

Further notes on Thai Dipterocarpaceae

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ABSTRACT. New information on Thai Dipterocarpaceae, derived from recent field work and studies of additional herbarium specimens, is presented. Two taxa newly recorded for Thailand are briefly described and illustrated. One of these, *Parashorea densiflora* subsp. *kerrii*, is newly recognised at subspecific rank. New information is provided on a number of species mainly in the genus *Dipterocarpus*. Eight genera and 63 species of Dipterocarpaceae are now known to occur in Thailand.

INTRODUCTION

A recently published checklist of Thai Dipterocarpaceae included 63 species and two subspecies (Pooma & Newman, 2001). Since then several field trips have been conducted to areas where poorly documented species are located. Furthermore additional specimens not previously available to the author have been examined. Two new records for Thailand have been found, one of which is newly recognised at the subspecific level. Notes on distribution ranges and putative hybrids are provided mainly within the genus *Dipterocarpus*. A few species included in the previous checklist are no longer considered to occur in Thailand. New identification keys are in preparation, pending additional work in connection with the Flora of Thailand account.

1. ANISOPTERA

1. *Anisoptera costata* Korth
2. *Anisoptera curtisii* Dyer ex King
3. *Anisoptera scaphula* (Roxb.) Kurz

2. COTYLELOBIUM

Cotylelobium lanceolatum Craib

3. DIPTEROCARPUS

1. *Dipterocarpus alatus* Roxb. ex G. Don

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Note.— *Dipterocarpus alatus* x *D. costatus* was recently recorded from Khong Chiam, Ubon Ratchathani (*Pooma et al.* 3345 (BKF)). The parent species were growing in close proximity to each other. Leaf form and fruit characters, including size and indumentum, are intermediate between both species. It should be noted that the hybrid *D. costatus* x *D. obtusifolius* is also known from the area.

2. *Dipterocarpus baudii* Korth.

Note.— *Dipterocarpus baudii* x *D. turbinatus* was recently recorded from Khao Kitchakut National Park, Chanthaburi, where it occurs at 300–600 m altitude scattered on a hillside covered with evergreen forest (*Pooma et al.* 3243a (BKF), 3243b (BKF), 3243c (BKF)). The seedling is partly covered with long, tufted, pale brown hairs as in *D. baudii* turning glabrescent with age. Fruiting specimens combine the narrowly ovoid fruits of *D. turbinatus* with the three large orbiculate calyx lobes of *D. baudii*. The tree only produces 1–2 fruits per large branch.

3. *Dipterocarpus chartaceus* Symington

4. *Dipterocarpus costatus* C.F.Gaertn.

Note.— See notes under *Dipterocarpus alatus*, *D. obtusifolius*, and *D. gracilis*.

5. *Dipterocarpus dyeri* Pierre

Note.— *D. dyeri* x *D. kerrii* was recently collected on Khao Phanom Benja, Krabi (*Pooma et al.* 3653 (BKF)). Vegetatively the hybrid is closer to *D. kerrii*, but the fruits differ by being large and slightly keeled on the upper half of the calyx tube.

6. *Dipterocarpus gracilis* Blume

Note.— *Dipterocarpus gracilis* x *D. costatus* was recorded from Pa Tao Dam, Kanchanaburi (*Phattarahirankanok* 86 (BKF)). The fruit is slightly keeled on the tube as in *D. costatus* but the overall shape is similar to that of *D. gracilis*.

7. *Dipterocarpus grandiflorus* (Blanco) Blanco

8. *Dipterocarpus hasseltii* Blume

9. *Dipterocarpus intricatus* Dyer

Note.— *Dipterocarpus intricatus* x *D. tuberculatus* was collected in Sakaerat, Nakhon Ratchasima (*Santisuk* 254 BKF). The hybrid is characterised by several intermediate characters in the fruit. Both parent species are very common in the dry deciduous dipterocarp forest of that area.

10. *Dipterocarpus kerrii* King

Note.— see notes under *Dipterocarpus dyeri*.

11. *Dipterocarpus obtusifolius* Teijsm. ex Miq.

Note.— *Dipterocarpus costatus* x *D. obtusifolius* has been reported several times, most recently by Pooma & Newman (2001). It was recently recorded at 100 m elevation from Khong Chiam, Ubon Ratchathani (*Pooma et al.* 3340 (BKF)). It apparently occurs in association with *Pinus kesiya* in the transition zone between dry deciduous dipterocarp forest dominated by *D. obtusifolius* and *D. intricatus* and dry evergreen dipterocarp forest dominated by *D. costatus* and *D. alatus*. Whereas the leaves resemble those of *D. obtusifolius*, the bark and fruits are closer to *D. costatus* in size and shape. The hybrid *D. alatus* x *D. costatus* is also known from this area.

12. *Dipterocarpus retusus* Blume

13. *Dipterocarpus tuberculatus* Roxb.

Note.— *Dipterocarpus tuberculatus* x *D. obtusifolius* has been collected in light, open, disturbed vegetation near Nam Phung Dam, Sakon Nakhon (*Pooma et al.* 3387 (BKF)). The leaves are similar to those of *D. obtusifolius*. The fruits are intermediate in size and shape.

14. *Dipterocarpus turbinatus* C.F.Gaertn.

Note.— See notes under *Dipterocarpus baudii*.

4. HOPEA

Note.— In Pooma & Newman (2001) *Hopea apiculata* and *H. mollissima* were wrongly mentioned to occur in Thailand. *Hopea* sp. 1 is now referred to *H. oblongifolia*.

1. *Hopea beccariana* Burck

2. *Hopea ferrea* Pierre

3. *Hopea griffithii* Kurz

Distribution.— Additional collections have been identified from Waeng, *Phengklay, Smitinand* 1212 (BKF); Khao Licho, *Phuphat* D4 (BKF); Bala, *Phuphat* D8 (BKF); Ban Chulaphorn Phatthana 7, *Pooma, Chamchumroon, Phuphat, Trakulkamchai* 3148 (BKF).

4. *Hopea helferi* (Dyer) Brandis

5. *Hopea latifolia* Symington

6. *Hopea oblongifolia* Dyer in Fl. Brit. India 1(2): 309. 1874. Type: India, *W. Griffith* 715 (holotype K!).— *Hopea oblongifolia* var. *grandis* C.E.C.Fisch, Bull. Misc. Inform. Kew 1926: 462 (1926) Type: Myanmar, Tenasserim, *C.E. Parkinson* 1685 (holotype K!), Figs. 1, 2.

Note.— This species was included as doubtful in Pooma & Newman (2001). Since then several fruiting specimens have been identified: Ranong, Khao Phota Chong Dong, *Kerr* 16734 (BK, K, L, BM); Surat Thani, Phanom, *Kerr* 18312 (BK, BM, K) and

Nop Pring, *Kerr* 18383 (BK, BM, K). Additional fruiting specimens were recently collected in the Sri Phangnga and Khao Sok National Parks (*Pooma et al.* 3692a-c (BKF), 3714a-b (BKF)). The following specimens were determined as *Hopea apiculata* in Pooma & Newman (2001): *Kerr* 18557 (BK, K), *Santisuk* s.n. (BKF); *Smitinand* 8015 (BKF) and *Soejarto et al.* 5904 (BKF) & 5907 (BKF). They are now referred to *H. oblongifolia*.

Sutheesorn 2326 (BK), was wrongly cited in Pooma & Newman (2001) as *Sutheesorn* 2376. The specimen was identified as *Hopea* sp. 1, but based on recent evidence I am convinced that the correct identification is *H. oblongifolia*. Finally, the unidentified specimen collected by *Pooma et al.* (1862 (BKF)) has been identified as *H. oblongifolia*.

7. *Hopea odorata* Roxb.

8. *Hopea pedicellata* (Brandis) Symington

9. *Hopea pierrei* Hance

10. *Hopea recopei* Pierre

Note.— The species author should be Pierre not Pierre ex Lenness.

11. *Hopea sangal* Korth.

12. *Hopea siamensis* F.Heim

13. *Hopea thorelii* Pierre

Distribution.— The following specimens were cited under this species in Pooma & Newman (2001): *Smitinand* 8057A (BKF, L) & 34998 (E), *Phusomsaeng* 34 (BKF, K, L) and *Chermsirivathana* 162 (BK). They were all collected at Sae Falls, Ubon Ratchathani, a locality that is now under water as a consequence of the Pak Moon Dam. However, additional specimens were recently collected in Dong Fa Huan Botanical Gardens, and Khong Chiam also in Ubon Ratchathani (*Pooma et al.* 2159 (BKF), *Pooma, et al.* 3316 (BKF) and *Pooma, et al.* 3343 (BKF)). Fig. 5B.

5. NEOBALANOCARPUS

***Neobalanocarpus heimii* (King) P.S.Ashton**

6. PARASHOREA

1. *Parashorea densiflora* Slooten & Symington subsp. *kerrii* (Tardieu) R.Pooma, stat. nov.— *Parashorea kerrii* Tardieu, Not. Syst. (Paris) 10(3): 135 1942. Type: Laos, Muang Huang (Vientiane), *Kerr* 20802 (holotype P; isotypes BM!, K!, L!). Figs. 3, 4.

Large evergreen tree, 30–40 m tall, with large buttresses at base. *Bark* shallowly fissured, scaly, with scattered corky lenticels at base; buds, external faces of the stipules

and panicles covered with tufts of pale brownish hairs. *Young twigs* almost glabrous, distinctly lenticellate. *Buds* ellipsoid, ca. 5 by 3 mm. *Stipules* broadly ovate, concave, thickened, almost covering bud, scar curved-lanceolate, horizontal. *Leaves* ovate-oblong to ovate-lanceolate, sometimes elliptic, slightly asymmetrical at base, almost glabrous on both surfaces with rather dense reddish fine dots or glaucous when immature, with bright yellow fine small scurfy scales when mature, 5–18 by 3–7 cm; apex acuminate; base cuneate; nerves 10–12 pairs, angle to midrib 20°–40°, slightly raised above, prominent below; tertiary nerves densely scalariform; midrib raised above, prominent below; petioles almost glabrous, 1–1.5 cm long, stout. *Domatia* minute, pubescent. *Panicles* 10–30 cm, rectangular in outline, branched to the 2nd order, primary branches up to 10 cm; secondary branches up to ca. 5 cm long, each with 3–6 flowers of which only 1–2 develop into fruits; bracts broadly ovate, 4 by 3 mm, eventually reflexed, \pm persistent; floral buds ovoid, pubescent, ca. 6–8 by 4 mm; calyx lobes deltoid, unequal, 2 outer lobes more slender than the inner 3, eventually reflexed, imbricate; pedicels 2–3 mm, stout. *Stamens* 15, arranged in 3 whorls; connective mucronate, slightly exceeding the anthers; anthers with 4 pollen sacs, narrowly oblong, tapering at both ends, the adaxial ones smaller, minute hairy, ca. 3 mm long; filaments compressed above, broad towards base, shorter than the anthers. *Ovary* ovoid, ca. 1 mm in diam., tomentose; style filiform, glabrous, ca. 2 mm long. *Fruiting calyx* lobes not developing into wings, united, lower half and adherent to the nut; lobes narrowly tongue-shaped with acuminate apex, subequal, thickened, reflexed, imbricate at base, 5–7 by 2–3 mm; stalk 3–4 mm long. *Nut* subglobose, brown to dark brown, corky with lenticels, almost glabrous except at the apex, ca. 3 by 2.5–3 cm, apiculate.

Thailand.— NORTH-EASTERN: Nong Khai [Phu Wua Wildlife Sanctuary, *Pooma et al.* 3403 (BKF), 3440a (BKF) & 3440b (BKF)].

Distribution.— Confined north-eastern Thailand and north-western Laos.

Ecology.— Frequently found in association with *Dipterocarpus turbinatus*, *Shorea thorelii* and *Vatica odorata* in lowland evergreen forest on sandstone.

Vernacular.— Klet khe (เกล็ดเค้) (Nong Khai); Khaen Hin (แคนหิน) (Laos).

Note.— The species concept applied here is in accordance with that of Ashton (1982), which is also cited in Pooma & Newman (2001).

Parashorea kerrii was treated as synonym of *P. buchananii* by Smitinand et al. (1980). In *Flore du Cambodge du Laos et du Vietnam*, Smitinand et al. (1990) maintained their taxonomic decision and based the description on Kerr's specimens and Parkinson's specimens from Myanmar (only *Parkinson* 2338 (K) was seen for this study). Unwinged fruiting specimens of *Parashorea* were recently been collected by Pooma et al. The leaves of these specimens are similar to those of Kerr's specimens by having 10–12 pairs of secondary nerves and densely set reddish dots beneath. The angular main axes of the inflorescence are also found on Kerr's specimens. Smitinand (1990) used this character to distinguish *P. buchananii* from *P. dussaudii*. *P. buchananii*, however, has a winged fruiting calyx, 12–18 pairs of secondary nerves, spreading inflorescences with oblong persistent bracts, and yellowish with a red tinged centre. Kerr's specimens and those from Nong Khai are characterised by having narrowly spreading inflorescences, broadly

triangular to ovate bracts that are not persistent as in *P. buehneri* and pinkish-white flowers. On this evidence I conclude that the above-mentioned collections represent two different species.

Parashorea dussaudii is intermediate in several characters between *P. buehneri* and Kerr's specimens. This applies particularly to the 10–12 pairs of secondary nerves, the rounded inflorescence axes, the white flowers, and the winged fruits (Smitinand et al., 1980). Later Smitinand et al. (1990) noticed that the fruits of *P. dussaudii* are unknown. A typical representative for *P. dussaudii* has leaves that are glabrous beneath (without reddish dots), early caducous and lanceolate bracts, in combination with the inflorescence characters mentioned above. It is interesting to note that the type specimens of *P. dussaudii* deposited in P have been annotated by P.S. Ashton as *P. buehneri* and *P. lucida* (Miq.) Kurz.

Parashorea densiflora Slooten & Symington was originally described from the Malay Peninsula. It has unwinged fruits and a reflexed calyx, and I consider it more closely related to specimens from Nong Khai, differing only in having lanceolate stipules, shorter inflorescence, more numerous secondary nerves (10–)13–20 pairs, and a distinct distribution range (Symington, 1943; Ashton, 1982). In accordance with the above-mentioned species concept, it is more appropriate to maintain *kerrii* at subspecies rank instead of raising it to specific rank. *P. dussaudii* is retained as a species pending more field work.

2. *Parashorea stellata* Kurz

Note.- Smitinand et al. (1990) stated that *Parashorea stellata* was unlikely to occur in Laos (Vientiane). The specimens examined could be *P. densiflora* subsp. *kerrii* described above, the juvenile leaves of which resemble *P. stellata*.

7. SHOREA

Note.— There is no longer evidence for the presence of *Shorea foxworthyi* as the specimens Thavorn 595 and 637 have since been identified as *S. thorelii*. A number of species comprise one or more subspecies. Those occurring in Thailand are indicated below.

1. *Shorea assamica* (Ridl.) Symington subsp. **globifera** (Ridl.) Symington

2. *Shorea curtisii* Dyer ex King subsp. **curtisii**

3. *Shorea faguetiana* F.Heim

Note.— Recently, fruiting specimens were collected at Sirindhorn Falls, Bala-Hala Wildlife Sanctuary, Narathiwat (*Niyomdham & Puudjaa* s.n., 12 August 2000 (BKF)).

4. *Shorea farinosa* C.E.C. Fisch.

5. *Shorea glauca* King

6. *Shorea gratissima* (Wall. ex Kurz) Dyer

7. *Shorea guiso* (Blanco) Blume

8. *Shorea henryana* Pierre

9. *Shorea hypochra* Hance

10. *Shorea laevis* Ridl.

Note.— This species has also been recorded in Myanmar (Muang Ba, *Pe* 13116 (K)).

11. *Shorea leprosula* Miq.

12. *Shorea macroptera* Dyer subsp. **macroptera**

13. *Shorea obtusa* Wall. ex Blume

14. *Shorea parvifolia* Dyer subsp. **parvifolia**

Shorea parvifolia Dyer subsp. **velutinata** P.S.Ashton

15. *Shorea roxburghii* G.Don

16. *Shorea siamensis* Miq.

17. *Shorea singkawang* (Miq.) Miq. subsp. **singkawang**

18. *Shorea sumatrana* (Slooten ex Thorenaar) Symington ex Desch

19. *Shorea thorelii* Pierre

8. VATICA

Two species are added here, *Vatica bella* and *V. umbonata* subsp. *umbonata*.

1. ***Vatica bella*** Slooten, Bull. Jard. Bot. Buitenz. 9(1–2): 102, f. 6. 1927. Fig. 4.

Note.— This is a newly recorded species for Thailand. It is placed in sect. *Vatica* which is characterised by having equal and persistent calyx lobes. It is a medium to large tree, 20–40 m tall, with tapering bole and smooth greyish-green bark. The leaves are oblong to lanceolate with relatively short petioles, the calyx is prominently beaked and eventually reflexed. The nut is corky, turbinate to subglobose with persistent terete style.

Vatica bella is only known from Hala-Bala Wildlife Sanctuary, Narathiwat (*Phuphat* D28 (BKF), *Pooma et al.* 3131 (BKF)). It is found scattered along streams in evergreen dipterocarp forest, typically in association with *Shorea curtisii*.

2. *Vatica diospyroides* Symington

Note.— Smitinand (1979) treated the northern Vietnamese species *Vatica fleuryana* Tardieu as a synonym of *V. diospyroides*, which was described from peninsular Thailand. Based on Symington's (1935) description, Cheng-Chiu (1987) reached the conclusion that *V. guanxiensis* Mo may be conspecific with *V. fleuryana* due to the similarity in leaf and tomentum characters. Because fruiting specimens have not been found in Vietnam he could not confirm the differences in the ovary and stigmas mentioned in the original description. A discussion of distribution patterns in northern Vietnam is not possible at this stage of my investigation since I have not had access to the specimens mentioned in *Flore du Cambodge du Laos et du Vietnam* (Smitinand et al., 1990).

In Thailand, *V. diospyroides* grows gregariously in the vicinity of swampy areas within the Nong Thung Thong Non-Hunting area. The swamp is sometimes flooded from October to December, and in December the water level almost reaches the canopy (Storer, 1978). The original description of this species was based on a collection by Kerr made from a cultivated plant in Bangkok. The species is one of the most common and expensive ornamental trees in the plant market, due to its strong fragrant flowers.

3. *Vatica harmandiana* Pierre

Note.— *Vatica harmandiana* described from Vietnam and *V. cinerea* described from the northern part of the Malay Peninsula have been treated as conspecific (Smitinand et al., 1990) although they are apparently not identical. *V. harmandiana* shows several affinities to *V. odorata* that was originally described from Myanmar (Mergui). Ashton (1967 & 1978) delimited *V. odorata* subsp. *mindanensis* to accommodate material collected in the Philippines based on petiole characters (longer, geniculate), and subsp. *tonkinensis* from Vietnam based on leaves (smaller, secondary nerves 5–10 pairs) and petioles (not geniculate). The *V. odorata* complex is tentatively considered here to comprise five subspecies: 1) *V. odorata* subsp. *cinerea* stat. nov. prov. (syn. *V. cinerea*) confined to Peninsular Thailand and upper Malay Peninsula; 2) *V. odorata* subsp. *odorata* (syn. *V. harmandiana*) confined to S. India, lower Myanmar, Vietnam, Cambodia, Thailand, Malay Peninsula, and Borneo (Fig. 5A); 3) *V. odorata* subsp. *mindanensis* Ashton confined to the Philippines; 4) *V. odorata* subsp. *tonkinensis* is confined to S Vietnam; and 5) *V. odorata* subsp. nov. prov. a new subspecies which is confined to northern, north-eastern and eastern Thailand, Cambodia, Laos, and N Vietnam to S China (Fig. 5C). However, further studies are needed before reaching definite conclusions.

4. *Vatica mangachapoi* Blanco subsp. *obtusifolia* (Elmer) P.S. Ashton

Note.— In accordance with species concept indicated above, this subspecies may need to be returned to specific status as *V. obtusifolia*. It has a wide distribution range from the Philippines, Sabah, and Peninsular Thailand. Fig. 5D.

5. *Vatica odorata* (Griff.) Symington subsp. *odorata*

Note.— See note under *Vatica harmandiana*.

6. *Vatica pauciflora* (Korth) Blume**7. *Vatica philastreana* Pierre**

Note.— This species has still only been recorded from Aranyaprathet, Sa Kaeo (*Put* 3109 (BK, K)) after *Suwannakoset* 2006 (BKF) from Nam Phung, Sakon Nakhon was transferred to *V. odorata*.

8. *Vatica stapfiana* (King) Slooten**9. *Vatica umbonata* (Hook.f.) Burck subsp. *umbonata***

Note.— A specimen collected near Betong (*Niyomdham & Puudjaa* 4634 (AAU, BKF)) was originally identified as *Vatica stapfiana*. It is now referred to *V. umbonata*, based on fewer secondary nerves, shorter petioles, longer fruit stalk and reflexed fruiting calyx lobes. Fig. 6.

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Figure 1. *Hopea oblongifolia* Dyer: A. inflorescences; B. fruits; C. buttresses; D. Young leaves. (Photos: R. Pooma, Khao Sok National Park, Phangnga).



Figure 2. *Parashorea densiflora* Slooten & Symington subsp. *kerrii* (Tardieu) R.Pooma: A. habit with young infructescences; B. typical leaf form, underneath with minute domatia; C. Inflorescences; D. mature fruit; E. cotyledon (a: radicle; b: large cotyledon; c: small cotyledon) (A, B: R. Pooma et al. 3440 (BKF); C: Kerr 20802 (BM); D: R. Pooma 3403a (BKF)).



Figure 3. *Parashorea densiflora* Slooten & Symington subsp. *kerrii* (Tardieu) R.Pooma: A. young fruit; B. mature fruit; C. buttresses; D. leaves and old fruits from ground; E. young leaves. (Photos: R. Pooma, Phu Wua Wildlife Sanctuary, Nong Khai).



Figure 4. *Vatica bella* Slooten: A. habit; B. mature fruit. (A: R. Pooma et al. 3126 (BKF); B: Phuphat d28 (BKF)).

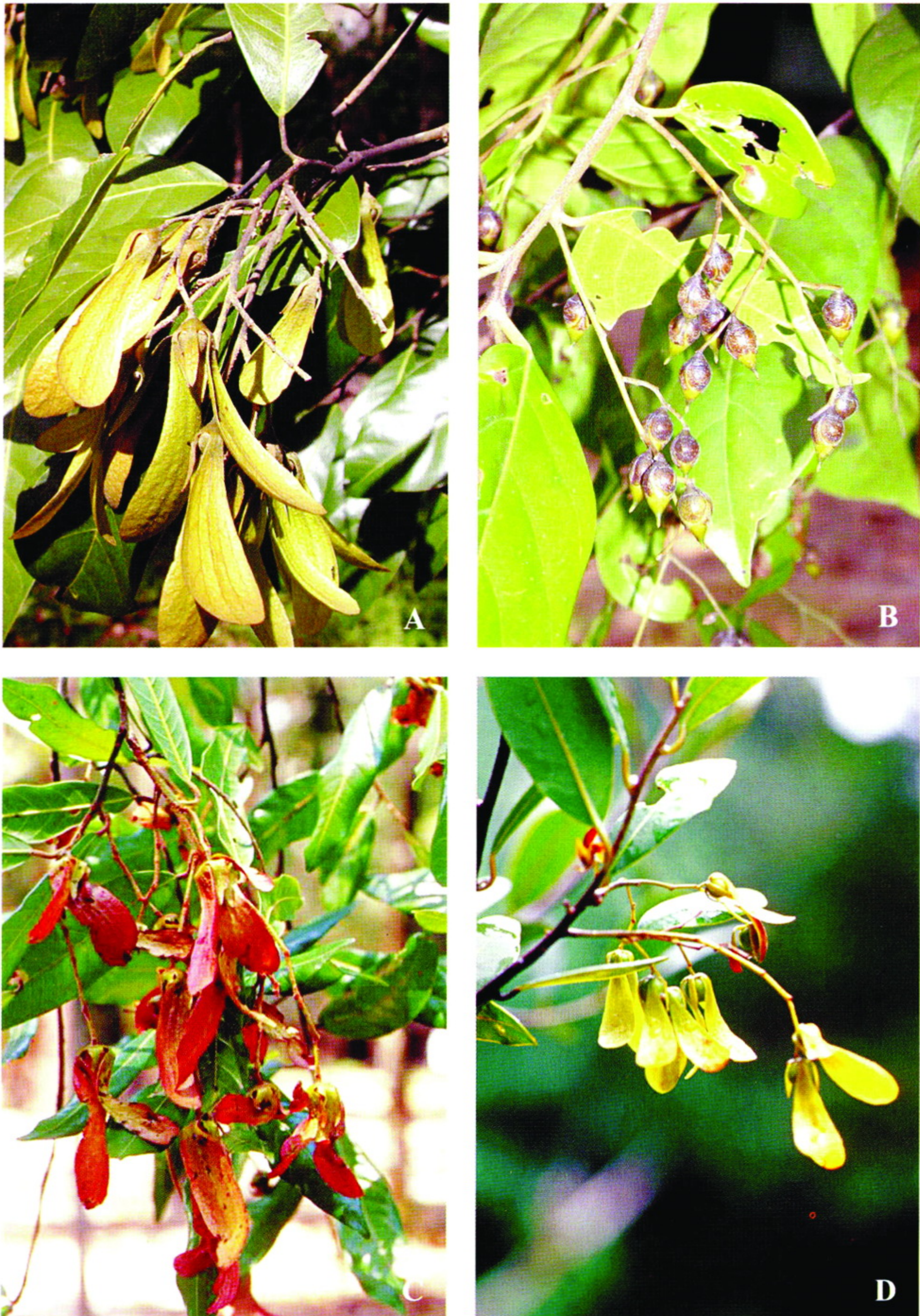


Figure 5. A. *Vatica odorata* (Griff.) Symington subsp. *odorata* (Peninsula, Kapo Falls, Chumphon); B. *Hopea thorelii* Pierre (Dong Fa Huan Botanical Garden, Ubon Ratchathani); C. *Vatica odorata* (Griff.) Symington subsp. nov. prov. (Northeastern, Phu Wua, Nong Khai); D. *Vatica mangachapoi* Blanco subsp. *obtusifolia* (Elmer) P.S.Ashton (Tham Sue, Krabi). (Photos: R. Pooma).



Figure 6. *Vatica umbonata* (Hook.f.) Burck subsp. *umbonata*: A.-B. Inflorescence and infructescence (Niyomdham & Puudjaa 4634 (BKF)).