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Studies in Flora of Thailand

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During May–December 1975, under the sponsorships of NUFFIC, DAAD and CNRS the author had a chance to study Thai plants at the Rijksherbarium, Leiden, Netherland, included a short visit to the Herbarium of Berlin, West Germany; Botanical Museum of the University in Copenhagen, Denmark; Royal Botanic Gardens, Kew and British Museum, England; and Muséum National d'Histoire Naturelle, Paris, France. During that period two families of Thai plants had been intensively studied, as follows:

1. Elaeocarpaceae with two genera, including 19 species
2. Nyssaceae with the indigeneous *Nyssa javanica* (Bl.) Wang.

1. ELAEOCARPACEAE

Trees or shrubs. Leaves spirally arranged to subopposite (some extra-Thai genera with opposite leaves). Sepals 4–5, valvate. Petals 4–5, free ; apex widened, fimbriate, dentate or lobed. Disk usually present. Stamens 10–many, anthers basifixed, two-locular, dehiscing by apical pores or slits, or dehiscing lengthwise; connective mostly with varying appendages. Ovary sessile with 2–many locules; ovules many or two per locule, anatropous, pendulous. Style simple, subulate. Fruit a capsule, drupe or berry. Embryo straight.

The family consists of 12 genera, occurs in Tropical and Sub-tropical areas. Only 2 genera are known from Thailand.

KEY TO THE GENERA

1. Flowers solitary ; stamens on a flattened torus. Fruit capsular, dehiscent, densely prickly **1. Sloanea**

1. Flowers in racemes ; stamens on a raised torus. Fruit drupaceous, smooth **2. Elaeocarpus**

1. SLOANEA

Linn., Sp. Pl. : 512. 1753.— *Echinocarpus* Bl., Bijdr. : 56. 1825.

Trees. *Stipules* caducous, glabrous. *Leaves* simple, spirally arranged, entire or serrate, chartaceous or subcoriaceous, arcuately veined, with stellately hairy, acarodomatia in axils of secondary nerves on lower surface. *Flowers* solitary in axils of (fallen) leaves on the upper part of young branches, bisexual, 4–5 merous. *Sepals* free or slightly joined. *Petals* free, apex dentate. *Stamens*

*Forest Herbarium, Royal Forest Department, Bangkok 9, Thailand.

numerous on broad flattened disc; anthers basifixed, linear, aristate, opening by slits. *Ovary* sessile, hairy, (3–) 4 (–5)-locular; locules with two to many ovules; style subulate; stigma pointed. *Capsule* woody, prickly, dehiscing into (3–) 4 (–5) parts when fully mature; seeds 1–2, ovoid, with well-developed red aril.

About 120 species in Tropical Asia and America, only 2 species occur in Thailand.

Key to the species

1. Calyx and corolla 4-merous. Prickles of capsule ± 10 mm long. Leaves ± glabrous **1. S. sigun**

1. Calyx and corolla 5-merous. Prickles of capsule 1–2 mm long. Leaves tomentose **2. S. tomentosa**

1. Sloanea sigun (Bl.) K. Schum. in Pflanzenfam. **3.6** : 5. 1890; Gagnep. in Fl. Gên. I.-C. **1** : 563. 1911. — *Echinocarpus sigun* Bl., Bijdr. : 56. 1825; Kurz, Fl. Burm. **1** : 162. 1877.— *Sloanea kerrii* Craib, Kew Bull. 1925 : 23; Fl. Siam. En. **1** : 194. 1925.— Fig. 1.

Thailand.— NORTHERN : Nan; NORTH-EASTERN : Loei; EASTERN : Nakhon Ratchasima; CENTRAL : Nakhon Nayok; SOUTH-EASTERN : Chanthaburi, Trat; SOUTH-WESTERN : Kanchanaburi; PENINSULAR : Nakhon Si Thammarat.

Distribution.— India, Burma, Cambodia, Malay Peninsula, Indonesia (Java, type).

Ecology.— In dry evergreen and lower montane forests; alt. 450–1,500 m. Flowering from December to January; ripe fruits from April to May.

Vernacular.— Ko rian ก่อเรียน (Peninsular); Sati ton สติ้น (North-eastern); Ngo pa เงาะป่า, Chaeng khao แจงเขา (South-eastern).

2. Sloanea tomentosa (Benth.) Rehd. & Wils. in Sarg., Pl. Wils. **2** : 362. 1915; Craib, Fl. Siam. En. **1** : 194. 1925.— *Echinocarpus tomentosus* Benth., J. Linn. Soc. 5, Suppl. **2** : 73. 1861; Mast. in Hook.f., Fl. Br. Ind. **1** : 400. 1874.— *Sloanea mollis* Gagnep. in Fl. Gên. I.-C. **1** : 564. 1911.— Fig. 2.

Thailand.— NORTHERN : Chiang Mai (Doi Inthanond).

Distribution.— India (E. Himalaya, type), Burma, Yunnan, Vietnam.

Ecology.— In lower montane forest by streams; alt. 1,100–1,400 m. Shedding leaves before flowering; flushing before or during flowering. Flowering in April; ripe fruits about 2 months later.

Vernacular.— Se-ba-si-wa-thu เสบ่าซิวาทุ (Northern-Karen).



Fig. 1. เจาะป่า *Sloanea sigun* (Bl.) K. Schum.
Habit and cross-section of capsule (T. Smitinand et al. 10863)



Fig. 2. เส่บาซิวาทุ *Sloanea tomentosa* (Benth.) Rehd. & Wils.
A. Habit. B. Inflorescence & flower. C. Capsule. (A. Corvanich 4)

2. ELAEOCARPUS

Linn., Sp. Pl. : 515. 1753.— *Monocera* Jack, Mal. Misc. **1** (5): 43. 1820.

Trees or shrubs. Stipules mostly early caducous, glabrous. *Leaves* simple, spirally arranged, very rarely opposite or subopposite, shallowly crenate or serrate, coriaceous; acarodomatia sometimes present. *Flowers* in axillary racemes, bisexual, rarely polygamous, 5-merous. *Sepals* free or shortly connate at base. *Petals* free, apically fimbriate. Stamens numerous on a raised disc; anthers basifixed, linear, aristate or comose or not so, opening by a terminal pore. Ovary sessile, glabrous or hairy, 2–7-locular, locules with 2 to many ovules; style subulate; stigma acute. *Drupes* smooth, with a single bony endocarp.

About 200 species in Tropical Eastern Asia, to Australia and the Pacific.

The genus *Elaeocarpus* can be readily recognized by the serrate or crenate, brick-red fallen leaves on the forest floor.

KEY TO THE SPECIES

1. Inflorescences exclusively in axils of fallen leaves below the tuft of younger leaves
   2. Anthers aristate at apex
      3. Laciniae ± 1/8 the length of petal ; petals with two basal hairy ridges inside. Disc entire or slightly lobed. Ovary 2-locular **1. E. rugosus**
      3. Laciniae ± 1/2 the length of petal ; petals smooth, glabrous at the base inside. Disc distinctly 5-lobed. Ovary 5-locular **2. E. sphaericus**
   2. Anthers not aristate at apex
      4. Style with only the basal half hairy
         5. Petals hairy at least along basal ridge inside
            6. Anthers beardless. Petals hairy all over on both sides. Stipules caducous. Leaves with arched and anastomosing secondary nerves **3. E. braceanus**
            6. Anthers bearded at top. Petals hairy only along basal ridge inside, but ciliated along margin on lower half. Stipules often persistent. Leaves with ascending secondary nerves **4. E. stipularis**
         5. Petals glabrous or ciliated only on lower half, without basal ridge inside
            7. Leaves sparsely swollen gland-dotted **5. E. floribundus**
            7. Leaves not gland-dotted
               8. Leaves with rounded or obtuse base. Petioles usually geniculate and swollen at both ends **6. E. robustus**
               8. Leaves with slightly acute base. Petioles not geniculate and not swollen at both ends **8. E. lanceifolius**
      4. Style hairy throughout **7. E. balansae**

1. Inflorescences in axils of leaves
   9. Anthers aristate at apex
      10. Ovary glabrous
         11. Stamens 10 mm or over. Leaves serrulate ; petioles up to 1.5 cm long. Apical part of young twigs not resinous **9. E. hainanensis**

         11. Stamens up to 6 mm. Leaves distinctly serrate; petioles 3.5 — 10 cm long. Apical part of young twigs resinous **10. E. petiolatus**

      10. Ovary hairy
         12. Stamens glabrous
            13. Laciniae ± 1/8 the length of petal ; petals rather smooth and glabrous on the upper half inside. Style pubescent in lower half only **11. E. macrocerus**

            13. Laciniae ± 1/5 the length of petal ; petals with two basal hairy ridges and hairy throughout inside. Style hairy throughout **12. E. grandiflorus**

         12. Stamens pubescent
            14. Style ± glabrous. Petals not fringed in bud. Apical part of young twigs not resinous. Ovary 2-locular **13. E. griffithii**

            14. Style at least partly hairy. Petals conspicuously fringed even in budding stage. Apical part of young twigs resinous. Ovary 3-locular
               15. Petals up to 5 mm long, with one basal hairy ridge inside, hairs pointed towards the apex. Leaves with arched and anastomosing secondary nerves ; scalariform veins inconspicuous. Petioles swollen at both ends **14. E. prunifolius**

               15. Petals ± 12 mm long, with three basal hairy ridges inside, hairs directed towards the base. Leaves with straight, more or less joined secondary nerves ; scalariform veins conspicuous. Petioles not swollen **15. E. varunua**

   9. Anthers not aristate at apex
      16. Petals glabrous, without basal ridge inside. Stipules caducous
         17. Ovary 3-locular. Laciniae not glandular **16. E. hygrophilus**

         17. Ovary 5-locular. Laciniae distinctly glandular **17. E. nitidus**

      16. Petals hairy along basal ridge inside. Ovary 3(—5)-locular. Stipules often persistent **4. E. stipularis**

1. **Elaeocarpus rugosus** Roxb., (Hort. Beng. : 42. 1814; n.n.) Fl. Ind. ed. 2. **2** : 596. 1832; Mast. in Hook.f., Fl. Br. Ind. **1** : 405. 1874; Ridl., Fl. Mal. Pen. **1** : 318. 1922.— *E. grandifolius* Kurz, J.As.Soc. Beng. 2. **2** :294. 1872; Fl. Burm. **1** : 165. 1877; Craib in Fl. Siam. En. **1** :195. 1925.— *E. aristatus* Roxb., (Hort. Beng. : 52. 1814; n.n.) Fl. Ind. ed. 2. **2** :599. 1832; Mast. in Hook.f., Fl. Br. Ind. **1** : 405. 1874.— Fig. 3.



Fig. 3. ผีพ่าย *Elaeocarpus rugosus* Roxb.
A. Habit, B. Flower, C. Petal (inside), D. Stamens, E. Ovary with stamens.
(Winit 1671).

Thailand.— NORTHERN : Chiang Mai; CENTRAL : Nonthaburi (probably cultivated); PENINSULAR : Surat Thani.

Distribution.— India, Burma (type), Malay Peninsula.

Ecology.— In tropical evergreen forest by streams; alt. 50–400 m. Flowering and fruiting in March–July.

Vernacular.— Phi phai ผีพ่าย (Peninsular); Phi nai ผีหน่าย (Central).

2. Elaeocarpus sphaericus (Gaertn.) K. Schum. in Pflanzenfam. 3. **6** : 5. 1890. — *Ganitrus sphaerica* Gaertn., Fruct. **2** : 271. t. 139. 1791. — *Elaeocarpus ganitrus* Roxb., (Hort. Beng. : 42. 1814; n.n.) Fl. Ind. ed. 2. **2** : 592. 1832; Mast. in Hook.f., Fl. Br. Ind. **1** : 400. 1874; Kurz, Fl. Burm. **1** : 168. 1877; Ridl., Fl. Mal. Pen. **1** : 310. 1922; Craib in Fl. Siam. En. **1** : 195. 1925.— Fig. 4.

Thailand.— NORTHERN : Chiang Mai, Sukhothai; NORTH-EASTERN : Phetchabun; SOUTH-EASTERN : Trat; SOUTH-WESTERN : Kanchanaburi.

Distribution. — Nepal, India (Bengal, type), Burma, Cambodia, Malay Peninsula, Indonesia, Australia.

Ecology.— Scattered in tropical evergreen forest ; alt. 600–900 m. Flowering and fruiting during March–September.

Vernacular.— Mun khom มุ่นโคม (Northern).

3. Elaeocarpus braceanus Watt ex Clarke, J. Linn. Soc. **25** : 8. 1889; Craib in Fl. Siam. En. **1** : 194. 1925. — Fig. 5.

Thailand.— NORTHERN : Chiang Mai, Nan.

Distribution.— Manipur (type), Burma.

Ecology.— Scattered in lower montane forest; alt. 1,500–2,000 m. Flowering and fruiting in January–May.

Vernacular.— Mun doi มุ่นดอย (Northern).

4. Elaeocarpus stipularis Bl., Bijdr. : 121. 1825; Mast. in Hook.f., Fl. Br. Ind. **1** : 404. 1874; Kurz, Fl. Burm. **1** : 170. 1877; Ridl., Fl. Mal. Pen. **1** : 311, fig. 29. 1922.— *E. tomentosus* Bl., Bijdr. : 121. 1825; Gagnep. in Fl. Gén. I.-C. **1** : 575. 1911.— *E. siamensis* Craib, Kew Bull. 1911 : 23; in Fl. Siam. En. **1** : 198. 1925. — Fig. 6.

Thailand.— NORTHERN : Chiang Mai, Lampang, Lamphun, Phrae; SOUTH-EASTERN : Trat; SOUTH-WESTERN : Kanchanaburi, Uthai Thani; PENINSULAR : Nakhon Si Thammarat, Songkhla, Narathiwat, Surat Thani, Ranong, Trang.

Distribution.— India, Burma, Cambodia, Malay Peninsula, Indonesia (Java, type), Philippines.

Ecology.— In evergreen forest; alt. 500–1,200 m. Flowering and fruiting from March–December.

Vernacular.— Mamun มะมุ่น (Northern); Daeng แดง, Samat สมัด, Mau lek เม่าเล็ก, Ton lot ตอนลอด, Thon lok ท้อนลอก (Peninsular).



Fig. 4. มุนโคม *Elaeocarpus sphaericus* (Gaertn.) K. Schum.
A. Habit, B. Petals, C. Sepal, D. Ovary with some stamens, E. Stamens.
(T. Smitinand 540).



Fig. 5. มุ่นดอย *Elaeocarpus braceanus* Watt ex Clarke
A. Habit, B. Flower, C. Petal, D. Stamen, E. Ovary (T. Smitinand et al. 7711).

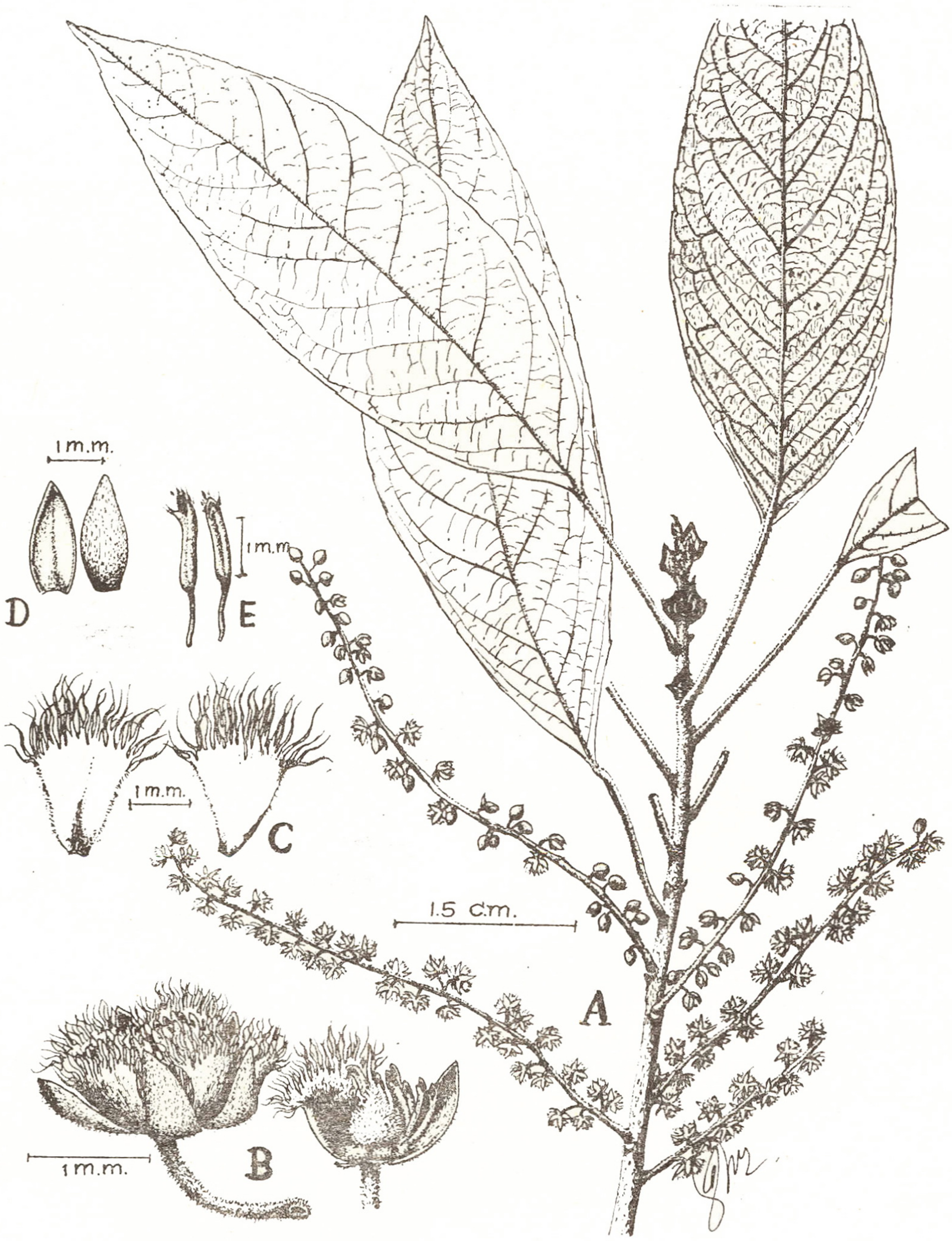


Fig. 6. สมัด *Elaeocarpus stipularis* Bl.
A. Habit, B. Flower and Ovary, C. Petals, D. Sepals, E. Stamens.
(Beusekom et al. 285).

5. **Elaeocarpus floribundus** Bl., Bijdr. : 120. 1825; Mast. in Hook.f., Fl. Br. Ind. **1** : 401. 1874; Kurz, Fl. Burm. **1** : 167. 1877; Gagnep. in Fl. Gén. I.-C. **1** : 577. 1911; Ridl., Fl. Mal. Pen. **1** : 313. 1922; Craib in Fl. Siam. En. **1** : 194. 1925. — Fig. 7.

T h a i l a n d .— NORTHERN : Chiang Mai, Lampang, NORTH-EASTERN : Loei, Phetchabun; CENTRAL : Nonthaburi (cultivated ?); PENINSULAR : Chumphon, Nakhon Si Thammarat, Narathiwat, Surat Thani, Phang nga, Trang.

D i s t r i b u t i o n .— India, Burma, Laos, Cambodia, Malay Peninsula, Indonesia (Java, type).

E c o l o g y .— More frequent in lowland tropical rain forest; also frequent in lower montane forest up to 1,500 m alt. Flowering and fruiting in February–June.

V e r n a c u l a r . — Mueat doi เหมือดดอย, Miat doi mai เมี่ยดดอยหมาย (Northern); Biat yai เบี่ยดใหญ่, Mak duk hin หมากดูกหิน, Man som มันส้ม (North-eastern); Kalon กาลน (Central); Kun thuen กุนเถื่อน, Di ngu ดิ่งู, Lon ลน, Thuai ทวย, Thui ทุย (Peninsular).

6. **Elaeocarpus robustus** Roxb., (Hort. Beng. : 42. 1814; n.n.) Fl. Ind. ed.2.**2** : 597. 1832; Mast. in Hook.f., Fl. Br. Ind. **1** : 402. 1874; Kurz, Fl. Burm. **1** : 169. 1877; Gagnep. in Fl. Gén. I.-C. **1** : 577. 1911; Ridl., Fl. Mal. Pen. **1** : 313. 1922; Craib in Fl. Siam. En. **1** : 198. 1925. — *E. leptostachyus* Wall. ex C. Muell., Annot. Elaeocarp. : 23. 1849; Mast. in Hook. f., Fl. Br. Ind. **1** : 403. 1874; Craib in Fl. Siam. En. **1** : 196. 1925. — *E. nitidus* Jack var. *leptostachyus* (Wall. ex C. Muell.) King, J. As. Beng. **60**. 2 : 128. 1891; Ridl., Fl. Mal. Pen. **1** : 314. 1922; Craib in Fl. Siam. En. **1** : 196. 1925. — *E. stipularis* Bl. var. *latifolia* auct. non King, Craib Fl. Siam. En. **1** : 198. 1925.— Fig. 8.

T h a i l a n d .— NORTH-EASTERN : Nong Khai ; EASTERN : Nakhon Ratchasima, Ubon Ratchathani; SOUTH-EASTERN: Chon Buri, Chanthaburi, Trat; SOUTH-WESTERN: Kanchanaburi; PENINSULAR: throughout the region.

D i s t r i b u t i o n .— India (type), Burma, Cambodia, Malay Peninsula, Indonesia.

E c o l o g y .— In tropical evergreen forest, from sea-level up to 800 m alt. Flowering and fruiting in April–September, generally between May–June.

V e r n a c u l a r . — Po ba โปะบ้า (Eastern); Luk krarok ลูกกระรอก, Thon rok ท้อนรอก Krathon rok กระท้อนรอก, Samo hin สมอหิน, Sathon rok สะท้อนรอก (Peninsular); Mamun มะมุ่น (South-western).

7. **Elaeocarpus balansae** A. DC., Bull. Herb. Boiss. II. **3** : 366. 1903; Gagnep. in Fl. Gén. I.-C. **1** : 573. 1910. — *E. tectonifolius* Ridl., J. Fed. Mal. St. Mus. **10** : 84. 1920; Craib in Fl. Siam. En. **1** : 198. 1925. — *E. stipulaceus* Gagnep; Not. Syst. **11** : 11. 1943.— Fig. 9.



Fig. 7. เหมือดดอย *Elaeocarpus floribundus* Bl.
A. Habit, B.–C. Young & Mature fruits, D. Flower, E. Sepals, F. Petals, G. Stamens, H. Ovary.

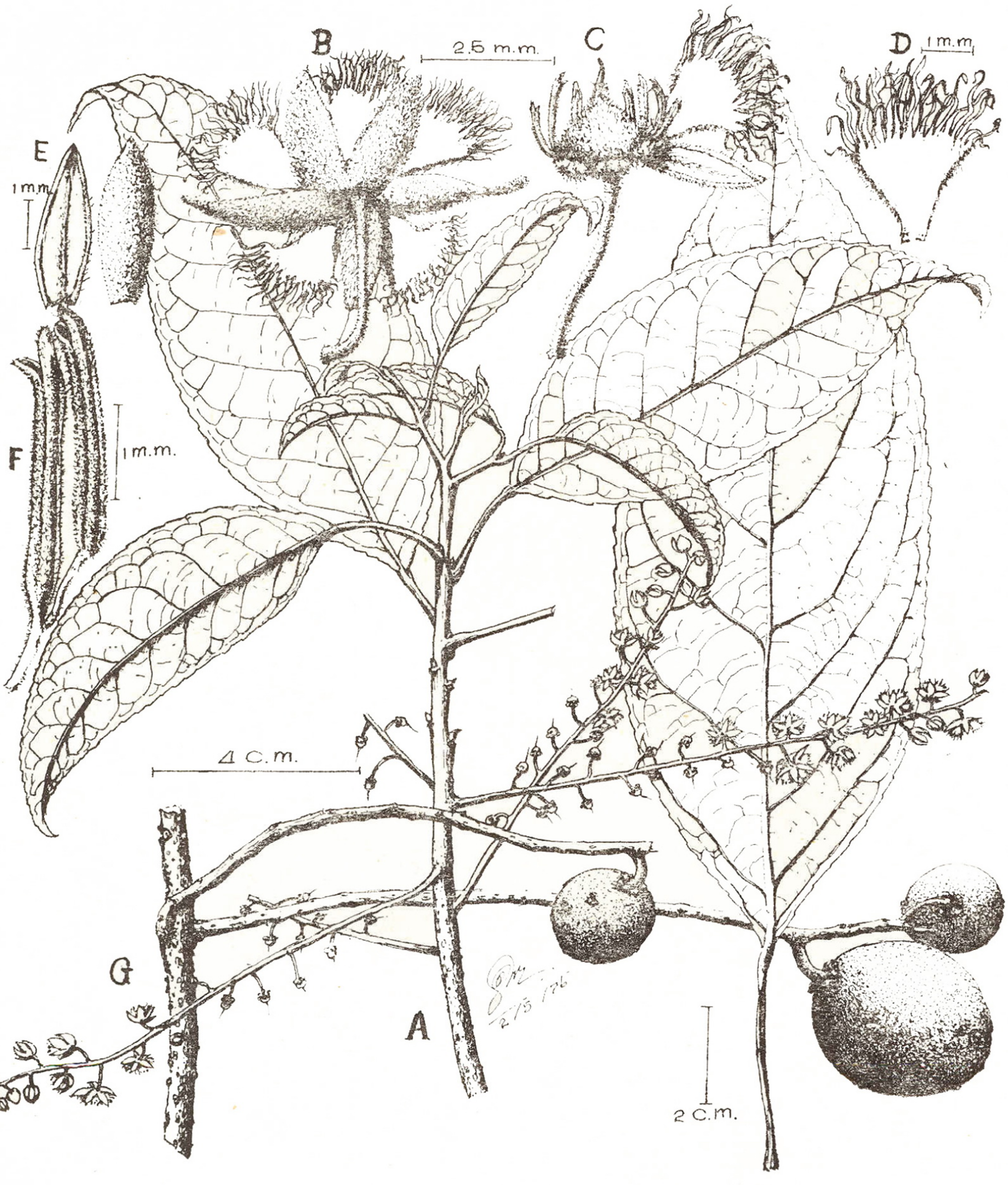


Fig. 8. กระท้อนรอก *Elaeocarpus robustus* Roxb.
A. Habit, B. Flower, C. Ovary, D. Petals, E. Sepals, F. Stamens, (K. Bunchuai 1832), G. Fruits (B. Sangkhachand 1562).



Fig. 9. *Elaeocarpus balansae* A. DC. (Kloss 6761).

Thailand.— PENINSULAR: Phang nga (Thap Li).

Distribution.— Vietnam (Tonkin, type), Cambodia, Burma, Malay Peninsula.

Ecology.— In dry evergreen forest; alt. 50–200 m. Flowering and fruiting in April–July.

8. Elaeocarpus lanceifolius Roxb., (Hort. Beng. : 42. 1814; n.n.) Fl. Ind. ed. 2. **2** : 598. 1832; Mast. in Hook.f., Fl. Br. Ind. **1** : 402. 1874; Kurz, Fl. Burm. **1** : 167. 1877.— *E. lacunosus* : Wall. ex Kurz, Fl. Burm. **1** : 168. 1877; Gagnep. in Fl. Gén. I.-C. **1** : 579. 1911; Craib in Fl. Siam. En. **1** : 196. 1925.— Fig. 10.

Thailand.— Throughout the country.

Distribution.— India (type), Burma, Laos, Vietnam, Cambodia, Malay Peninsula, Indonesia.

Ecology.— Frequent in tropical evergreen and moist upper mixed deciduous forests (also reported to occur in savannas), scattered in lower montane forest up to 1,300 m; more frequent between 300–450 m alt. Flowering and fruiting in May–October.

Vernacular.— Ya khop ngu ยาขบงู, Mamun มะมุ่น, Mun มุ่น (Northern); Dok soi ดอกสร้อย (North-eastern); Krabok hin กระบกหิน (Eastern); Krathon rok กระท้อนรอก (Peninsular).

9. Elaeocarpus hainanensis Oliv. in Hook., Ic. Pl. : t. 2462. 1896; Gagnep. in Fl. Gén. I.-C. **1** : 567. 1911.— *E. lacei* Craib, Kew Bull. 1925 : 23; in Fl. Siam. En. **1** : 196. 1925.— Fig. 11.

Thailand.— NORTHERN : Chiang Mai, Lampang.

Distribution.— Upper Burma, China (type), Vietnam.

Ecology.— In moist upper mixed deciduous forest by stream; alt. 200–500 m. Flowering and fruiting in January–May.

Vernacular.— Khrai nam ไคร้น้ำ, Khrai champa ไคร้จำปา (Northern).

10. Elaeocarpus petiolatus (Jack) Wall., Cat. 2673. 1831; Kurz, Fl. Burm. **1** : 164. 1877; Gagnep. in Fl. Gén. I.-C. **1** : 573. 1911; Ridl., Fl. Mal. Pen. **1** : 315. 1922; Craib in Fl. Siam. En. **1** : 197. 1925.— *Monocera petiolata* Jack, Mal. Misc. **1** (5) : 43. 1820.— *Elaeocarpus ovalis* Miq., Sum.: 406. 1860; Gagnep. in Fl. Gên. I.-C. **1** : 572. 1911; Craib in Fl. Siam. En. **1** : 196. 1925.— *Elaeocarpus integra* Wall. ex Mast. in Hook.f., Fl. Br. Ind. **1** : 408. 1874.— Fig. 12.

Thailand.— NORTHERN : Chiang Mai; SOUTH-EASTERN : Chanthaburi, Chon Buri, Trat; PENINSULAR : Krabi, Nakhon Si Thammarat, Narathiwat, Phang-nga, Ranong, Surat Thani, Trang.

Distribution.— China, India, Burma, Laos, Cambodia, Vietnam, Malay Peninsula (type), Indonesia.



Fig. 10. มะมุ่น *Elaeocarpus lanceifolius* Roxb.
A. Habit, B. Flower, C. Fruits, D. Sepals, E. Petal, F. Stamens



Fig. 11. ไคร้จำปา *Elaeocarpus hainanensis* Oliv.
A. Habit, B.–C. Stamens, D. Sepals, E. Petals, F. Ovary, G. Drupe
(V. Amonthat 12).

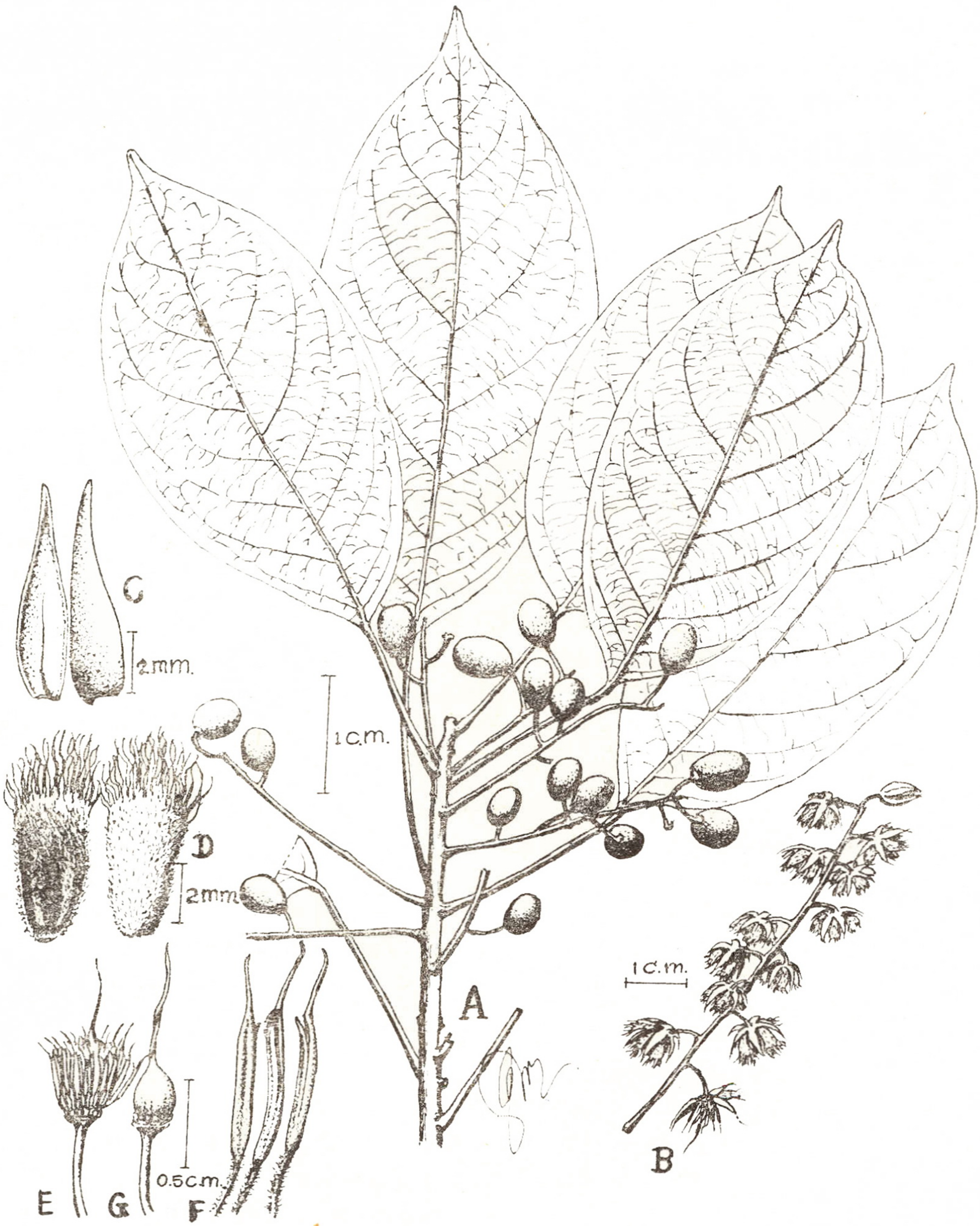


Fig. 12. ทวย *Elaeocarpus petiolatus* (Jack) Wall.
A. Habit, B. Inflorescence, C. Sepals, D. Petals, E.–F. Stamens, G. Ovary. (B. Sangkhachand 215).

Ecology.— In evergreen forest; alt. 50–1,200 m. Flowering and fruiting in all seasons.

Vernacular.— Chao ha praong เจ้าห้าพระองค์ (Northern), Thuai ทวย (Peninsular).

11. Elaeocarpus macrocerus (Turcz.) Merr., J. Arn. Arb. **32**:183. 1951.—*Monocera macrocera* Turcz., Bull. Soc. Nat. Mosc. **19**. 2 : 494. 1846. —*Elaeocarpus littoralis* Teijsm. & Binn. ex Kurz, J. As. Beng. **43**. 2 : 132. 1874; Fl. Burm. **1** : 167. 1877; Gagnep. in Fl. Gén. I.-C. **1** : 569. 1911.— Fig. 13.

Thailand.— PENINSULAR : Chumphon.

Distribution.— Burma, Cambodia, Indonesia, Philippines, Malay Peninsula (type).

Ecology.— In fresh water swamp forest; alt. from sea-level up to 20 m. Flowering and fruiting in January–May.

Vernacular.— Kasun phran กระสุนพราน (Peninsular).

12. Elaeocarpus grandiflorus J.E. Smith in Rees., Cycl: 12. 1809; Kurz. Fl. Burm. **1** : 166. 1877; Pierre, Fl. For. Cochinch. **2** : t. 142. 1888 : Gagnep. in Fl. Gén. I.-C. **1** : 568. 1911; Craib in Fl. Siam. En. **1** : 195. 1925; Corner, Gard. Bull. **10** : 319. 1939.— Fig. 14.

Thailand.— Throughout the country.

Distribution— India, Burma, Laos, Vietnam, Cambodia, Malay Peninsula, Indonesia, (Type not designated).

Ecology.—Frequent by streams in evergreen forest; alt. 50–800 m; once recorded to occur in mangrove (Vanpruk 625). Flowering and fruiting in January–September.

Vernacular.— Saraphi nam สารภีน้ำ, Khrai yoi ไคร้ย้อย (Northern); Pumpa ปุมปา, Mun nam มุ่นน้ำ (North-eastern); Taeo nam แต้วน้ำ (Eastern); Chik จิก, Dok pi mai ดอกปีใหม่, (South-western); Khlai song hu คล้ายสองหู, Phi nai ผีหน่าย, (Peninsular).

13. Elaeocarpus griffithii (Wight) A.Gray, Bot. U.S. Explor. Exped. **1** : 203. 1854; Mast. in Hook.f., Fl. Br. Ind. **1** : 408. 1874; Kurz, Fl. Burm. **1** : 164. 1877; Gagnep. in Fl. Gén. I.-C. **1** : 570. 1911; Ridl., Fl. Mal. Pen. **1** : 316. 1922; Craib in Fl. Siam. En. **1**: 195. 1925.— *Monocera griffithii* Wight, Ill. Ind. Bot. **1** : 84. 1831, non Muell. 1849. — *Elaeocarpus paniculatus* Wall. ex C. Muell., Annot. Elaeocarp. :12. 1849; Mast. in Hook.f., Fl. Br. Ind. **1** : 407. 1874 ; Ridl., Fl. Mal. Pen. **1** : 315. 1922; Craib in Fl. Siam. En. **1** : 197. 1931.— Fig. 15.

Thailand.— NORTHERN : Phitsanulok ; NORTH-EASTERN : Ubon Ratchathani; EASTERN : Surin, Nakhon Ratchasima; SOUTH-EASTERN: Chanthaburi; PENINSULAR : Nakhon Si Thammarat, Narathiwat, Satun.

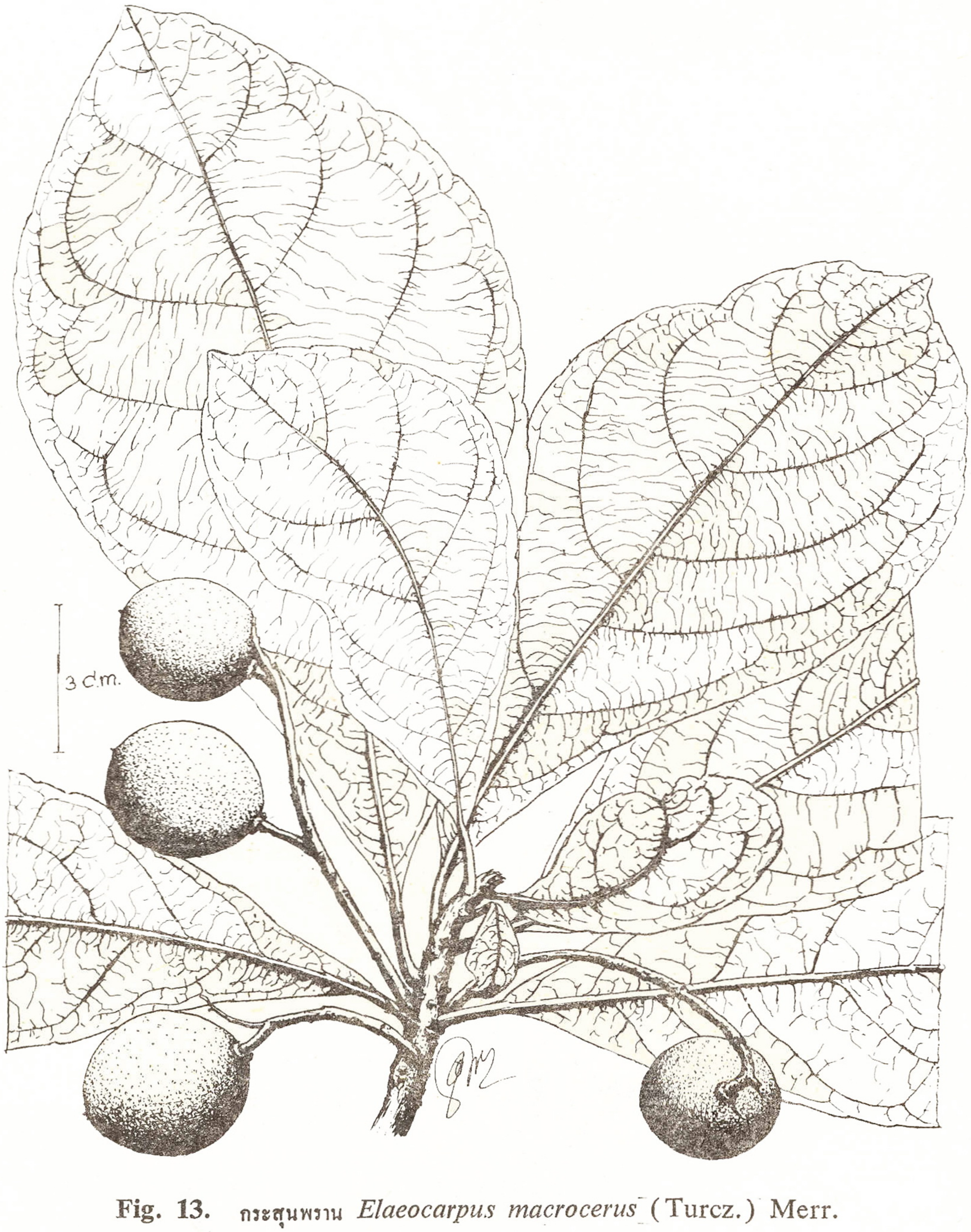


Fig. 13. กระสุนพราน *Elaeocarpus macrocerus* (Turcz.) Merr.



Fig. 14. สารภีน้ำ, มุ่นน้ำ *Elaeocarpus grandiflorus* J.E. Smith
A. Habit with drupes (B. Nimanong et al. 223), B. Habit with Flowers (A. Chanthamuk 117).



Fig. 15. ต่อไส้ *Elaeocarpus griffithii* (Wight) A. Gray
A. Habit (T. Smitinand 10983), B. Drupes (A. Prombuppha s.n.).

Distribution.— India, Burma, Vietnam, Laos, Cambodia, Malay Peninsula (type), Indonesia.

Ecology.— Frequent in lowland tropical rain forest in the Peninsula; scattered in dry evergreen elsewhere; alt. 50–300 m. Flowering and fruiting in January–June.

Vernacular.— To sai ต่อไส้ (South-eastern); Yong yo ยงโย่ (Eastern).

14. Elaeocarpus prunifolius Wall. ex C. Muell., Annot. Elaeocarp. : 15. 1849; Mast. in Hook.f., Fl. Br. Ind. **1** : 407. 1874.— *E. robertsonii* Gamble, Kew Bull. 1912 : 199; Craib in Fl. Siam. En. **1** : 197. 1925.— Fig. 16.

Thailand.— NORTHERN : Chiang Mai, Lampang; NORTH-EASTERN : Loei.

Distribution.— India (type), Burma, China.

Ecology.— In lower montane forest; alt. 1100–1300 m. Flowering between June–July.

15. Elaeocarpus varunua Ham. ex Mast. in Hook.f., Fl. Br. Ind. **1** : 407. 1874; Kurz, Fl. Burm. **1** : 165. 1877; Brand., Ind. Trees : 106. 1921 ; Craib in Fl. Siam. En. **1** : 198. 1925. — Fig. 17.

Thailand.— NORTHERN : Nan.

Distribution.— Nepal (type), Burma, Laos, Malay Peninsula.

Ecology.— By streams in tropical evergreen forest; alt. c 300 m. Flowering and fruiting in March–June.

Vernacular.— Mun luang มุ่นหลวง (Northern).

16. Elaeocarpus hygrophilus Kurz, Fl. Burm. **1** : 168. 1877; Brand., Ind. Trees: 103. 1921; Craib in Fl. Siam. En. **1** : 195. 1925.—*E. madopetalus* Pierre, Fl. For. Cochinch. : t. 168. 1888; Gagnep. in Fl. Gén. I.-C. **1** : 582. 1911; Craib in Fl. Siam. En. **1** : 196. 1925. — Fig. 18.

Thailand.— NORTHERN : Chiang Mai ; NORTH-EASTERN : Khon Kaen; CENTRAL : Ang Thong, Bangkok, Thon Buri, Nakhon Pathom, Suphan Buri; SOUTH-EASTERN : Prachinburi; Chanthaburi; SOUTH-WESTERN : Phetchaburi.

Distribution.— India (cultivated), Burma (type), Laos, Cambodia.

Ecology.— Frequent along streams in the lowlands, mostly under cultivation.

Vernacular.— Makok nam มะกอกน้ำ (Central); Saraphee nam สารภีน้ำ, Samo phiphai สมอภิพ่าย (Northern).

Use.— Fruits steeped in brine for local consumption.



Fig. 16. *Elaeocarpus prunifolius* Wall. ex C. Muell.
A. Habit, B. Flower, C. Stamens & Ovary, D. Flower bud & leaf.



Fig. 17. มุ่นหลวง *Elaeocarpus varunua* Ham. ex Mast.
A. Habit, B. Flower (A.F.G. Kerr 5026)



Fig. 18. มะกอกน้ำ *Elaeocarpus hygrophilus* Kurz
A. Habit, B. Flowers, C. Sepals, D. Petals, E. Stamens (P. Bunma 2).

17. **Elaeocarpus nitidus** Jack, Mal. Misc. **1** (5) : 41. 1820; Ridl., Fl. Mal. Pen. **1** : 314. 1922. — *E. parvifolius* Wall. ex C. Muell., Annot. Elaeocarp. : 24. 1849; Mast. in Hook.f., Fl. Br. Ind. **1** : 401. 1874; Ridl., Fl. Mal. Pen. **1** : 310.1922; Craib in Fl. Siam. En. **1** : 197. 1925.— Fig. 19.

Thailand.— PENINSULAR : Pattani, Phang-nga.

Distribution.— Laos, Vietnam, Malay Peninsula (type), Indonesia, Singapore.

Ecology.— In evergreen forest; alt. 400–800 m. Flowering and fruiting from March–July.

Vernacular.— Pho tha yae พอทะแย (Peninsular).

2. NYSSACEAE

Trees or shrubs. Leaves simple, exstipulate. Flowers polygamo-dioecious; male in heads, racemes or umbells; female and hermaphrodite solitary or in 2–12- flowered head. Sepals 5- merous; petals (4–) 5 (–8)-merous. Stamens (8–) 10 (–16). Ovary inferior, 1-locular; ovule 1, hanging from the apex of locule, anatropous with 2 integuments. Fruits drupaceous, 1-seeded.

The family consists of 3 genera, occuring in Asia and North America. Only the typical genus occurs in Thailand.

NYSSA

Linn., Sp. Pl. : 1058. 1753; Wasscher, Fl. Mal. I. **4** : 23. 1948.

Dioecious tree. *Leaves* simple, spirally arranged, exstipulate. Flowers unisexual, usually in heads or short racemes, in the axil of a bract with 2 bracteoles. *Male flowers* 5-merous. *Stamens* arranged in two alternate whorls; anthers 2-celled, dorsifixed, with lateral lengthwise slits; disc pulvinate. *Female flowers* (4)–5-merous. *Ovary* inferior, 1-locular, 1-ovuled; staminodes usually present; style bifid, with stigmatic tissue at the inside of the style arms. Fruits drupaceous.

6 species, 4 in N. America, 1 in China, 1 in tropical Asia.

Nyssa javanica (Bl.) Wang. Pflanzenr. **41** : 15. 1909; Craib in Fl. Siam. En. **1** : 809. 1931. — *Agathisanthes javanica* Bl., Bijdr. : 645. 1825. *Nyssa bifida* Craib, Kew Bull. 1913 : 69; Fl. Siam. En. **1** : 809. 1931.— Fig. 20.

Thailand.— NORTHERN : Chiang Mai, Nan; NORTH-EASTERN : Loei, Phetchabun; PENINSULAR : Nakhon Si Thammarat.

Distribution.— India, Burma, Laos, Vietnam, Malay Peninsula, Indonesia (Java, type).

Ecology.— In evergreen forest along streams and valleys; alt. 800–1100 m. Flowering : March–May; fruiting : May–October. Shedding leaves and producing new leaves before or together with the flowers.

Vernacular.— Khueng khak ดึงคาก, Khang khok คางคก, Mi หมี่, Khang khak คางคาก, Kham muang คำเมือง, Thoen เทิน (Northern); Khai pla ไข่ปลา, Lueang hin เหลืองหิน, Miat khon khao เมี่ยดคนขาว (North-eastern).

Use.— Ripe fruits edible.



Fig. 19. พอกะแบ *Elaeocarpus nitidus* Jack
A. Habit, B. Flower, C. Sepals, D. Petals, E. Stamen, F. Ovary.



Fig. 20. ดึงดาก, ดางดก *Nyssa javanica* (Bl.) Wang.
A.–B. Habit, C. Inflorescence, D. Fruits.

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