Le Cham s.n (VFM); Vu Dung 300 (VFM); Vu Dung & The Boi 411, 7421, s.n (VFM); Trong Dung BC - TV000439 (VNF); Poilane 6612 (P).

***Parashorea chinensis* Wang Hsie.**

Acta Phytotax. Sin. **15** (2):10, pl. 1 (1981); VU VAN DUNG & NGUYEN VAN CHINH, Ess. For. Vietnam **4**: 34, fig.17 (1981); Smitinand, J.E. Vidal and P.H. Ho, Flora of Cambodia, Laos and Vietnam **25**: 110, t. 21, figs. 5–9. 1990; Flora of China Vol. 13. 2007; Hoang et al, Blumea **49**.2009. Type c.i. 75-777 YNFI (Yunnan National Forestry Institute (holotype)

Synonyms

Shorea chinensis (Wang Hsie) H. Zhu;

Diagnostic characteristics

Large trees up to 50 m high, 100 cm diameter (but sometimes up to 200 cm). Trunk cylindrical. Bark grey with slight longitudinal fissures, inner bark slightly aromatic. Leaves elliptic to ovate, 7–20 by 2.6–8 cm, base rounded, margin entire, apex attenuate or shortly caudate, glabrous and shining on the upper side except on the veins, stellate hairy and with dot-like glands on the lower surface, folded in bud, usually distinctly undulate between each vein, secondary veins 13–20 pairs. Petiole 1–1.5 cm long, with stellate hairs. Stipules ovate, pointed at the top, cordate at the base, 2 stipules embracing the twigs, with stellate hairs, stipule scar short. Inflorescences terminal or axillary panicles, 7–17 cm long, rachis cylindrical, densely soft stellately hairy. Bracts ovate-oblong, 10–15 by 5–6 mm, usually 2 embracing the flower. Sepals imbricate, finely velutinous on both sides. Petals ovate, yellowish, with whitish indument outside. Stamens 12–15, filaments 2–4.5 mm long, the inner whorl much longer, anthers 1.6 mm long, apiculate, inner ones shorter, anther prolongation 1–1.2 mm long, subulate. Ovary superior, ovoid, 3–5 by 2–2.5 mm, densely velutinous, 3-locular, ovules 2 in each locule, style glabrous. Fruits ovoid to ellipsoid, densely covered by grey scales, calyx lobes glabrous, a little bit unequal in length, embracing the fruit, 3 larger ones elliptical - oblong, 6–10 by 1.2–2 cm, 5–7 veins, the two smaller ones 3.5–7 by 0.6–1 cm.

Distribution: *Parashorea chinensis* is distributed in South China, Laos and Vietnam. In Vietnam: most provinces of northern Vietnam from Lai Chau, Lao Cai to Quang Binh provinces, but mainly in Ha Giang, Tuyen Quang, Kien Giang, Ninh Binh, Thanh Hoa, Nghe An, and Ha Tinh provinces. This species has been planted in many places in northern Vietnam, especially in Cuc Phuong National Park.

Note: It is well known that this species is endemic to South China and North Vietnam (Smitinand, Vidal and Ho, 1990; Flora of China Vol. 13. 2007). However, we found that it also occurs in Nakai district, Khammouane Province in middle of Laos (based on the specimen in Laos National University – Svengsuksa B.BT 245).

Habitat & Ecology: In Vietnam, found in valleys, along rivers, in evergreen forests, at an altitude of 100–1000 m, but more often at 300–700 m, usually mixed with *Aglaiia gigantea*, *Dracontomelum dao*, *Pometia pinnata*, *Saraca dives*, *Terminalia myriocarpa*, and *Vatica odorata*.

Flowering: April to June; fruiting: July to September.

Conservation status: *Parashorea chinensis* was categorized as Endangered (EN A1cd, C2a) in IUCN Red List (2018); This species was not listed in the Red Data Book of Vietnam (2007). However, based on the specimens and result of field surveys we suggest that this species should be categorized as VU (A1cd+2cd, B1+2c) both for IUCN and Vietnam Data Red Book.

Specimens examined: Can 59 (CPNP); Ninh & Duc B35, 62-1 (CPNP); Soejarto & Cuong 10608

(CPNP); Cuong 275 (CPNP, L); Canh Dp 1 (VNF); Binh BC-TV 1275 (VNF); Linh & Ly BC-TV 1274 VNF), Sam BC-TV 1299, BC-TV 1302, BC-TV 1304 (VNF), Son 195 (VFM), 74 (VFM); Bo.514 (VFM), Chuyen & Bo.336 (VFM), Vu Dung s.n. (P), Favrot s.n (P), Schmid s.n. (P); Duc H3 (VFM); Chuyen 5211 (VFM); Chuyen 194 (VFM). Chuyen 199 (VFM); Chuyen 201 (VFM); Nguyen Bien 5214 (VFM); Hong 6793 (VFM), Nhuan s.n (VFM); 1838 (VFM); 1839 (VFM); 5215 (VFM); Svengsuksa B.BT 245 (NUOL).

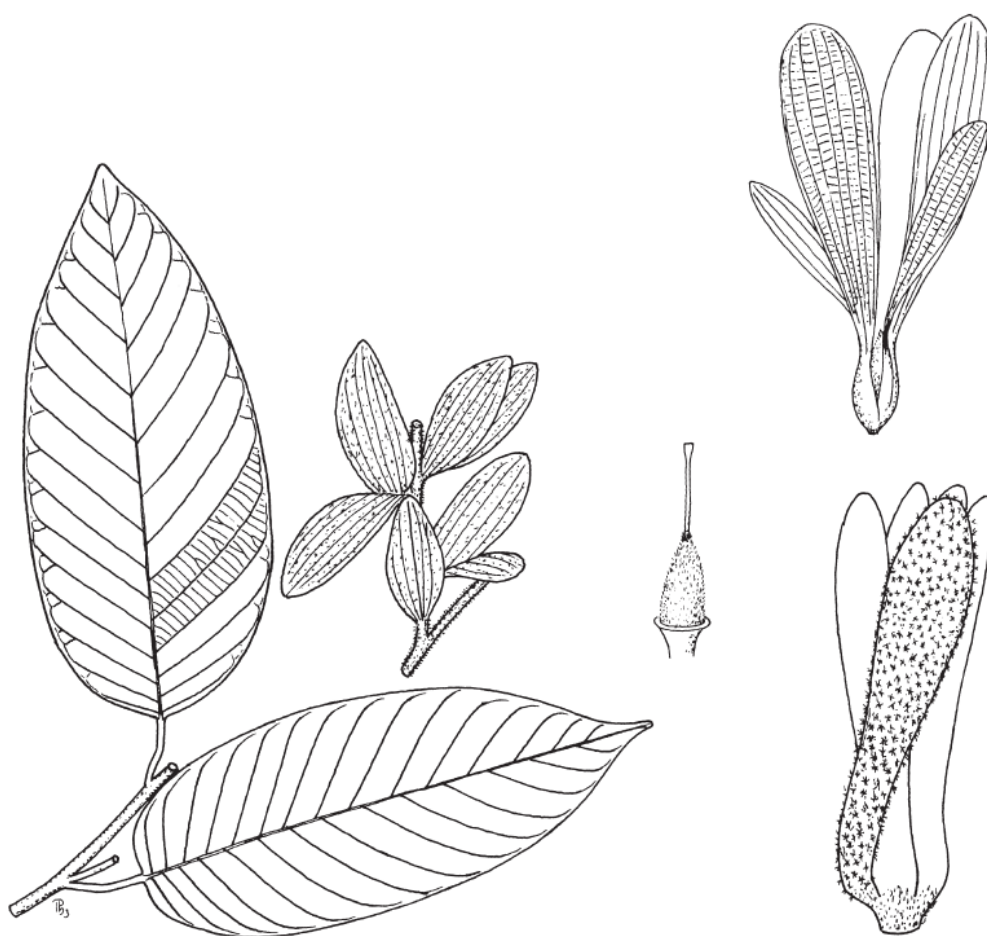


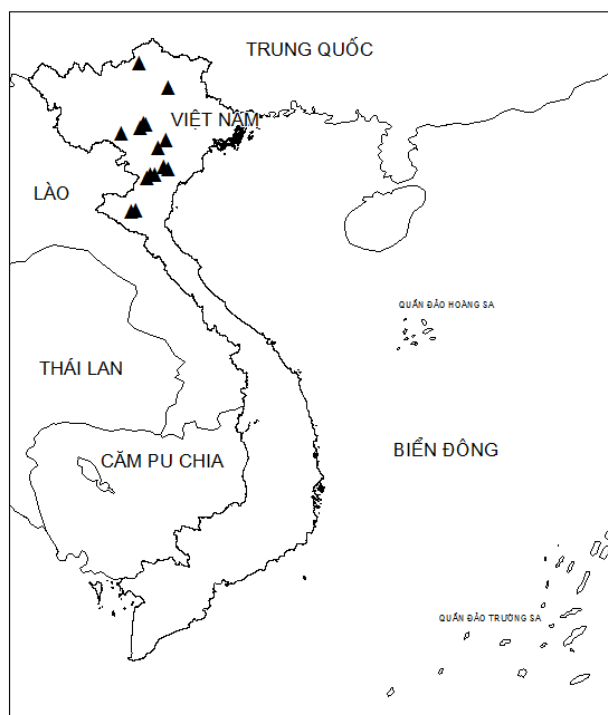
Fig. 02: *Parashorea chinensis* Wang Hsie.



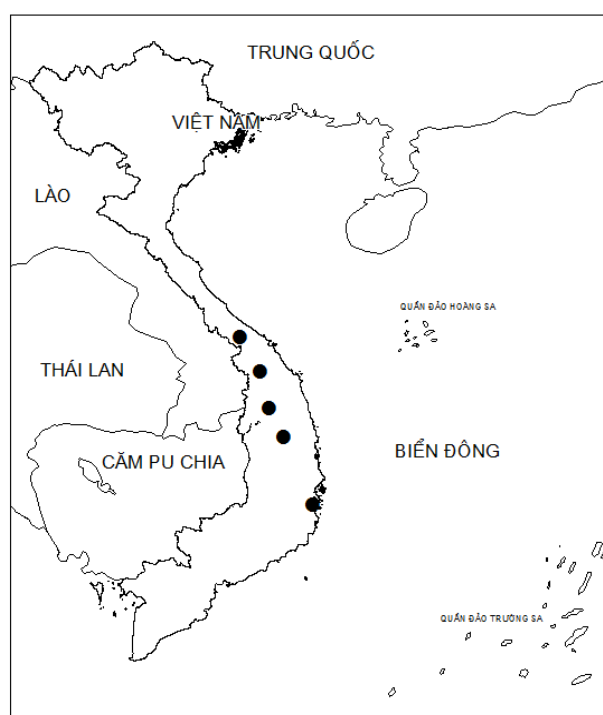
Picture 01: Plantation of *Parashorea chinensis* Wang Hsie in Cuc Phuong National Park, Ninh Binh province (Picture from H.V. Sam)



Picture 02: Fruit of *Parashorea stellata* Kurz. Picture from Juliana Proserpi (CIRAD)



Map 01: Distribution of *Parashorea chinensis* Wang Hsie



Map 02: Distribution of *Parashorea stellata* Kurz

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