รายงานฉบับสมบูรณ์

โครงการวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทย

โดย

นายธวัชชัย วงศ์ประเสริฐ และคณะ

กันยายน

2552

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รหัสโครงการ BRT R_149025

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คณะผู้วิจัย

นายธวัชชัย วงศ์ประเสริฐ นักวิทยาศาสตร์ชำนาญการพิเศษ
สำนักงานหอพรรณไม้ กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช
นายจำลอง เพ็งคล้าย ราชบัณฑิต วิทยาศาสตร์ชีวภาพ สาขาพฤกษศาสตร์
สำนักวิทยาศาสตร์ ราชบัณฑิตยสถาน
นายธีรวัฒน์ บุญทวีคุณ นักวิทยาศาสตร์ชำนาญการพิเศษ
สำนักงานหอพรรณไม้ กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช

สนับสนุนโดยโครงการพัฒนาองค์ความรู้
และศึกษานโยบายการจัดการทรัพยากรชีวภาพในประเทศไทย
(โครงการ BRT)

กิตติกรรมประกาศ

(Acknowledgement)

"โครงการวิจัยนี้ได้รับทุนสบับสนุนจากโครงการพัฒนาองค์ความรู้และศึกษานโยบายการจัดการทรัพยากรชีวภาพในประเทศไทย ซึ่งร่วมจัดตั้งโดยสำนักงานกองทุนสนับสนุนการวิจัย และศูนย์พันธุวิศวกรรมและเทคโนโลยีชีวภาพแห่งชาติ รหัสโครงการ BRT R_149025"

"This work was supported by the TRF/BIOTEC Special Program for Biodiversity Research and Training grant BRT R_149025"

สรุป OUTPUTS ที่ได้รับจากการดำเนินงาน

โครงการวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทย (รหัสโครงการ BRT R_149025)

ตั้งแต่เดือนตุลาคม พ.ศ. 2549 ถึง เดือนกันยายน พ.ศ. 2552

1. การตีพิมพ์บทความในวารสารวิชาการ

1.1 ตีพิมพ์เรียบร้อยแล้ว (published) จำนวน เรื่อง ดังนี้

[ระบุชื่อผู้แต่ง (Authors), ชื่อเรื่อง (Title), ชื่อวารสารพร้อม volume และเลขหน้า]

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1.2 อยู่ระหว่างการตีพิมพ์ (in press) จำนวน เรื่อง ดังนี้

[ระบุชื่อผู้แต่ง (Authors), ชื่อเรื่อง (Title), ชื่อวารสาร]

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1.3 อยู่ระหว่างส่งต้นฉบับให้วารสารวิชาการ (submitted) จำนวน เรื่อง ดังนี้

[ระบุชื่อผู้แต่ง (Authors), ชื่อเรื่อง (Title)]

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1.4 อยู่ระหว่างการจัดทำต้นฉบับ (in manuscript) จำนวน 2 เรื่อง ดังนี้

[ระบุชื่อผู้แต่ง (Authors), ชื่อเรื่อง (Title)]

1. C. Phengklai, Th. Wongprasert and T. Boonthavikoon: A synoptic account of Meliaceae of Thailand ลงพิมพ์ใน Thai Forest Bulletin (Botany)
2. C. Phengklai, Th. Wongprasert and T. Boonthavikoon: Meliaceae of Thailand ลงพิมพ์ใน Flora of Thailand

2. การตีพิมพ์ผลงานในรูปแบบ Proceedings/คู่มือ/หนังสือ หรืออื่นๆ (โปรดระบุ) จำนวน เรื่อง ดังนี้

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3. การนำเสนอในรูปแบบโปสเตอร์ จำนวน 2 เรื่อง ดังนี้

1. พรรณไม้วงศ์ไม้กระท้อนของไทย ในการประชุมวิชาการประจำปีโครงการ BRT ครั้งที่ 11 วันที่ 15-18 ตุลาคม 2550 ณ โรงแรมนภาลัย จังหวัดอุดรธานี
2. พรรณไม้วงศ์ไม้กระท้อนของไทย ในการประชุมวิชาการประจำปีโครงการ BRT ครั้งที่ 12 วันที่ 10-13 ตุลาคม 2551 ณ โรงแรมไดมอนด์พลาซ่า จังหวัดสุราษฎร์ธานี

4. จำนวนนักศึกษาระดับปริญญาตรี โท เอก ในโครงการ จำนวน เรื่อง ดังนี้
(ระบุชื่อนักศึกษา, ชื่อวิทยานิพนธ์, ระดับการศึกษา)

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ลงนาม.....

ผู้รับทุน

วันที่ 16 พฤศจิกายน 2552

สารบัญ

รายงานฉบับสมบูรณ์ โครงการวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทย

รหัสโครงการ BRT R_149025

โครงการพัฒนาองค์ความรู้และศึกษานโยบายการจัดการทรัพยากรชีวภาพในประเทศไทย [Biodiversity Research and Training Program (BRT)] ได้อนุมัติและจัดสรรงบประมาณ จำนวน 2,200,000 บาท ให้คณะวิจัย ซึ่งประกอบด้วย นายธวัชชัย วงศ์ประเสริฐ นักวิทยาศาสตร์ชำนาญการพิเศษ กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช, ดร.จำลอง เพ็งคล้าย ราชบัณฑิต และนายธีรวัฒน์ บุญทวีคุณ นักวิทยาศาสตร์ชำนาญการพิเศษ กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช ทำการวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทย เพื่อให้ทราบถึงข้อมูลพื้นฐาน ทั้งชนิด รูปร่างลักษณะ การผลิดอกเป็นผล ถิ่นที่อยู่ การกระจายพันธุ์ และการใช้ประโยชน์ โดยมีหลักฐานการอ้างอิง เพื่อประมวลเป็นองค์ความรู้ และเพื่อสู่การจัดทำหนังสือพรรณไม้ของประเทศไทย เช่นเดียวกับนานาประเทศ เพื่อเป็นหลักฐานและสิทธิประโยชน์ของประเทศต่อไปในอนาคต

โครงการนี้เริ่มต้นตั้งแต่ วันที่ 1 ตุลาคม 2549 จนถึงสิ้นสุดในวันที่ 30 กันยายน 2552 และโครงการพัฒนาฯ ยังได้กรุณาจัดสรรงบประมาณอีก 404,721.32 บาท ให้ ดร.จำลอง เพ็งคล้าย เดินทางไปตรวจสอบพรรณไม้และศึกษาเปรียบเทียบตัวอย่างต้นฉบับ (Type specimens) ในต่างประเทศเป็นเวลา 3 เดือน

คณะผู้วิจัยฯ ได้ดำเนินการวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทยเสร็จสมบูรณ์ตามนัยดังกล่าวข้างต้น ซึ่งเป็นที่สรุปได้ว่าชนิดพรรณไม้วงศ์ไม้กระท้อนของไทยที่แน่นอนมี 18 สกุล (Genera), 84 ชนิด (species) 3 ชนิดย่อย (subspecies) และ 4 พันธุ์ (variety) ในจำนวนดังกล่าวมีบางส่วนที่ใคร่ขอสรุปไว้ดังนี้ คือ

1. เป็นพรรณไม้ที่ยังไม่ปรากฏว่าพบในประเทศไทยมาก่อน (New records) 11 ชนิด คือ เทียมดง *Aglaia macrocarpa* (Miq.) Pannell, สังเครียด *A. palembanica* Miq., ชมพู่เสม็ด *A. rubiginosa* (Hiern) Pannell, สังเครียดแดง *A. rufinervis* (Blume) Bentv.; ตุ้มดง *Aphanamixis sumatrana* (Miq.) Ridl.; พวงงาม *Chisocheton amabilis* (Miq.) C. DC.; ตาเสือ *Dysoxylum acutangulum* Miq., ตาเสือแหลม *D. angustifolia* King, ตาเสือขอบจัก *D. mollissimum* Blume, ตาเสือแดง *D. rubrocostatum* Pierre; ยมล้านนา *Pseudoclausena chrysogyne* (Miq.) T.P. Clark

2. เป็นพรรณไม้ที่ค่อนข้างล่อแหลมต่อการสูญพันธุ์ (endangered) มี 10 ชนิดคือค้างคาวใบรี *Aglaia sexipetala* Griff.; ตุ้มดง *Aphanamixis sumatrana* (Miq.) Ridl.; ตาเสือขน *Chisocheton grandiflorus* (Kurz) Hiern; ตาเสือหนังหนา *Dysoxylum acutangulum* Miq., ตาเสือลาย *D. lenticellatum* Wu, ตาเสือขอบจัก *D. mollissimum* Blume, ตาเสือขน *D. papillosum* King, ตาเสือแดง *D. rubrocostatum* Pierre; ยมล้านนา *Pseudoclausena chrysogyne* (Miq.) T.P. Clark; และ สะท้อนพรุ *Sandoricum beccarianum* Baill.

3. เป็นพรรณไม้ที่ประชาชนในท้องถิ่นใช้บริโภคเนื้อผลหรือเยื่อหุ้มเมล็ดมี 22 ชนิด คือ ค้างคาว *Aglaia edulis* (Roxb.) Wall., สังเครียด *A. elliptica* Blume, สังเครียดไร้หู *A. exstipulata* (Griff.) Theob., หอม *A. forbesii* King, ค้างคาวใหญ่ *A. grandis* Korth. ex Miq., กียะ *A. korthalsii* Miq., สังกะโต้ง *A. lawii* (Wight) Sald. ex Ram., สังเครียดเลือด *A. leptantha* Miq., มะก่อง *A. leucophylla* King, ประยงค์ *A. odorata* Lour. ประยงค์ป่า *A. odoratissima* Blume, ประยงค์ใบใหญ่ *A. oligophylla* Miq., ประยงค์เบี้ยว *A. sexipetala* Griff., สังเครียดขน *A. teysmanniana* (Miq.) Miq.; เทียม *Azadirachta excelsa* (Jack) Jacobs; ยมหวด *Chisocheton cumingianus* (C. DC.) Harms; ลางสาด *Lansium domesticum* Corrêa, สะท้อนพรุ *Sandoricum beccarianum* Baill., กระท้อน *S. koetjape* (Burm.f.) Merr.; ขี้อ้าย *Walsura robusta* Roxb., กัดลิ้น *W. trichostemon* Miq. และขี้อ้ายดง *W. villosa* Wall. ex Hiern.

งานวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทยที่สำเร็จลุล่วงด้วยดี เพราะความกรุณาของท่านประธานและเจ้าหน้าที่ทุกๆ ท่านในโครงการพัฒนาองค์ความรู้และศึกษานโยบายการจัดการทรัพยากรชีวภาพในประเทศไทย คณะผู้วิจัยใคร่ขอขอบพระคุณไว้ ณ ที่นี้ นอกจากนี้ยังมี หอพรรณไม้ต่างๆ ทั้งในและต่างประเทศ อันมี พิพิธภัณฑ์พืชกรุงเทพ, กรมวิชาการเกษตร หอพรรณไม้องค์การสวนพฤกษศาสตร์ จังหวัดเชียงใหม่ หอพรรณไม้มหาวิทยาลัยสงขลานครินทร์ หอพรรณไม้มหาวิทยาลัยขอนแก่น หอพรรณไม้กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช หอพรรณไม้มหาวิทยาลัยโคเปนเฮเกนและหอพรรณไม้มหาวิทยาลัยออร์ฮุส ประเทศเดนมาร์ก หอพรรณไม้คิวและหอพรรณไม้ธรรมชาติวิทยา พิพิธภัณฑ์สถานแห่งชาติ ประเทศสหราชอาณาจักร ที่ได้กรุณาให้เข้าตรวจสอบพรรณไม้ และอำนวยความสะดวกนานาประการแก่เจ้าหน้าที่ผู้วิจัย จนทำให้งานวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทย สำเร็จได้ตาม

วัตถุประสงค์และเป้าหมายที่วางไว้ทุกประการ ขอเจ้าหน้าที่และสถาบันดังกล่าวได้รับความปรารถนาดี จากคณะผู้วิจัยในครั้งนี้ด้วย

The final report on Meliaceae of Thailand
under the auspices of
The Biodiversity Research and Training Program (BRT)

BKT R-149025, a three years project research on **Meliaceae of Thailand**, with strongly support by BRT was held from October 1, 2006 to September 30, 2009. The researchers composed of Mr. Thawatchai Wongprasert, Mr. Thirawat Boonthavikoon both from Department of National Parks, Wildlife and Plant Conservation, and Mr. Chamlong Phengklai from the Royal Institute of Thailand. We had been surveying, collecting and identifying the specimens from various parts of the country, including a number of specimens from neighboring countries and the important type specimens which were deposited in the European herbaria.

We are confident that, in Thailand, the total numbers of 84 species, 3 subspecies and 4 varieties, can be enumerated from 18 Genera of *Aglaia* Lour., *Aphanamixis* Blume, *Azadirachta* A. Juss., *Chisocheton* Blume, *Chukrasia* A. Juss., *Cipadessa* Blume, *Dysoxylum* Blume, *Heynea* Roxb. *Lansium* Côrr., *Melia* L., *Munronia* Wight, *Pseudoclausena* T.P. Clark, *Sandoricum* Cav., *Swietenia* Jacq., *Toona* (Endl.) M. Roem., *Turraea* L., *Walsura* Roxb., and *Xylocarpus* Köenig.

Among those, 11 species are recorded as new to Thailand i.e: *Aglaia macrophylla* (Miq.) Pannell, *A. palembanica* Miq., *A. rubiginosa* (Hiern) Pannell, *A. rufinervis* (Blume) Bentv.; *Aphanamixis sumatrana* (Miq.) Ridl.; *Chisocheton amabilis* (Miq.) C. DC.; *Dysoxylum acutangulum* Miq., *D. angustifolia* King, *D. mollissimum* Blume, *D. rubrocostatum* Miq.; *Pseudoclausena chrysogyne* (Miq.) T.P. Clark.

On the other hand 22 species are known as the edible fruits by local peoples i.e. *Aglaia edulis* (Roxb.), *A. elliptica* Blume, *A. exstipulata* (Griff.) Theob., *A. forbesii* King, *A. grandis* Korth. ex Miq., *A. korthalsii* Miq., *A. lawii* (Wight) Sald. ex Ram., *A. leptantha* Miq., *A. leucophylla* King, *A. odorata* Lour., *A. odoratissima* Blume, *A. oligophylla* Miq., *A. sexipetala* Griff., *A. teysmanniana* (Miq.) Miq.; *Azadirachta excelsa* (Jack) Jacobs; *Chisocheton cumingianus* (C. DC.) Harms.; *Lansium domesticum* Corrêa; *Sandoricum beccarianum* Baill., *S. koetjape* (Burm.f.) Merr.; *Walsura robusta* Roxb., *W. trichostemon* Miq. and *W. villosa* Wall. ex Hiern.

Finally the researchers are most thankful to the Biodiversity Research and Training Program (BRT) under the guidance of Prof. Dr. Visut Baimai in providing a grant, with the accomplishment of this successful research project.

บทคัดย่อ

พรรณไม้วงศ์ไม้กระท้อนของไทยในปัจจุบัน มี 18 สกุล จำนวน 84 ชนิด 3 ชนิดย่อย และ 4 สายพันธุ์ ในจำนวนนี้ 11 ชนิดเป็นพรรณไม้ที่ยังไม่เคยยืนยันมาก่อนว่ามีอยู่ในประเทศไทย และเป็นพรรณไม้สกุลที่พบเป็นครั้งแรกของไทย 1 สกุล คือ สกุล *Pseudoclausena*

คำหลัก : 84 ชนิด 3 ชนิดย่อย และ 4 สายพันธุ์ วงศ์ไม้กระท้อนของไทย

Abstract

Thai neem family are deal with 18 genera, 84 species, 3 subspecies and 4 variety. These are including 11 new record species, and among these the genus *Pseudoclausena* noticed as a new Genus to Thailand.

Key words : 84 taxa of Thai neem family

ถ้าหากจะพูดถึงทรัพยากรธรรมชาติกันแล้ว ประเทศไทยที่มีพื้นที่ประมาณ 321 ล้านไร่ เป็นประเทศหนึ่งที่มีทรัพยากรธรรมชาติมากที่สุด จนมีคำกล่าวกันว่า ในน้ำมีปลา ในนามีข้าว ในป่ามีพันธุ์ไม้นานาชนิด ทั้งไม้สัก ไม้ตะเคียนทอง ไม้ประดู่ เหลือที่จะคณานับ เรามีฤดูกาลที่แน่นอนและหมุนเวียนมาอย่างสม่ำเสมอ คือฤดูร้อน 4 เดือน จะเริ่มประมาณต้นเดือนกุมภาพันธ์ถึงพฤษภาคม ฤดูฝน 4 เดือน จะเริ่มจากเดือนมิถุนายนถึงเดือนกันยายน และฤดูหนาว 4 เดือนเช่นกัน เริ่มจากเดือนตุลาคมถึงมกราคม คนไทยโดยเฉพาะอย่างยิ่งที่เป็นชาวนาจะกำหนดช่วงเวลาปฏิบัติภาระกิจ เป็นรอบหมุนเวียนอย่างสม่ำเสมอ พืชผักต่าง ๆ จะได้จากท้องนา และตามรั้วบ้าน เช่น ผักบุ้ง ผักตำลึง ผักกระถิน อาหารจำพวกโปรตีน ก็หาเอาเองจากห้วยหนองคลองบึง เป็นพวกกุ้ง หอย ปู ปลา นานาชนิด หน้าแล้งเกี่ยวข้าวเก็บเข้ายุ้งฉางเสร็จก็ใช้ควายเทียมเกวียนเข้าป่า เพื่อหาฟืนให้พอเพียงกับที่จะใช้ในครัวเรือนตลอดปี การเพาะปลูกและการเพาะเลี้ยงก็แทบจะไม่รู้จักกันเลย พื้นที่ป่าไม้มีมากกว่า 50 เปอร์เซ็นต์ หรือประมาณ 165 ล้านไร่ (1 ไร่ = 1,600 ต.ร.ม.) ประชากรในประเทศประเมินว่ามี 18 ล้านคน การเรียนรู้เกี่ยวกับพืชหรือสัตว์เป็นไปตามธรรมชาติ จากปากต่อปาก จดจำและพิมพ์ฝังแน่นอยู่ในหัว โดยเฉพาะอย่างยิ่งพืชหรือสัตว์ที่เป็นประโยชน์ ทั้งที่มีประโยชน์เพื่อการบริโภค เพื่อใช้เป็นยารักษาโรค เพื่อใช้เป็นที่อยู่อาศัย เพื่อใช้ทำเชือกหรือเครื่องนุ่งห่ม หรือที่เป็นพิษเป็นภัยทั้งการกินและสัมผัส ทุกคนรู้จักชนิดและแหล่งที่เสาะหานับเป็นร้อย ๆ ชนิดทีเดียวทำให้มีความรู้สึกว่าความรู้นั้นเป็นเรื่องธรรมชาติ ไม่จำเป็นต้องศึกษา (เรียนแบบปัจจุบัน) แต่อย่างใด ในตอนนั้นถ้าพบผู้ใดเดินไปเก็บชิ้นส่วนของพรรณไม้มาอัด ตากแห้ง แล้วเอามานั่งดู (เช่น หมอคาร์) ชาวบ้านจะมองด้วยความสงสัยว่า ผู้นั้นมีอาการปกติหรือเปล่า แต่ชั่วไม่นานเพียงต่ออายุกัน 1-2 ชั่วชีวิต ประเทศไทยเราเปลี่ยนแปลงไปมาก พื้นที่ประเทศยังคงเดิม แต่ป่าเหลือเพียงประมาณ 106 ล้านไร่ หรือ 33 เปอร์เซนต์ของพื้นที่ประเทศ ประชากรเพิ่มขึ้นเป็น 63 ล้านคน (ไม่นับผู้ที่มีอำนาจที่อพยพเข้ามาอีกหลายล้านคน) แผ่นดินที่ในน้ำมีปลาในนามีข้าวเปลี่ยนไปเป็นในน้ำมีแพในนามีบ้านจัดสรรแทน ต้องหาพื้นที่ปลูกผัก ทำบ่อเลี้ยงปลา เลี้ยงเป็ด ไก่ สุกรเพื่อการบริโภค ก่อให้เกิดมลภาวะ เหตุทั้งนี้เรามิได้เตรียมการรับมือหรือป้องกันมาก่อน เพราะสบายมากเกินไปกระมัง และหากจะเหลือบมองอีกสักนิดว่า บรรดาพืชอาหาร ผักและผลไม้ เช่น ผักกาด ผักคะน้า ผักชี กล่ำปลี หน่อไม้น้ำ มังคุด แตงกวา ถั่วพู ถั่วฝักยาว มะเขือเทศ ฯลฯ นับเป็นร้อย ๆ ชนิดที่วางขายกันอยู่ในท้องตลาดนั้น เป็นพืชที่นำเข้ามาปลูกจากต่างประเทศทั้งสิ้น ก็ยิ่งน่าหดหู่ใจยิ่งขึ้น แล้วจำพวกผักลิ้นห่าน ผักหวาน เท้ายายม่อม หรือก่อเดือย หายไปไหน และหากต่อไปประเทศที่เป็นแหล่งของพืชนั้น ๆ เขาลุกขึ้นมาทวงสิทธิประโยชน์ (เริ่มมีบ้างแล้ว) ที่เขาควรพึงมีพึงได้จากทรัพยากรของเขา แล้วเราจะทำอย่างไร ก็คงต้องซื้อผักด้วยราคาที่ประเมินต้นทุนการปลูกจนถึงตลาด บวกค่าสิทธิประโยชน์เข้าไปอีกใช่หรือไม่ หากจะถามว่าสายเกินไปไหม คำตอบน่าจะเป็นว่าไม่สาย และไม่มีอะไรที่สาย

เกินไปที่เราจะกลับมามอง มาศึกษาวิจัยค้นคว้าเกี่ยวกับทรัพยากรของประเทศไทยเรา ทั้งในแนวลึกและการพัฒนาศักยภาพ เพื่อให้เป็นที่นิยมของชุมชนคนไทยและต่างประเทศให้ได้ทั้งในเชิงวิชาการและเชิงพาณิชย์ พืชนับเป็นทรัพยากรธรรมชาติที่สามารถเพิ่มพูนได้ การใช้ทรัพยากรนี้เพื่อการใดๆ จำเป็นอย่างยิ่งที่จะต้องทราบชนิดให้ถูกต้องแน่นอน เพราะแต่ละชนิดจะมีความแตกต่างในคุณสมบัติเฉพาะทาง ถ้าใช้ผิดชนิด แทนที่จะเป็นคุณอาจเป็นโทษได้ ดังที่กล่าวมาแต่ต้นแล้วว่าประเทศไทยมีความหลากหลายของพรรณพืช ซึ่งควรจะได้นำมาใช้ประโยชน์อย่างถูกต้องและต่อเนื่อง หากจะได้ทำการวิจัยว่าเรามีพืชชนิดใดบ้างและสามารถนำไปใช้ประโยชน์ทางใด การตรวจสอบหาชื่อชนิดให้ถูกต้องนั้นมีหนทางเดียวคือจะต้องตรวจวิจัยอย่างเข้มข้นเป็นแต่ละวงศ์ (Family) ไป ขอหยิบยกวงศ์ไม้กระท้อน (Meliaceae) เป็นกลุ่มตัวอย่างศึกษา เพราะเป็นวงศ์ที่มีคุณค่าทางเศรษฐกิจและคุณค่าทางปกป้องสิ่งแวดล้อมตามธรรมชาติ เพราะส่วนใหญ่ชอบขึ้นตามป่าดิบเขา ตามที่ลาดชันสูงจนถึงที่ราบลุ่มใกล้แหล่งน้ำ จึงเป็นกลุ่มพืชที่สำคัญที่ช่วยปกป้องการพังทลายของดิน รักษาอุณหภูมิและดูดซับความชุ่มชื้นเก็บไว้ในดินได้ดีกว่าพวกไม้สน (Pine) เหมาะแก่การที่จะปลูกหรือปลูกเสริมป่าต้นน้ำลำธาร ในขณะเดียวกันก็ยังมีไม้ในวงศ์นี้อีกมากชนิดที่ชอบขึ้นในสังคมพืชที่ผิดแผกกันไป จึงต้องศึกษาวิจัยให้รอบคอบยิ่งขึ้น อนึ่งบรรดาประเทศใกล้เคียงประเทศไทย เช่น พม่า ลาว เขมร เวียดนาม อินเดีย อินโดนีเซีย และจีน ในแต่ละประเทศได้มีการสำรวจและวิจัยหาชื่อชนิดพรรณพืชของเขาเสร็จสิ้นไปแล้วทั้งหมด เขาจึงสามารถบริหารหรือจัดการทรัพยากรธรรมชาติด้านพืชได้อย่างดี คงเหลือแต่ประเทศไทยเพียงประเทศเดียวเท่านั้นที่ยังไม่มีข้อมูลสมบูรณ์เกี่ยวกับพรรณพืชของไทย แต่ปัจจุบันนี้เราก็ได้ดำเนินการมาเสร็จเรียบร้อยได้ประมาณ 75 เปอร์เซ็นต์ ยังคงต้องดำเนินการอีกระยะเวลาหนึ่ง เมื่อเทียบกับกำลังเจ้าหน้าที่กับพื้นที่ของประเทศ

มองย้อนอดีตเกี่ยวกับการศึกษาวิจัยพรรณไม้วงศ์กระท้อนของไทยนั้น ขอกล่าวย่อ ๆ ดังนี้ ท่านแรกคงต้องให้เกียรติกับ Dr. W.G. Craib (1915) เขียนเรื่องพรรณไม้วงศ์กระท้อนเกาะช้าง มี 4 สกุล รวม 5 ชนิด คือ *Chisocheton divergen* Bl. var. *robusta* Valeton; *Aglaia odorata* Lour.; *Walsura robusta* Roxb., *Xylocarpus granatum* Roxb., *Xylocarpus obovatus* (Bl.) A. Juss. ต่อมา Dr. C.M. Pannell (1992) ทำการศึกษาและวิจัยสกุลไม้ค้างคาว (Aglaia) สรุปว่าในประเทศไทย มีพรรณไม้สกุล Aglaia จำนวน 32 ชนิด และ Dr. D.J. Mabberley และ Dr. C.M. Pannell (1995) ทำการทบทวน เพื่อจัดทำ Flora Malesiana สรุปในส่วนที่เกี่ยวข้องกับประเทศไทย ว่าประเทศไทยมี 17 สกุล จำนวน 73 ชนิด

วัตถุประสงค์หลักของการวิจัยมี 6 ประการด้วยกัน คือ

1). ให้ทราบชนิดและลักษณะรูปร่างแต่ละชนิดของพรรณไม้วงศ์ไม้กระท้อนของไทยทั้งหมด

พืชเป็นสิ่งที่มีชีวิตเหมือนกับมนุษย์และสัตว์ ย่อมมีเอกลักษณ์เฉพาะตนและมาจากเผ่าพันธุ์ที่แผกกันไปทำให้รูปร่างหน้าตาก็ไม่เหมือนกัน อาจคล้ายกันถ้ามาจากสายพันธุ์เดียวกัน การจะคบการจะทำความรู้จัก ก็จำเป็นต้องดูรูปร่างลักษณะเฉพาะของแต่ละคนหรือแต่ละต้นเพื่อจะได้จดจำได้ เมื่อพบกันหรือจำเป็นต้องพบกันในโอกาสข้างหน้า มนุษย์มีนิสัยชอบจัดอยู่แล้ว และในการจัดคงไม่สนใจว่าสิ่งที่ถูกจัดจะพอใจหรือไม่ โดยเฉพาะอย่างยิ่งพืชสื่อความหมายยากกว่าสัตว์มาก ก็เลยถูกจัดตามอัธยาศัยของมนุษย์ แต่มนุษย์ก็พยายามสร้างหลักเกณฑ์ในการจัด และมนุษย์ก็มีความเห็นขัดแย้งกันเองจนเกิดทฤษฎีในการจัดขึ้นมามาก สร้างความงุนงงแก่มนุษย์ด้วยกัน แต่ทุกคนมีโอกาสวินิจวิเคราะห์และตัดสินใจว่าจะคล้อยตามทฤษฎีของใคร หรือจะตั้งขึ้นใหม่ถ้ามีเหตุผลก็คงไม่ว่ากัน นักวิจัยคนไทยในเรื่องจัดทฤษฎีที่สูงตั้งแต่ระดับสกุล (Genus) ระดับวงศ์ (Family) ขึ้นไป ยังไม่มีท่านใดเข้าสู่จุดนี้เพราะความจำเป็นเฉพาะหน้าในเรื่องอื่น ๆ ขวางกั้นอยู่มากมาย เพียงแต่ให้ทราบว่าชนิดที่ 1 หรือชนิดที่ 2 ต่างมีรูปร่างหน้าตาอย่างไร ชื่อปัจจุบัน ซึ่งประกอบด้วยชื่อสกุล ชนิด และผู้ตั้ง ณ ปัจจุบันเรียกว่าอะไร เช่น สัก *Tectona grandis* L. เราคงยืนยันชื่อนี้เป็นหลัก ต่อไปภายหน้าอาจมีคนมาเปลี่ยนเป็นอื่นก็ย่อมสื่อย้อนกลับได้ว่า มันคือชนิดเดียวกันนั่นเอง เพียงแต่ว่า ณ วันนี้โลกส่วนใหญ่เขาว่าอย่างนี้ถูกต้อง เราคงต้องยอมรับ เรารับความเป็นปัจจุบัน แต่ไม่ได้หมายความว่ายอมรับความเป็นอนาคต

2). ให้ทราบถิ่นที่เกิดตามธรรมชาติของพรรณไม้วงศ์ไม้กระท้อนของไทยทุกชนิด

พรรณไม้แต่ละชนิดกว่าจะตั้งถิ่นฐานได้ ต้องต่อสู้แย่งชิงพื้นที่กันมานับเวลาเป็นร้อยปีพันปี แต่ไม่แก่งแย่งกันรุนแรงเหมือนกับมนุษย์และสัตว์ เช่นมีจุดใดที่เป็นที่โล่ง พันธุ์ไม้ที่ขึ้นอยู่รอบ ๆ ก็จะส่งผลให้ลอยมาตามน้ำ ตามลม หรือติดมากับสัตว์ที่กินผล แล้วไปถ่ายเมล็ดไว้ในที่โล่งนั้น ๆ เมล็ดก็จะงอกเป็นกล้าขึ้นมา ต้นใดทนสภาพแวดล้อมไม่ได้ก็ตายไปเหลือแต่ที่ทนได้ แต่แม่ไม้รอบ ๆ ข้างก็พยายามส่งเมล็ดเข้าไปทุก ๆ ปี จนในที่สุดฝ่ายชนะที่ทนได้ เติบโตจนผลิดอกออกผลได้ อาจเหลือไม่กี่ชนิด และในแต่ละชนิดก็ตกลงกันได้ที่จะอยู่แบบพึ่งพากัน ก็เกิดเป็นสังคมพืชนั้น ๆ ขึ้นมา เรามักจะมีคำเรียกว่า ป่าทุ่งหญ้า ป่าเบญจพรรณ ป่าดิบ ป่าดิบเขา ฯลฯ ทั้งหมดเป็นป่าที่ค่อนข้างยุติในเรื่องการแก่งแย่งพื้นที่กันแล้วทั้งสิ้น การให้ทราบถิ่นที่เกิด ก็เพื่อความสะดวกในการเสาะหาพืชชนิดนั้น ๆ ในเมื่อจำเป็นที่จะต้องนำมาใช้ประโยชน์ของมนุษย์ หรือใช้เป็นข้อพิจารณาที่มนุษย์จะปรับปรุงโยกย้ายพืชชนิดนั้น ๆ ไปปลูกขยายที่อาจเรียกว่าปลูกสวนป่า หรือปลูกเสริมป่า เป็นต้น

3). ให้ทราบความสัมพันธ์ต่อสิ่งแวดล้อมของสังคมพืชที่วงศ์ไม้กระท้อนขึ้นอยู่

ในกรณีนี้เป็นผลต่อเนื่องมาจากข้อ 2). เพราะมนุษย์จะได้ไปสร้างสิ่งแวดล้อมให้กับพืชหลักที่ตนประสงค์จะปลูกให้เจริญงอกงามในถิ่นใหม่โดยพิจารณาถึงดิน น้ำ ระดับความสูง ปริมาณน้ำฝน อากาศ และพืชใกล้เคียงที่มีอยู่ในถิ่นเดิมนั้น ๆ เอามาเป็นข้อมูลในการสร้างถิ่นใหม่ให้พืชที่เราต้องการ

4). ให้ทราบถึงส่วนที่จะนำไปใช้ประโยชน์ของไม้กระท้อนไทยเท่าที่เป็นอยู่และน่าจะเป็น

ดังที่กล่าวแต่ต้นแล้วว่าวงศ์ไม้กระท้อนไม้เป็นสังคมพืชภูเขาและตามที่ราบลุ่มย่อมคุ้มครองในเรื่องการอนุรักษ์ดินและน้ำ โดยเฉพาะอย่างยิ่ง เป็นแหล่งต้นน้ำลำธารโดยภาพรวม แต่ความสามารถเฉพาะแต่ละชนิดยังมีความแตกต่างกัน โดยเฉพาะอย่างยิ่งที่จะอำนวยประโยชน์ให้กับมนุษย์โดยตรงในด้านการใช้บริโภคและอุปโภค มีไม้วงศ์นี้ของไทยมากชนิดที่ให้เนื้อในผลเป็นอาหาร ให้เปลือก ให้เนื้อไม้เพื่ออุตสาหกรรมพิเศษบางชนิด ที่ทั้งหมดสามารถที่จะพัฒนาศักยภาพไปสู่อุตสาหกรรมขนาดใหญ่ได้ทั้งสิ้น

5). ให้เป็นฐานข้อมูลในการอ้างอิงสิทธิประโยชน์ของทรัพยากรไทยในด้านพันธุ์พืช

ประเทศไทยไม่ได้อยู่ลำพังประเทศเดียวในโลก ในแต่ละประเทศจำเป็นต้องสงวนสิทธิ์รักษาสิทธิ์อันพึงมีพึงได้ของประเทศตนเอง ทั้งพื้นดิน ทรัพย์สิน และเสรีภาพ เรื่องพื้นดินในปัจจุบันปัญหาลดน้อยลง เพราะมีขอบเขตหรือตกลงแนวเขตกันค่อนข้างแน่ชัด ส่วนทรัพย์สินโดยเฉพาะทรัพย์สินทางชีวภาพนั้น เริ่มมีปัญหาในการแก่งแย่งกรรมสิทธิ์แห่งการเป็นเจ้าของทั้งของดั้งเดิม และของที่ปรับปรุงใหม่ ประเทศใกล้เคียงกันที่มีสภาพภูมิประเทศและภูมิอากาศคล้ายกัน ย่อมมีทรัพยากรพืชและสัตว์เหมือนกันและคล้ายกัน ถ้าพืชของเรามีแต่เราไม่เคยประกาศอ้างอิงหลักฐานว่าพืชชนิดนี้เป็นพืชไทยที่มีมาแต่ดั้งเดิม แต่ประเทศอื่น ๆ เขาประกาศชัดเจนว่าเป็นพืชของเขามีหลักฐานอ้างอิงเป็นที่ยอมรับแล้ว สิทธิประโยชน์ขณะนี้หรือต่อไปในอนาคตก็คงต้องเป็นของผู้แสดงหลักฐาน เมื่อถึงตอนนั้นคงจะต้องมาโทษกันเองว่า เรามัวทำอะไรอยู่จึงไม่ศึกษาวิจัยว่าทรัพยากรนั้น ๆ เป็นของเรา และมีอยู่มาก่อนในประเทศของเรา

6). ให้เป็นส่วนช่วยในงานวิจัยเพื่อการจัดทำหนังสือพรรณไม้ของประเทศไทยให้สำเร็จสมบูรณ์เร็วขึ้น

ข้อนี้เป็นการสรุปการขจัดปัญหาทั้งมวลใน 5 ข้อแรก โครงการทำหนังสือฯ นี้เริ่มอย่างเป็นทางการเป็นครั้งแรกในปี พ.ศ. 2508 (ค.ศ. 1965) ณ. หอพรรณไม้เมืองไลเดน ประเทศเนเธอร์แลนด์ มี ศ.ดร. เต็ม สมิตินันทน์ เป็นหัวหน้านักพฤกษศาสตร์ฝ่ายไทย มีนักพฤกษศาสตร์จากเนเธอร์แลนด์ เดนมาร์ก อังกฤษ และฝรั่งเศส ร่วมประชุมให้ความร่วมมือ ทั้งส่งเจ้าหน้าที่และจัดหาทุนตามความจำเป็นช่วยเจ้าหน้าที่ไทย จากวันนั้นถึงวันนี้ (พ.ศ. 2552) ประมาณ 43 ปี งานวิจัยพรรณไม้ไทยที่พิมพ์ออกเผยแพร่ประมาณ 75% ของงานที่จะต้องดำเนินการ เพื่อให้สมประโยชน์ตามข้อ 1-5 ที่กล่าวข้างต้น ปัญหานักวิจัยของไทยและทุนวิจัยที่มีน้อยนิดเป็นอุปสรรคสำคัญ และเจ้าหน้าที่จำนวนน้อยนี้ยังต้องปฏิบัติภารกิจเฉพาะหน้าตามสายงานอีก จึงยิ่งทำให้โอกาสที่จะทำงานวิจัยนี้ลดลงไปอีกอย่างน่าเป็นห่วง ทำให้นักพฤกษศาสตร์ของไทยเราแม้จะเกษียณอายุราชการไปแล้ว ยังต้องอุทิศเวลาให้กับงานวิจัยนี้

ดำเนินต่อไป แม้ว่าจะไม่ได้รับผลตอบแทนจากหน่วยงานที่เกี่ยวข้องแต่อย่างใดก็ตาม โครงการ BRT นับเป็นโครงการหนึ่งที่ให้โอกาสและสร้างความสำเร็จเพื่อส่วนรวมของชาติ ขอได้รับความขอบคุณไว้ ณ ที่นี้ด้วย

การสำรวจและเก็บตัวอย่างพรรณไม้: งานภาคสนาม

พรรณไม้วงศ์ไม้กระท้อนของไทยส่วนมากพบขึ้นในเขตป่าดิบแล้งและป่าดิบชื้นของประเทศ แต่ก็สามารถขึ้นได้กระจัดกระจายตามป่าที่ถูกทำลาย, พื้นที่รกร้างว่างเปล่า บริเวณที่ราบเชิงเขา บริเวณเขาหินปูน, หินทราย, บริเวณสองข้างทาง ฯลฯ การสำรวจและเก็บตัวอย่างพรรณไม้ในวงศ์นี้จึงจำเป็นต้องพิจารณาคัดเลือกพื้นที่ที่จะเข้าดำเนินการดังกล่าว อันได้แก่

1. **ภาคเหนือ** พื้นที่สำรวจหลักได้ถูกกำหนดไว้ในท้องที่จังหวัดตากและเชียงใหม่ ที่ครอบคลุมพื้นที่ต้นน้ำลำธาร พื้นที่บริเวณเทือกเขาหินปูนตามแนวเทือกเขาตะนาวศรีในเขตจังหวัดตาก แต่จะเน้นพื้นที่บริเวณอุทยานแห่งชาติดอยอินทนนท์, อุทยานแห่งชาติแม่โถ, เขตรักษาพันธุ์สัตว์ป่าดอยเชียงดาว ในเขตจังหวัดเชียงใหม่ ส่วนในจังหวัดตากพื้นที่สำรวจส่วนใหญ่จะดำเนินการในบริเวณเทือกเขาหินปูนต่างๆ ในเขตอำเภอแม่สอด

2. **ภาคตะวันออกเฉียงเหนือ** ในสภาพป่าบริเวณเขาหินทรายในเขตท้องที่จังหวัดเลยและจังหวัดหนองคายเป็นพื้นที่สำรวจหลัก และป่าในเขตพื้นที่จังหวัดเพชรบูรณ์เป็นพื้นที่สำรวจรอง การกำหนดพื้นที่สำรวจดังกล่าวเนื่องจากยังมีสภาพป่าดิบแล้งหลงเหลืออยู่ในเขตอุทยานแห่งชาติและเขตรักษาพันธุ์สัตว์ป่าหลายแห่ง อาทิเช่น อุทยานแห่งชาติภูกระดึง, เขตรักษาพันธุ์สัตว์ป่าภูหลวง จังหวัดเลย, เขตรักษาพันธุ์สัตว์ป่าภูวัว จังหวัดหนองคาย กินอาณาบริเวณกว้างขวาง และมีความหลากหลายของภูมิประเทศสูง

3. **ภาคตะวันออกเฉียงใต้** คณะผู้สำรวจได้เน้นพื้นที่สำรวจในป่าท้องที่จังหวัดจันทบุรี โดยเฉพาะอย่างยิ่งเขตรักษาพันธุ์สัตว์ป่าเขาสอยดาว และอุทยานแห่งชาติเขาคิชฌกูฏ จังหวัดจันทบุรี ที่เป็นตัวแทนสภาพป่าดิบแล้งดั้งเดิม ถูกรบกวนน้อย จึงเป็นตัวแทนของพื้นที่ป่าของภาคนี้ได้เป็นอย่างดี นอกจากนี้ยังได้ทำการสำรวจและเก็บตัวอย่างในพื้นที่ใกล้เคียงอีก เช่น อุทยานแห่งชาติเขาใหญ่ เพื่อให้ได้รายละเอียดของพรรณพืชเพิ่มขึ้น

4. **ภาคตะวันตกเฉียงใต้** จังหวัดกาญจนบุรีเป็นพื้นที่ชายแดนระหว่างไทย-พม่า ที่ได้รับอิทธิพลจากพรรณพืชเขตอินเดีย-หิมาลัย (หรือเขตอินเดีย-พม่า) ในบริเวณเขาหินปูนน้อยใหญ่เป็นแหล่งต้นน้ำ จึงเป็นแหล่งที่เหมาะสมสำหรับพืชพรรณนานาชนิด ในสภาพป่าเบญจพรรณ หรือป่าผลัดใบผสมไผ่ที่แปรสภาพมาจากป่าดั้งเดิม และมีพรรณไม้วงศ์ไม้กระท้อนขนาดใหญ่หลงเหลือมาจากป่าธรรมชาติ

5. **ภาคใต้** สังคมพืชของสภาพพื้นที่ดั้งเดิมถูกคัดเลือกมาเป็นพื้นที่สำรวจของสภาพป่าดิบชื้น เนื่องจากพื้นที่เหล่านี้ถูกรบกวนน้อย อาทิเช่นเขตรักษาพันธุ์สัตว์ป่าคลองนาคา จังหวัดระนอง, อุทยานแห่งชาติศรีพังงา, อุทยานแห่งชาติเขาหลัก-ลำรู่, วนอุทยานน้ำตกรามัญ จังหวัดพังงา, อุทยานแห่งชาติธารโบกขรณี, อุทยานแห่งชาติเขาพนมเบญจา จังหวัดกระบี่ จัดเป็นพื้นที่สำรวจที่สามารถเก็บตัวอย่างพรรณไม้วงศ์ไม้กระท้อนได้ทั้งจำนวน และมีความหลากหลายของสกุล และชนิดสูงมาก

การดำเนินงานเก็บหาตัวอย่างพรรณพืชนั้น ต้องบันทึกภาพ รายละเอียดต่างๆ ของพรรณไม้ และภูมิประเทศ ตามรูปแบบสากลที่ดำเนินการกันทั่วไป แล้วนำตัวอย่างที่เสาะแสวงหามาได้ไปทำการตรวจวินิจฉัยในรายละเอียดที่พอพรรณไม้ กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช เพื่อให้ได้ข้อมูลที่ถูกต้อง เป็นขั้นตอนสุดท้าย

การตรวจสอบพรรณไม้

ขั้นตอนการตรวจสอบทำได้หลายรูปแบบตามความถนัดหรือความคิดเห็นของผู้วิจัย สำหรับการวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทย ไม่ได้ยึดติดกับชื่อที่มีผู้ให้ชื่อไว้แล้ว แต่ทุกชนิดนำมาคลุกและดูตามลักษณะขั้นตอนดังนี้

(1) พิจารณาจากลักษณะของใบ ตั้งแต่รูปทรง การติดของใบกับกิ่ง โคนใบ ปลายใบ ขอบใบ เส้นใบซึ่งรวมทั้งเส้นกลางใบ เส้นแขนงใบ เส้นใบย่อย ลักษณะผิวใบ ก้านใบ ว่ามีความเหมือนหรือแตกต่างกันหรือไม่ อย่างไร

(2) พิจารณาเกี่ยวกับช่อดอกว่าเป็นแบบใด เช่น ช่อเชิงลด ช่อแบบหางกระรอก ช่อกระจะ ช่อแยกแขนง ฯลฯ

(3) พิจารณาเกี่ยวกับดอกว่าเป็นดอกสมบูรณ์เพศ แยกเพศ สี กลีบเลี้ยง กลีบดอก เกสรเพศผู้ เกสรเพศเมีย แบบของรังไข่ รวมทั้งการติดของออวุลหรือไข่อ่อนในรังไข่

จากรายละเอียดทุกประการข้างบน ซึ่งจะต้องบันทึกไว้ แล้วเอาชนิดตัวอย่างที่เหมือนกันมารวมกันเป็นแต่ละกลุ่ม ยังไม่ต้องคำนึงว่าเป็นชนิดใด

การตรวจเอกสาร

เริ่มกันที่เอกสารที่เกี่ยวข้องกับวงศ์ไม้กระท้อน (Meliaceae) เพื่อซึมซับกับลักษณะพืชของวงศ์นี้ ดูเอกสารที่แยกสกุล (Genera) ของพรรณไม้วงศ์ไม้กระท้อน ว่ากำหนดไว้อย่างไรในแต่ละสกุล และประการสุดท้ายดูเอกสารที่มีการทบทวน (Revised) ล่าสุดของแต่ละวงศ์หรือแต่ละสกุล จะทำให้เรามองเห็นชัดเจนได้ว่า พรรณไม้ที่เราแยกไว้และจัดไว้เป็นกอง ๆ พร้อมรายละเอียดต่าง ๆ ของแต่ละกองนั้น น่าจะเป็นชนิดใด แต่เท่านี้ยังไม่พอ เมื่อเราค่อนข้างแน่ใจว่าน่าจะเป็นชนิดใดแล้ว ต้องเสาะหาดูพรรณไม้ต้นแบบ (Holotype หรือ Isotype หรือ Type) ที่โดยมากมักจะเก็บอยู่ตามหอพรรณไม้

ที่สำคัญ ๆ ของโลก เพื่อสร้างหรือยืนยันความมั่นใจให้แน่นหนายิ่งขึ้น เพราะมีบางที่อ้างต่อ ๆ กันมาจนเบี่ยงเบนไปจากต้นแบบมากเกินไปก็มี จากนั้นจะต้องสอบเอกสารการตั้งชื่อ (Nomenclature) รวมทั้งเอกสารทะเบียนชื่อรวม (Kew Index) เพื่อประกอบความถูกต้องในการอ้างอิงเพื่อการเขียน จากทั้งหมดเราจะพบว่าชื่อใดถูกลบไปเป็นชื่อพ้องกับชื่อชนิดอื่นแล้ว หรือชื่อนั้นถูกต้องแน่นอนเป็นปัจจุบัน (ในขณะนี้) แล้ว แต่ถ้ากลุ่มใดที่แยกไว้ไม่เข้ากับลักษณะชนิดพืชตามเอกสารและจากพรรณไม้ต้นแบบที่มีอยู่ ก็ดำเนินการไปสู่การพิจารณาตั้งเป็นพรรณไม้ชนิดใหม่ (ของโลก) ต่อไป ผลงานจากการวิเคราะห์วิจัยจนได้ชนิดครบถ้วนแล้ว จะไปสู่การเรียบเรียงเพื่อง่ายต่อการรวบรวมและการศึกษาเกี่ยวกับชนิดไม้กระท้อนของไทยต่อไป

การเรียบเรียง

ในการเรียบเรียงขึ้นอยู่กับข้อตกลงในกลุ่มคณะผู้จัดเพื่อให้เป็นระบบและเป็นไปในทำนองเดียวกัน ผู้วิจัยวงศ์ไม้กระท้อนของไทยยึดตามข้อตกลงคณะกรรมการพรรณไม้ประเทศไทย (Flora of Thailand) ว่าจะต้องเขียนลักษณะประจำวงศ์ และของสกุล จัดทำรูปวิธาน (Key) แบบแยกสองกลุ่ม (Binomial) เพื่อให้ผู้ใช้ได้เห็นข้อเปรียบเทียบที่ต่างกัน เขียนบรรยายลักษณะของแต่ละชนิด พร้อมการกระจายพันธุ์ ข้อมูลทางนิเวศน์ ประโยชน์เท่าที่จำเป็นพอสังเขป รวมทั้งการให้มีภาพถ่าย รูปวาดประกอบมากหรือน้อยตามความเหมาะสม ซึ่งผลการวิจัยพรรณไม้วงศ์ไม้กระท้อนของไทย ได้เสนอร่างผลงานฉบับสมบูรณ์ ภาคภาษาไทย ต่อ BRT เพื่อพิจารณาจัดพิมพ์เผยแพร่เรียบร้อยแล้ว มีเนื้อหาสาระครบถ้วนดังที่ได้กล่าวมา และแต่ละชนิดได้ย่อสาระสำคัญเน้นแต่ละชนิดที่ยาวไม่เกิน 4 บรรทัดไว้ด้วยแล้ว ทั้งนี้คณะผู้วิจัยฯ ตระหนักดีว่า ในแต่ละชนิดจะแตกต่างกันเล็กน้อย ถ้าไม่สังเกตจริง ๆ จะมองไม่เห็น จึงใช้ระบบย่อประกอบกับรูปภาพ เพื่อความสะดวกของผู้ใช้ส่วนหนึ่ง แต่ถ้าหากต้องการลงลึกถึงรายละเอียดเพื่อการอ้างอิงหรือวิเคราะห์เกี่ยวกับชนิดพรรณที่ท่านต้องการความชัดเจนยิ่งขึ้น ก็สามารถอ่านรายละเอียดที่แต่ละชนิดให้ไว้ที่ค่อนข้างพอเพียงในข้อความถัดลงมาอยู่แล้ว

ผลงานโดยภาพรวมและสิ่งที่น่าจะดำเนินการต่อไป

การดำเนินการวิจัยเป็นไปตามระบบและขั้นตอนตามที่กำหนดดังกล่าว เป็นผลให้งานสำเร็จด้วยดี เราสามารถยืนยันได้ว่า พรรณไม้วงศ์กระท้อนในประเทศไทยปัจจุบันมี 18 สกุล (Genera), จำนวน 84 ชนิด (species) 3 ชนิดย่อย (subspecies) และ 4 พันธุ์ (variety) ซึ่งแยกตามคุณสมบัติของพืชเป็นบางส่วนได้ดังนี้

1. กลุ่มพรรณไม้วงศ์ไม้กระท้อนที่ยังไม่ปรากฏว่าพบในประเทศไทยมาก่อน (New records) จำนวน 11 ชนิด คือ เทียมดง *Aglaia macrocarpa* (Miq.) Pannell, สังเครียด *A. palembanica* Miq., ชมพู่เสม็ด *A. rubiginosa* (Hiern) Pannell, สังเครียดแดง *A. rufinervis* (Blume) Bentv.; ตุ้มดง

Aphanamixis sumatrana (Miq.) Ridl.; พวงงาม *Chisocheton amabilis* (Miq.) C. DC.; ตาเสือ *Dysoxylum acutangulum* Miq., ตาเสือแหลม *D. angustifolia* King, ตาเสือขอบจัก *D. mollissimum* Blume, ตาเสือแดง *D. rubrocostatum* Pierre; ยมล้านนา *Pseudoclausena chrysogyne* (Miq.) Clark

2. เป็นพรรณไม้ที่ประชาชนในท้องถิ่นใช้บริโภคเนื้อผลหรือเยื่อหุ้มเมล็ดมี 22 ชนิด คือ ค้างคาว *Aglaia edulis* (Roxb.) Wall., สังเครียด *A. elliptica* Blume, สังเครียดไร้หู *A. exstipulata* (Griff.) Theob., หอม *A. forbesii* King, ค้างคาวใหญ่ *A. grandis* Korth. ex Miq., กียะ *A. korthalsii* Miq., สังกะโต้ง *A. lawii* (Wight) Sald. ex Ram., สังเครียดเลือด *A. leptantha* Miq., มะก่อง *A. leucophylla* King, ประยงค์ *A. odorata* Lour. ประยงค์ป่า *A. odoratissima* Blume, ประยงค์ใบใหญ่ *A. oligophylla* Miq., ประยงค์เบี้ยว *A. sexipetala* Griff., สังเครียดขน *A. teysmanniana* (Miq.) Miq.; เทียม *Azadirachta excelsa* (Jack) Jacobs; ยมหวด *Chisocheton cumingianus* (C. DC.) Harms; ลางสาด *Lansium domesticum* Corrêa, สะท้อนพรุ *Sandoricum beccarianum* Baill., กระท้อน *S. koetjape* (Burm.f.) Merr.; ขี้อ้าย *Walsura robusta* Roxb., กัดลิ้น *W. trichostemon* Miq. และขี้อ้ายดง *W. villosa* Wall. ex Hiern.

3. เป็นพรรณไม้ที่ค่อนข้างล่อแหลมต่อการสูญพันธุ์ (endangered) มี 10 ชนิด คือ ค้างคาวใบรี *Aglaia sexipetala* Griff.; ตุ้มดง *Aphanamixis sumatrana* (Miq.) Ridl.; ตาเสือขน *Chisocheton grandiflorus* (Kurz) Hiern; ตาเสือหนังหนา *Dysoxylum acutangulum* Miq., ตาเสือลาย *D. lenticellatum* Wu, ตาเสือขอบจัก *D. mollissimum* Blume, ตาเสือขน *D. papillosum* King, ตาเสือแดง *D. rubrocostatum* Pierre; ยมล้านนา *Pseudoclausena chrysogyne* (Miq.) Clark; และ สะท้อนพรุ *Sandoricum beccarianum* Baill.

4. กลุ่มพรรณไม้วงศ์ไม้กระท้อนเพื่อการเกษตร-ป่าไม้ มีการใช้ประโยชน์จำนวนหลายชนิด ไม่ว่าจะเป็นการปลูกเพื่อใช้สอย ปลูกเพื่อการอนุรักษ์พื้นที่ป่า เป็นพืชเศรษฐกิจ เช่นไม้ผล ตัวอย่างพรรณไม้สำคัญ ได้แก่ มะฮอกกานี *Swietenia mahogani* (L.) Jacq. ถูกนำมาปลูกกันในประเทศ ตั้งแต่ปี พ.ศ. 2419 สามารถนำเนื้อไม้มาใช้ในการก่อสร้างนานาวัตถุประสงค์; สกุลสะเดา *Azadirachta indica* A.Juss. var. *siamensis* Valeton เป็นพันธุ์ไม้พื้นเมืองสามารถนำไปปลูกสร้างสวนป่า เป็นพันธุ์ไม้ปรับปรุงภูมิทัศน์ ปลูกให้ร่มเงาสองข้างทาง ทนทานต่อโรคและแมลง; สกุลสะเดาเทียม *Azadirachta excelsa* (Jack.) Jacobs เป็นไม้ต้นโตเร็ว น่าปลูกเป็นไม้เศรษฐกิจที่สำคัญ; สกุลยมหิน *Chukrasia tabularis* A. Juss. เป็นพันธุ์ไม้แห่งภูมิภาคเอเชียใต้ และเอเชียตะวันออกเฉียงใต้ ให้เนื้อไม้อยู่ในชั้น

คุณภาพ A มีความแข็งแรงและทนทานสูง ใช้ในการก่อสร้าง และปลูกเป็นพันธุ์ไม้ปรับปรุงภูมิทัศน์สองข้างทางได้เป็นอย่างดี; สกุลตะบัน *Xylocarpus rumphii* (Kostel.) Mabb. เป็นพันธุ์ไม้ขึ้นตามโขดหิน ชายหาด ลำต้นใหญ่ถูกนำมาแปรรูปเพื่อก่อสร้างเรือขนาดเล็กมีความทนทานสูงมาก; สกุลยมหอม *Toona ciliata* M. Roem. พันธุ์ไม้สารพัดประโยชน์โตเร็ว ให้เนื้อไม้ที่มีความทนทานสูง; สกุลกระท้อน *Sandoricum koetjape* (Burm.f.) Merr. เป็นได้ทั้งพืชเศรษฐกิจ ขึ้นได้ทั่วไป ปลูกเป็นไม้ให้ร่มเงา และพืชอาหารสัตว์ เนื้อไม้แปรรูปใช้ในการก่อสร้างมีความทนทานสูงมาก; สกุลลางสาด *Lansium domesticum* Corrêa เป็นไม้ผลเศรษฐกิจปลูกกันแพร่หลายได้เกือบทุกภาคของประเทศ; พรรณไม้ต่างๆ ในสกุลตาเสือ *Dysoxylum* spp. และสกุลกัดลิ้น *Walsura* spp. ถูกนำมาใช้ในการก่อสร้างและผลิตเฟอร์นิเจอร์, ในสกุลประยงค์ *Aglaia* spp. อีกหลายชนิด สามารถนำมาปลูกเป็นไม้ประดับและสมุนไพร

5. กลุ่มสารเคมีที่พบในพรรณไม้วงศ์ไม้กระท้อน พรรณไม้หลายชนิดในวงศ์ไม้กระท้อนมีการสร้างสารทุติยภูมิ (Secondary metabolites) ที่มีฤทธิ์ป้องกันแมลงหรือฆ่าแมลงได้ โดยเฉพาะสารในกลุ่ม limonoids (meliacins) ที่สามารถบอกถึงความสัมพันธ์กับพืชในวงศ์ส้ม (Rutaceae) ได้เป็นอย่างดี รวมถึงพืชในอันดับ Rutales อีกด้วย นักพฤกษศาสตร์ได้พยายามศึกษารายละเอียดของพฤกษเคมีของพืชในวงศ์กระท้อนมาเมื่อประมาณ 20 ปีมานี้เอง ทำให้การศึกษาและค้นคว้าวิจัยด้านนี้ของพืชในวงศ์ไม้กระท้อนจึงมีอยู่ค่อนข้างจำกัด จากเอกสารงานวิจัยต่างๆ เราพอจะสรุปถึงกลุ่มสารสำคัญต่างๆ ที่พืชในวงศ์กระท้อนสร้างขึ้นดังนี้

กลุ่ม Essential oils: ที่ได้จากตาเสือ *Aphanamixis polystachya* (Wall.) R. Parker, ลางสาด *Lansium domesticum* Corrêa และเมล็ดของตาเสือขาว *Dysoxylum* spp.; กลุ่ม Flavonoids: พบในยมหิน *Chukrasia tabularis* A. Juss., ใบสะเดา, เปลือกรากของตาเสือ *Aphanamixis polystachya* (Wall.) R. Parker และเปลือกต้นของสังเครียดลางสาด *Aglaia tomentosa* Teijsm. & Binn. เป็นต้น; กลุ่ม Tannins: พืชในวงศ์นี้จะสังเคราะห์และเก็บ tannins ไว้ในส่วนต่างๆ ของพืชโดยเฉพาะส่วนเปลือกต้นและเปลือกรากเป็นส่วนใหญ่ ได้แก่ catechins, gallocatechins, gallic acid ฯลฯ; กลุ่ม Alkaloids และ Protoalkaloids: พบในพรรณพืชหลายชนิดของวงศ์ไม้กระท้อน เช่นจากใบของจันทน์ชะมด *Aglaia silvestris* (M. Roem.) Merr. ใบประยงค์ *Aglaia odorata* Lour. ใบค้างคาว *Aglaia edulis* (Roxb.) Wall. เป็นต้น; กลุ่ม Limonoids หรือ Meliacins: เป็น bitter substances ที่ได้จากเลี่ยน *Melia azedarach* L., สกุล ตะบูน *Xylocarpus* spp.; กลุ่ม Triterpenoids: เป็นกลุ่มสารเคมีที่น่าสนใจยิ่ง ที่พบในพืชวงศ์นี้หลายชนิด เช่น จากเนื้อไม้ของยมหอม *Toona ciliata* M. Roem. เปลือกต้นของสะเดา *Azadirachta* spp. ใบของตาเสือ *Aphanamixis polystachya* (Wall.) R. Parker; กลุ่ม Saponins: และสารคล้ายคลึง; กลุ่ม กลุ่มอื่นๆ เช่นสารอนินทรีย์, mucilages, และสารที่ไม่ทราบโครงสร้างอื่นๆ

จากการที่พืชในวงศ์ไม้กระท้อนสามารถสังเคราะห์สารเคมีต่างๆ ขึ้นมาได้นั้นจัดเป็นพรรณไม้วงศ์หนึ่งที่น่าติดตามทำการวิจัยและศึกษาด้านพฤกษเคมีเป็นอย่างยิ่ง นับเป็นโอกาสอันดีที่คณะผู้วิจัยได้ศึกษาทางด้านอนุกรมวิธานเป็นฐานข้อมูลเบื้องต้นไว้แล้ว ก็เท่ากับเปิดโอกาสให้นักเคมีเข้าร่วมศึกษาวิจัยในรายละเอียดทางด้านพฤกษเคมีของพรรณไม้แต่ละชนิดลงไปอย่างเฉพาะเจาะจง อันจะทำให้องค์ความรู้ทางด้านพืชของพรรณไม้ในวงศ์ไม้กระท้อนมีความสมบูรณ์และอาจนำนานาประโยชน์มาใช้ได้ในอนาคต

สรุป

ผลจากการทราบชนิดไม้กระท้อนของไทยทั้ง 18 สกุล (Genera), จำนวน 84 ชนิด (species) 3 ชนิดย่อย (subspecies) และ 4 พันธุ์ (variety) พร้อมข้อมูลที่จำเป็นในการทำความรู้จักเป็นแต่ละชนิด รวมทั้งรูปลักษณ์ที่ได้จากทั้งการเรียบเรียงพร้อมรูปวาดประกอบ ที่ทาง BRT จะพิมพ์เผยแพร่ในภาคภาษาไทย และโครงการวิจัยพรรณไม้แห่งประเทศไทย จะพิมพ์เผยแพร่ในภาคภาษาอังกฤษในรูปของวารสาร Thai Forest Bulletin (Botany) และในรูปของ Flora of Thailand จะเป็นการแสดงย้ำให้นานาประเทศได้รับทราบถึงทรัพยากรธรรมชาติ โดยเฉพาะกลุ่มหรือวงศ์ไม้กระท้อนของไทยเป็นอย่างดี

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MELIACEAE

Th. Wongprasert[1], C. Phengklai[2], T. Boonthavikoon[1]

Polygamous, dioecious, monoecious or with only bisexual trees or shrubs (rarely herbaceous); bark bitter and astringent. Leaves pinnate to bipinnate, unifoliolate or simple in spiral (rarely decussate) usually with entire leaflets. Flowers if unisexual often with rudiments of opposite sex, in spikes to thyrses, axillary to supraaxillary, rarely cauliflorus; calyx (2)3-5(-7); corolla 3-7(-14) in 1(-2) whorls. Stamens usually on top of staminal tube with 3-19(-30) anthers in 1(2) whorls. Disk usually around the ovary. Ovary superior, (1)2-6(-20) with as many locules and usually axile placentation. Fruits a capsule, berry or drupe; seeds winged and then attached to woody columella, or with corky outer layers or with fleshy sarcotesta or aril.

A family comprises 50-52 genera with about 650 species are widely distributed majority in the tropics and subtropics zones. 18 genera with 84 species, 3 subspecies and 4 varieties occur in Thailand.

KEY TO THE GENERA

(based on flowering and leaf specimens)

1. Flowers in pre-blooming; ovoid, oval, oboval or obconical, not exceed than 5 mm. long
   2. Leaves paripinnate
      3. Staminal tube absent; androgynophore instead — **15. Toona**
      3. Staminal tube present
         4. Calyx 5, corolla 5. Bud scales present — **14. Swietenia**
         4. Calyx 4, corolla 4. Bud scales absent — **18. Xylocarpus**
   2. Leaves imparipinnate
      5. Disc distinct
         6. Disc patelliform, ovary obovoid — **6. Cipadessa**
         6. Disc annular
            7. Anthers with bifid apices — **8. Heynea**
            7. Anthers without bifid apices — **17. Walsura**
      5. Disc indistinct
         8. Inflorescences spike, spikelet or catkin

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9. Inflorescences long spike or with spikelet. Braches; axillary to supra axillary **2. Aphanamixis**
9. Inflorescences catkin; on branches or on stems **9. Lansium**
8. Inflorescences thyrse compound
10. Leaves and young parts with stellate and scaly indumentum **1. Aglaia**
10. Leaves and young parts puberulus then glabrous **12. Pseudoclausena**
1. Flowers in pre-blooming; oblong, tubular-oblong, salverform, not less than 5 mm. long
11. Leaves paripinnate or imparipinnate
12. Leaves paripinnate only; usually end with juvenile hairy pistil **5. Chukrasia**
12. Leaves mixed, both paripinnate, 4 imparipinnate
13. Pistil glabrous. Leaves imparipinnate, rarely paripinnate **3. Azadirachta**
13. Pistil hairy
14. Pistil hairy throughout; juvenile leaflets end of rachis wrinkle **4. Chisocheton**
14. Pistil hairy up to a half of style; juvenile leaflets end of rachis (if present) not wrinkle **7. Dysoxylum**
11. Leaves imparipinnate, trifoliolate, (2-3)-imparipinnate or simple
15. Shrub or undershrub
16. Leaves simple
17. Leaves serrate or undulate margin. Petals united into a long tube **11. Munronia (M. humilis)**
17. Leaves entire margin. Petals free **16. Turraea**
16. Leaves imparipinnate **11. Munronia (M. pinnata)**
15. Tree
18. Leaves 2(-3)-imparipinnate; leaflets serrate margin **10. Melia**
18. Leaves trifoliolate; leaflets entire margin **13. Sandoricum**

AGLAIA

Aglaia Lour., Fl. Cochinch. 1: 173. 1790. nom. conserv. Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 1-379. 1992. Mabb. & Pannell, Flora Males. ser. I, 12 (1): 194-314. 1995.

Trees or shrubs, with indumentum of stellate hairs or peltate scales. Male and female flowers in separate inflorescences, rarely dioecious. Trunk often with buttresses. *Bark* smooth, or somewhat rough, usually with rows of lenticels, latex often present. *Leaves* spirally arrange, usually imparipinnate, rarely simple; leaflets with indumentum, distichous, subopposite or alternate, usually asymmetrical sides. *Inflorescence* a thyrse compound, axillary or supraaxillary, rarely ramiflorus or cauliflorus and often on an apical shoot. *Flowers* unisexual with well developed rudiments of the opposite sex, bracts and bracteoles usually caducous. *Male inflorescence* many branches, while the female inflorescences single to few branches, usually larger than the male one. *Calyx* 1/4-2/3 the length of the corolla, cup-shaped with shallowly or deeply 3-5(-6) lobed, aestivation or imbricated. *Corolla* aestivation imbricated or quincuncial, globose or obovoid in outline, petals 3-5(-6) free or united at the base, free from the staminal tube. *Staminal tube* globose or obovoid, without

appendages, crenate or shallowly lobed margin; anthers 5-10, in a single whorl, dehiscing by two longitudinal slits, inserted on the inner surface of the tubes; anthers in female flowers similar but sterile. *Disk* absent. *Ovary* 1-3(-5) loculi, superior, depressed-globose or ovoid with dense stellate hairs; each locule with 1-2 ovules, where carpels more than 1, placentation axile; style short constricted between the ovary and style or absent; stigma ovoid, more or less cylindrical or depressed-globose, entire at the apex or with 2-3(-4) small lobes; ovary in male sterile. *Infructescence* often several or on a shoot with few to many fruits. *Fruits* subglobose, obovoid or ellipsoid, indehiscent or a loculicidal capsule, with 1-3(-5) locules, each with one seed. *Seed* usually with aril or sarcotesta nearly or completely enclosed the seed.

KEY TO THE SPECIES

(based on flowering and leaf specimens)

1. The lower lateral leaflets alternate
 2. Leaflets below the apical one cordate-base
  3. Last of sub-inflorescence as a raceme or spike-liked; leaflets densely indumentum and stellate hairs beneath **12. A. grandis**
  3. Last of sub-inflorescence as a thyrse-liked
   4. Calyx 5-lobed, corolla 5. lobed; leaflets beneath glabrous or sparsely reddish-brown hairs, conspicuously scalariform veins. **21. A. pachyphylla**
   4. Calyx 3-lobed, corolla 3-lobed; leaflets beneath with densely tomentose and squid-liked indumentum **24. A. rubiginosa**
 2. Leaflets below the apical one not cordate-base
  5. Pedicels up to 1mm. long or sessile, sub-inflorescence a spike-liked.
   6. Filaments raised up from staminal tube higher than the upper half of tube
    7. Flowers more sessile; flowers closed together as gall-liked; leaflets up to 15 cm. long **25. A. rufinervis**
    7. Flowers conspicuous pedicel up to 1 mm. long; flowers separate; leaflets not less than 15 cm. long **11. A. forbesii**
   6. Filaments raised up from staminal tube lower from the half of tube
    8. Leaflets strongly oblique at base, indumentum beneath or glabrous **15. A. leptantha**
    8. Leaflets with obtuse or cuneate at base, densely tomentose beneath
     9. Leaflets obtuse base **3. A. crassinervia**
     9. Leaflets cuneate base **30. A. tenuicaulis**
  5. Pedicels 2 mm. or longer, sub-inflorescence a thyrse-formed
   10. Leaves simple, spirally arranged **28. A. simplicifolia**
   10. Leaves imparipinnate
    11. Leaflets strongly oblique or cuneate at base; filaments raised up from staminal tube higher than the upper half of tube
     12. Leaflets strongly oblique at base, glabrous both sides **26. A. sexipetala**
     12. Leaflets cuneate base, sparsely golden brown beneath **27. A. silvestris**
    11. Leaflets obtuse or slightly obtuse at base; filament raised up from staminal tube lower from the half of tube
     13. Calyx and pedicels densely indumentum **2. A. chittagonga**
     13. Calyx and pedicels densely stellate hairs **31. A. teysmanniana**
1. The lower lateral leaflets opposite
 14. Leaflets hairy or glaucous or silvery on lower surface

15. Leaflets glaucous or silvery on lower surface
    16. Leaflets glaucous with densely lepidote beneath; style inconspicuous; ovary without gynophores **1. A. argentea**
    16. Leaflets silvery with sparsely indumentum and hairs beneath; style conspicuous; ovary with gynophores **9. A. eximia**
15. Leaflets with tomentose or stellate hairs, especially on lower surface
    17. Leaflets elliptic-oblong or oblong-lanceolate; leaflets up to 15 by 4 cm.;
        18. Leaflets with reddish brown simple hairs on lower surface **10. A. exstipulata**
        18. Leaflets with red stellate hairs on lower surface **22. A. palembanica**
    17. Leaflets obovate, oblanceolate or oblanceolate-oblong, stellate hairs on lower surface; leaflet up to 29 by 7 cm. **32. A. tomentosa**

14. Leaflets glabrous on both surfaces
    19. Calyx 3-lobed and corolla 3-lobed
        20. Apical leaflet oblong or broadly elliptic
            21. Apical leaflet oblong and usually reduced to a small hollow pocket **4. A. cucullata**
            21. Apical leaflet broadly elliptic and nerves reduced **8. A. erythrosperma**
        20. Apical leaflet obovate or oblanceolate
            22. Apical leaflet up to 13 by 4.5 cm. **17. A. macrocarpa**
            22. Apical leaflet not less than 25 by 7.5 cm **29. A. spectabilis**
    19. Calyx 5-lobed and corolla 5-lobed
        23. Pistils with distinct style or stigma or both
            24. Pistils distinct both style and stigma **14. A. lawii**
            24. Pistils distinct only style or stigma
                25. Pistil distinct only style as a tubular **23. A. perviridis**
                25. Pistils distinct only stigma, as a nipple on top of ovary
                    26. Ovary broadly expanded at base of staminal tube, and glabrous; leaflets 3-12 pairs, apex caudate to acuminate **16. A. leucophylla**
                    26. Ovary ovate and densely hairs; leaflets 1-2 pair, apex obtuse or acute **18. A. odorata**
        23. Pistils indistinct both style and stigma
            27. Ovary without conspicuous gynophore
                28. Stamens with anthers on the margin of staminal tube, tube obconical shape **7. A. elliptica**
                28. Stamens with the apical of anthers as same level of staminal margin; tube slightly tubular shape **5. A. edulis**
            27. Ovary with conspicuous gynophores
                29. Staminal tube ovoid or slightly obovoid
                    30. Ovary broader than height **20. A. oligophylla**
                    30. Ovary higher than breadth **13. A. korthalsii**
                29. Staminal tube obconical
                    31. Base of staminal tube narrow like androgynophore; apical of anthers protrude the marginal tube **19. A. odoratissima**
                    31. Base of staminal tube like the base of glass; apical of anthers not protrude the marginal tube **6. A. elaeagnoidea**

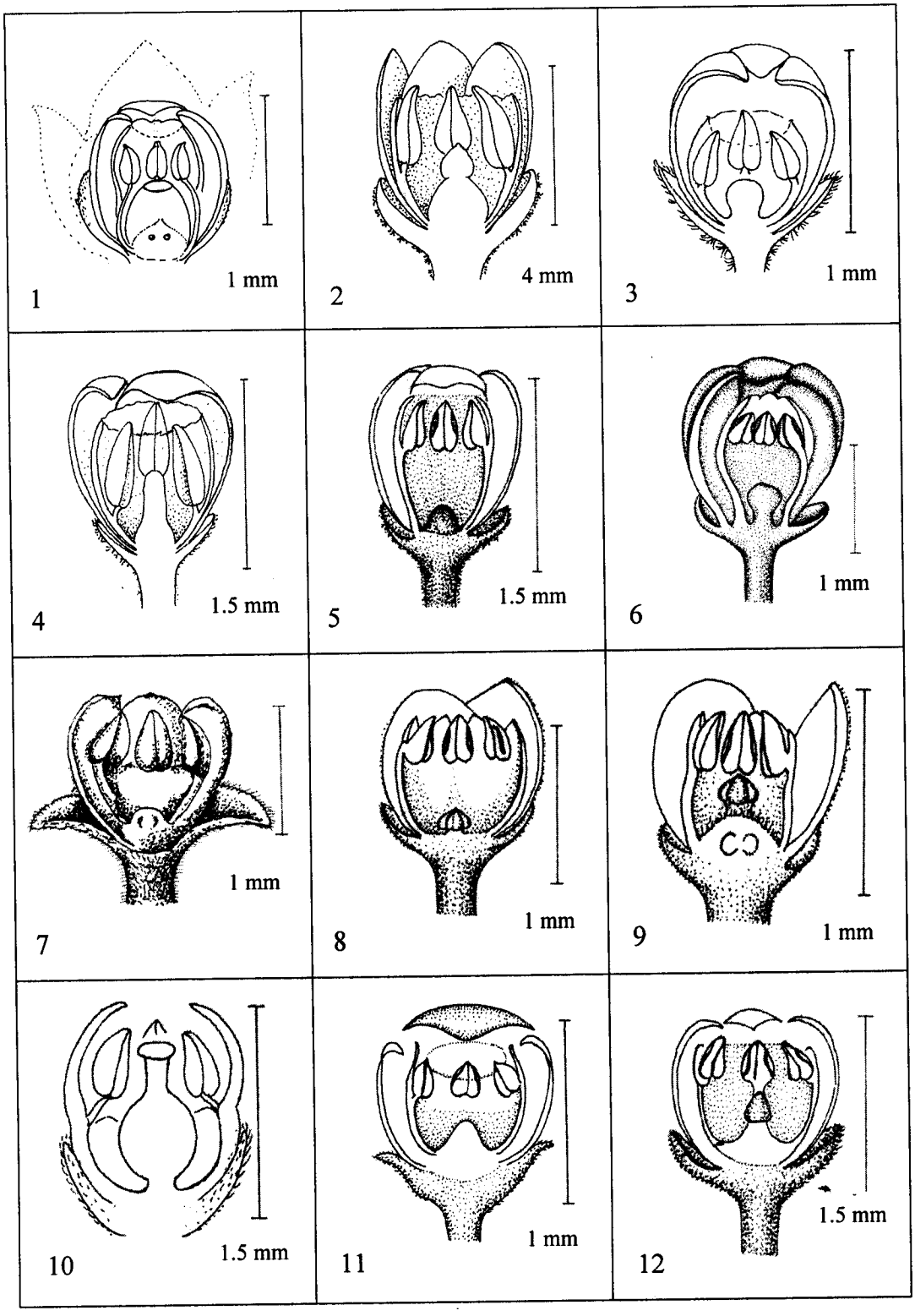

Fig. 1. Longitudinal section of flower in Genus *Aglaia*: 1) *Aglaia argentea*; 2) *A. chittagonga*; 3) *A. crassinervia*; 4) *A. cucullata*; 5) *A. edulis*; 6) *A. elaeagnoidea*; 7) *A. elliptica*; 8) *A. erythrosperma* ♂; 9) *A. erythrosperma* ♀; 10) *A. eximia*; 11) *A. exstipulata*; 12) *A. forbesii*.

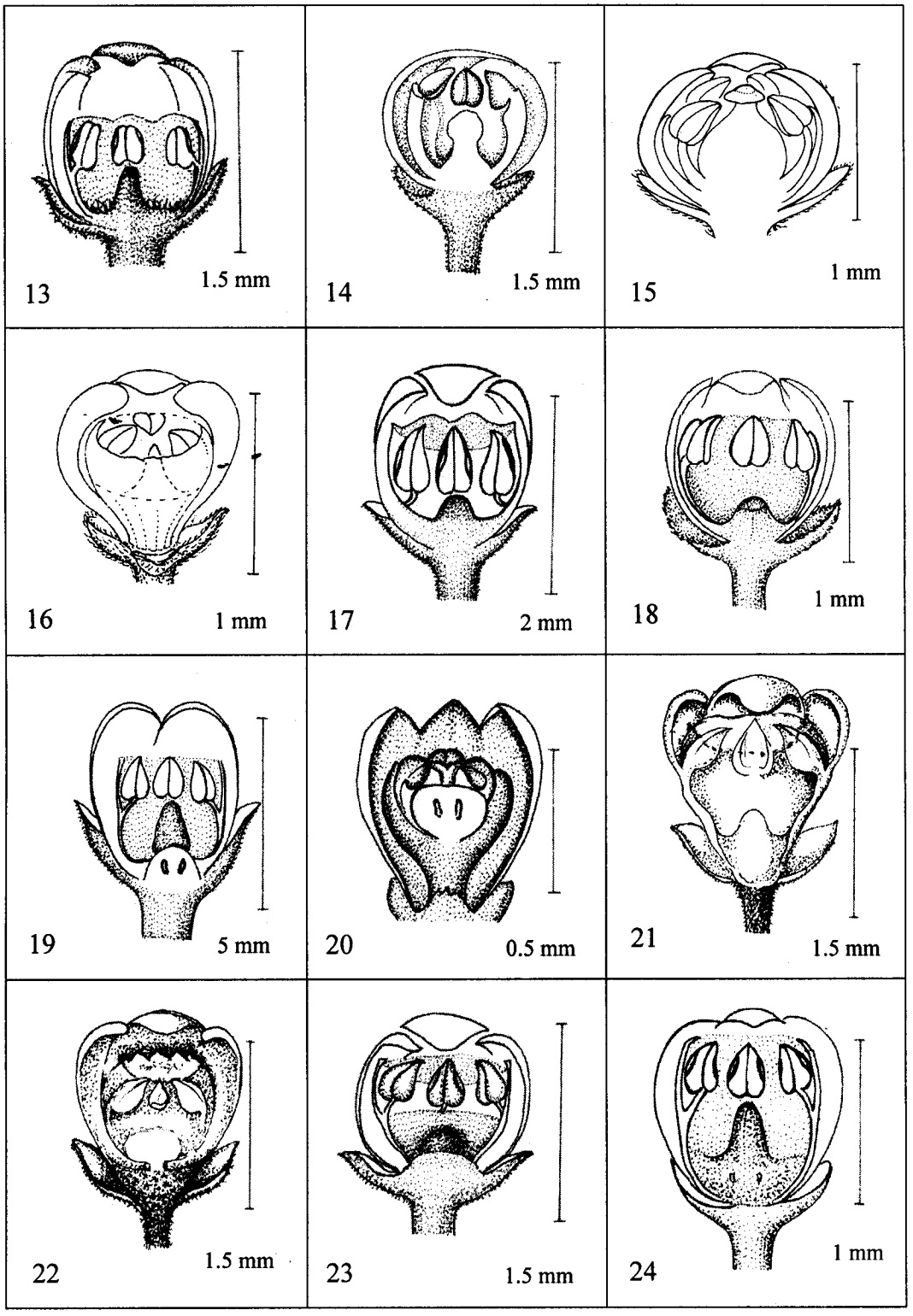

Fig. 2. Longitudinal section of flower in Genus *Aglaia*: 13) *Aglaia grandis*; 14) *A. korthalsii*; 15) *A. lawii* ♀; 16) *A. lawii* ♂; 17) *A. leptantha*; 18) *A. leucophylla*; 19) *A. macrocarpa*; 20) *A. odoratissima*; 21) *A. oligophylla* ♀; 22) *A. oligophylla* ♂; 23) *A. palembanica*; 24) *A. perviridis*.

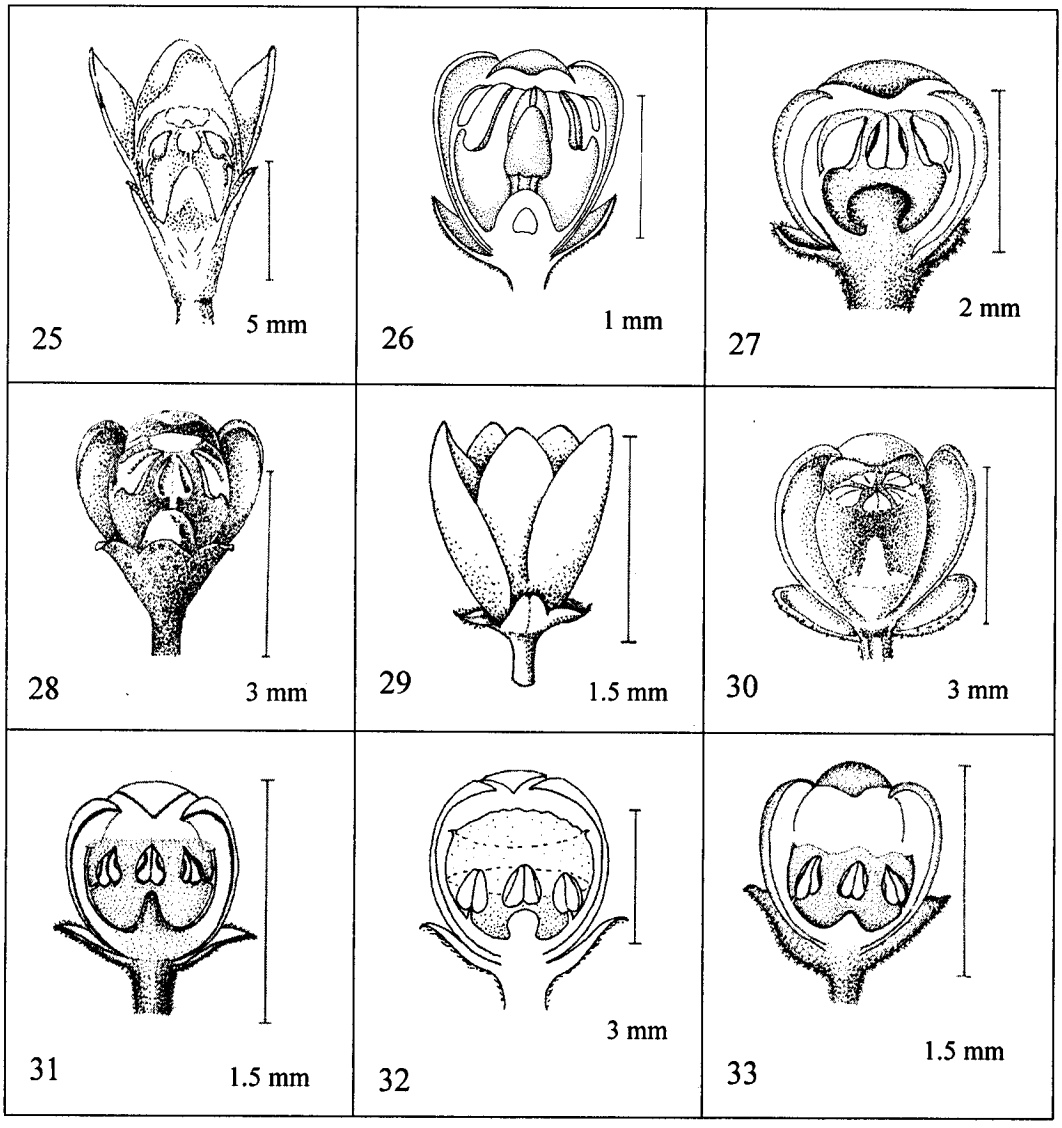

Fig. 3. Longitudinal section of flower in Genus *Aglaia*: 25) *Aglaia rubiginosa*; 26) *A. rufinervis*; 27) *A. sexipetala*; 28) *A. silvestris*; 29) *A. simplicifolia*; 30) *A. spectabilis*; 31) *A. tenuicaulis*; 32) *A. teysmanniana*; 33) *A. tomentosa*.

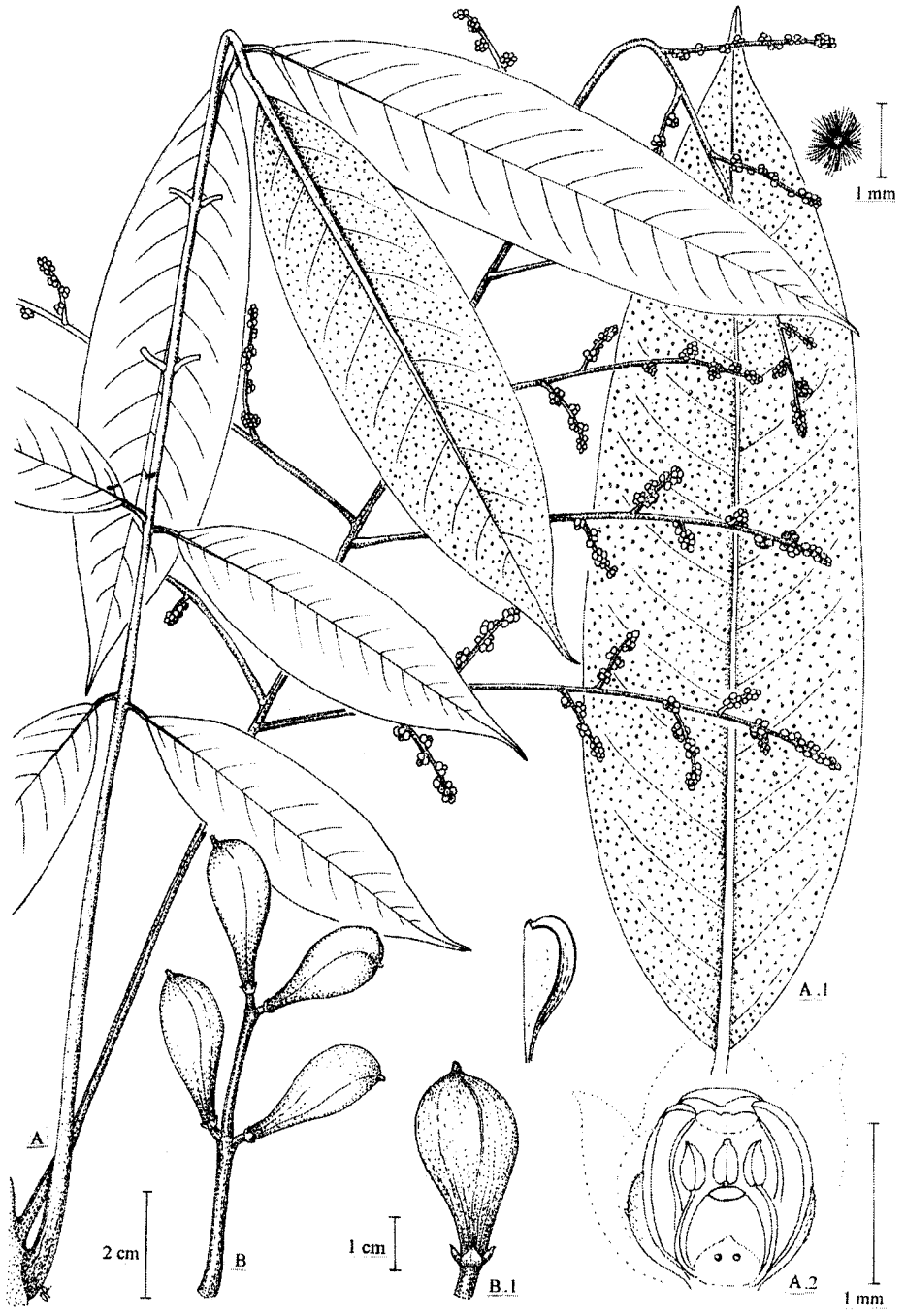

Fig. 4. *Aglaia argentea Blume*: A. twig with inflorescences, A.1 another form of leaflet, A.2 male flower (enlarged) (T. Santisuk 1293); B. part of infructescence, B.1 young drupe (B. Sangkachand 11).

1. Aglaia argentea Blume, Bijdr. Fl. Ned. Ind.: 170. 1825; Miq., Fl. Ind. Bat., Suppl.1: 543. 1861; King, J. Asiat. Soc. Bengal 64(2): 70. 1895; Ridl., Fl. Malay Penins. 1: 405. 1922; Backer. & Bakh.f., Fl. Java 2: 129. 1965; Pannell in Tree Fl. Malaya 4: 211. 1989 et Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 125,f. 27. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 237. 1995.—*Aglaia hypoleuca* Miq., Fl. Ind. Bat., Suppl. 1: 197. 1861.—*Aglaia argentea* Blume var. *angustata* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 55. 1868.—*Aglaia argentea* Blume var. *borneensis* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 55. 1868.—*Aglaia argentea* Blume var. *superba* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 55. 1868.—*Aglaia argentea* Blume var. *hypoleuca* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 55. 1868.—*Aglaia argentea* Blume var. *curtisii* King, J. Asiat. Soc. Bengal 64(2): 71. 1895.—*Aglaia discolor* Merr., Univ. Calif. Publ. Bot. 15: 130. 1929.

Trees (4-)5-15(-25) m high, 30-80 cm girth; young shoots dark brown or purplish brown. *Twigs* glabrous, sparsely lenticels and lepidote scales; longitudinal wavy ridges always distinct. *Bark* rather smooth, brown or greyish green, finely rough; inner bark white, brownish or yellowish; sapwood brownish, very hard. *Leaves* imparipinnate, 18-40 cm long, spirally arranged; leaflets oblong, lanceolate-oblong, rarely oblanceolate; 6-12 by 2-5.5 cm opposite or slightly opposite, chartaceous; glossy green upside, glaucous with densely lepidote beneath; apex acuminate to acute; base acute to obtuse; margin entire; midrib ridge to sharp ridge beneath, depressed upside; secondary nerves 10-17 pairs, hardly distinct, depressed upside; arched and anastomosing near margin. *Petiole* 7-14 cm long swollen near base; petiolules 2-5 mm long, sparsely with yellow lepidote and tomentose. *Inflorescence* a thyrse compound, sub-branched as spike-liked; axillary or supraaxillary 20-30 cm long, many branches; bracts and bracteoles narrowly triangular ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobes ca. 3/4 of all length, dots outside, glabrous inside, ciliate. *Corolla* 5, free, obovate, ca. 1 mm long, glabrous, white, or yellowish, ciliate. *Staminal tube* urceolate, ca. 1 mm long, glabrous, margin entire or slightly undulate. *Stamens* 5, filaments adnate the tube inside, the apical of anther not protrude the marginal tube. *Ovary* without gynophores, ovate, up to 0.5 mm long, glabrous; 3 loculi, each locule with 1(2) ovule, style and stigma only a round patch on top of ovary, glabrous. *Infructescence* upper leaf scars or axillary; erected up to 15 cm long, tomentose, then glabrescent. *Capsules* obovate, 2.5-3.5 by 1-1.5 cm, the apical round with a beak and minutely curved point, strongly attenuate to the base; epicarp leathery and woody; green, grey to yellowish grey.

T h a i l a n d.—NORTHERN: Lampang; PENINSULAR: Ranong, Surat Thani, Phangnga, Phatthalung, Trang, Songkhla.

D i s t r i b u t i o n.—Malaysia.

E c o l o g y.—Tropical evergreen rain forest, often near sea or stream; altitude (20)50-200(750) m. Flowering August-December; fruiting March-April (August).

V e r n a c u l a r.—Sang kried klong (สังเครียดคลอง), Sang ka ma (สังขะมา) (Peninsular).

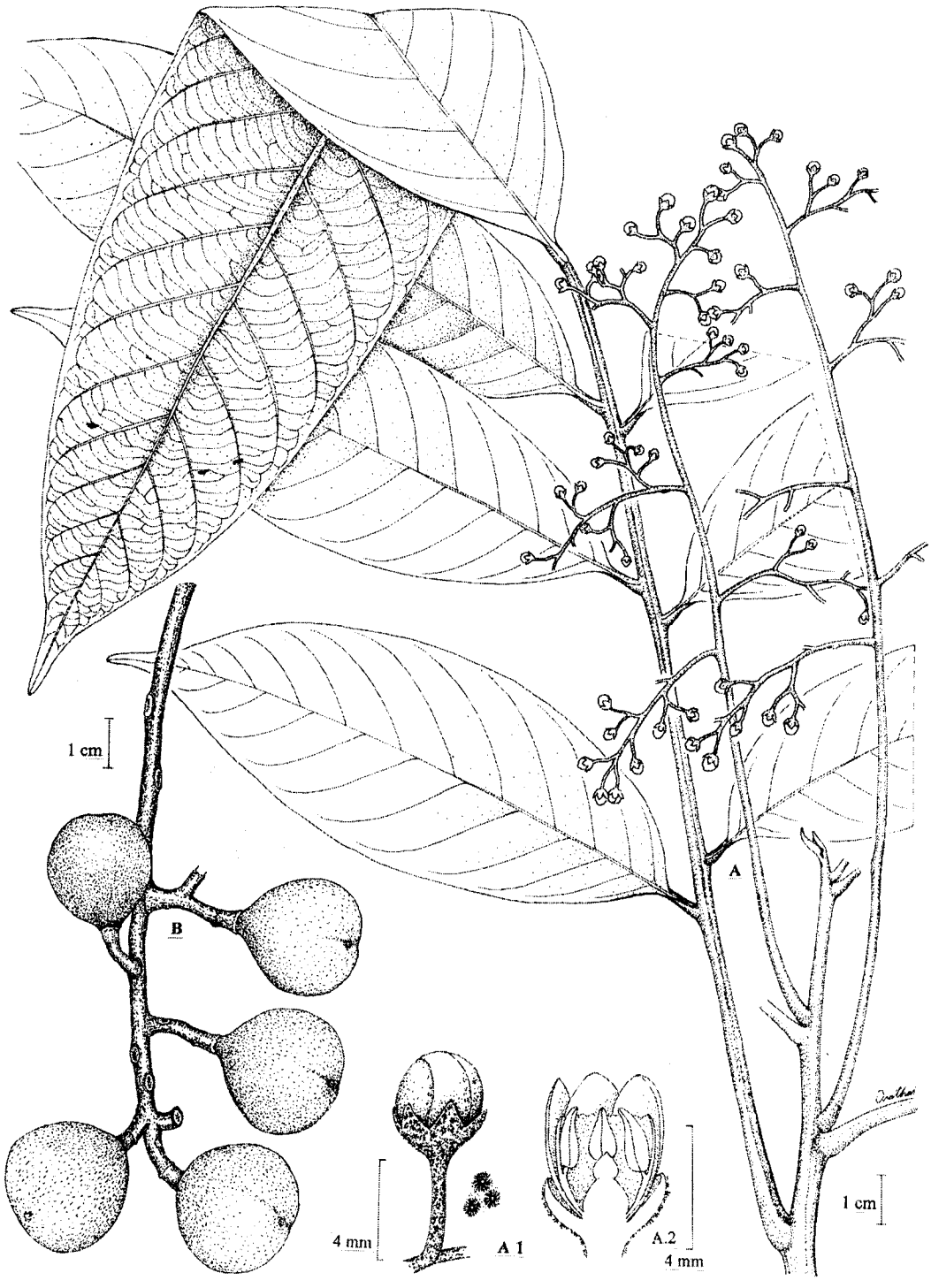

Fig. 5. *Aglaia chittagonga* Miq.: A. twig with inflorescences, A.1 flower & scales, A.2 longitudinal section of flower (enlarged) (F. Konta 4015); B. infructescence (T. Smitinand 4708).

2. Aglaia chittagonga Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 44. 1868; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 140. 1992;—*Amoora chittagonga* (Miq.) Hiern in Hook.f., Fl. Brit. India 1: 559. 1875.

Trees (7-)10-15 m high, (30-)45-120 cm girth. *Twigs* slightly 4-angled, densely reddish brown indumentum, then glabrescent. *Bark* grey or greenish brown scaly or smooth; inner bark yellowish brown; sapwood white or purplish brown; heartwood reddish brown. *Leaves* imparipinnate, 10-40 cm long, spirally arranged; leaflets 4-8 pairs, alternate to sub-opposite, top most usually reduced; the lower lateral leaflets alternate; oblong, oblong-lanceolate, or ovate-lanceolate; 9-27 by 4-7 cm, subcoriaceous to coriaceous, glabrous and glossy green upside, peltate scaly beneath; apex acute, acuminate to shortly caudate; base obtuse in outline, to broadly cuneate not cordate; margin entire, slightly undulate or fimbriate; midrib prominent beneath, flat upside, densely reddish brown indumentum and simple hairs then glabrescent upside; secondary nerves 14-17 pairs, depressed upside, slightly narrow ridge and more or less anastomosing, scalariform veins conspicuous beneath. *Petiole* 6-15 cm long, slightly longitudinal angular; petiolules 0.3-1 cm long, all with densely reddish brown indumentum, then glabrescent. *Inflorescence* a thyrse compound, axillary near end of twigs, 10-40 cm long; sub-inflorescences a thyrse-formed; peduncles 7-15 cm long, slender; pedicels 2-5 mm long; densely indumentum throughout; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* broadly campanulate, all ca. 2 mm long, lobes ca. 1/2 of all length, densely indumentum without, glabrous within. *Corolla* 5, free, slightly oblanceolate, 3-4 mm long, glabrous, greenish, whitish to yellowish. *Staminal tube* cupular, 2-3 mm long glabrous, margin undulate. *Stamens* 6, filaments raised up from staminal tube lower from the half of tube within, apical of anther slightly protrude the undulate marginal tube. *Ovary* broadly ovate ca. 1.5 by 1 mm, glabrous; 2 loculi, each locule with 1-2 ovules; style and stigma ovate, ca. 0.5 mm long, glabrous. *Infructescence* upper leaf-scars or axillary, up to 30 cm long, pendulous. *Drupes* globose or slightly obovoid, slightly 3-longitudinal lobed, bristle, 2-4 by 2-4 cm, usually retuse apex, simple hairy throughout, pinkish purple, fruiting-calyx fall off in mature stage; indehiscent. *Seed*, usually developed one, ca. 1 x 0.5 x 0.3 cm, enclosed with edible aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Phrae; NORTH-EASTERN: Phetchabun; SOUTH-WESTERN: Prachuap Khiri Khan; SOUTH-EASTEN: Chachoengsao, Chanthaburi; PENINSULAR: Ranong, Surat Thani, Krabi, Trang, Pattani, Yala, Narathiwat.

D i s t r i b u t i o n.—Bangladesh (type), Burma.

E c o l o g y.—From lowland nearby stream to hill evergreen forest, limestone bedrock; altitude 25-1,600 m (most commonly 200-1,000 m). Flowering February-December (most commonly March-July); fruiting February-December (most commonly May-September).

V e r n a c u l a r.—Khang khao nu (ค้างคาวหนู) (Southeastern); Ta suea (ตาเสือ) (Northeastern); Sang ka tong (สังกะโต้ง) (Southwestern); Tang kiad (ตังเกียด) (Peninsular).

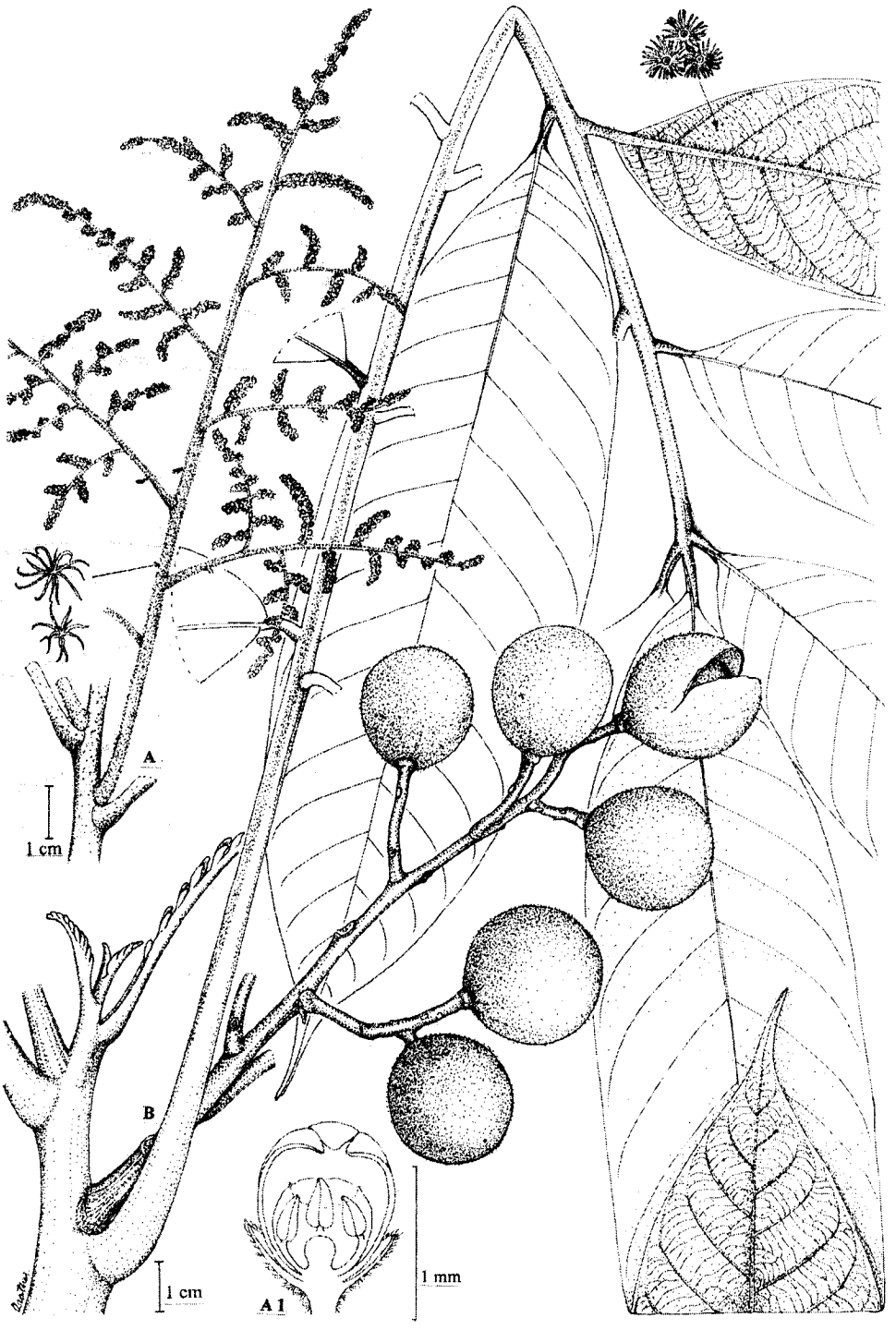

Fig. 6. *Aglaia crassinervia* Kurz ex Hiern: A. inflorescences, A.1 longitudinal section of flower (S. Thawon 418); B. twig with infructescence (A.F.G. Kerr 18622).

3. Aglaia crassinervia Kurz ex Hiern in Hook.f., Fl. Brit. India 1: 556. 1875; Pannell in Tree Fl. Malaya 4: 229. 1989; et in Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 213. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 267. 1995.—*A. cinerea* King, J. Asiat. Soc. Bengal 64(2): 66. 1895; Ridl., Fl. Malay Penins. 1: 404. 1922.—*Chisocheton sumatranus* Baker f., J. Bot. Lond. 62 Suppl.: 18. 1924.—*Aglaia pyricarpa* Baker f., op. cit.: 20. 1924.

Trees 5-15(-24) m high, 40-10-(200) cm girth; terminal buds sword-shaped 1-2 cm long, stellate indumentum. *Bark* grey, greyish brown, rough, lenticellate in vertical lines; inner bark reddish brown with white interval stripes, creamy yellow, with creamy exudates after cut. *Leaves* imparipinnate (7-)10-40 cm long, spirally arranged, lower lateral leaflets alternate; leaflets 4-12 pairs, oblong, oblanceolate or obovate 10-20 by 4-5.5 cm, subcoriaceous to chartaceous, glossy green and sparsely black dots upside, reddish brown stellate indumentum beneath; apex caudate, acuminate to acute sometime; base obtuse; margin entire, undulate and recurved; midrib prominent and densely stellate indumentum beneath, depressed upside; secondary nerves 8-17 pairs, arched and more or less anastomosing, scalariform veins subconspicuous beneath, all hairy indumentum. *Petiole* 2-6 cm long, stellate, then glabrescent, swollen near base; petiolules 0.5-1 cm long, wrinkle when dry, stellate then glabrescent. *Inflorescence* a thyrse compound, subinflorescences a spike-liked, 10-40 cm long, axillary, many branchlets, densely stellate indumentum all parts; pedicels ca. 1 mm long, scaly; bracts and bracteole narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobe ca. 1/2 all length, with scattered whitish hairs outside; glabrous inside. *Corolla* 5, free, obovate, 1.5-2 by 1 mm, glabrous yellowish, scented. *Staminal tube* ovaliform, ca. 1/2 of corolla, margin entire, glabrous, filaments raised up from the staminal tube lower from the half of tube inside. *Ovary* round and glabrous, ca. 1 by 1 mm; 1-2 locule, each locule with 1 ovule; style and stigma hardly distinct. *Infructescence* on upper leaf-scars or axillary, up to 30 cm long, pendulous or erected; peduncles 2-10 cm long, with dense stellate indumentum throughout. *Drupes* ovoid, 2-2.5 cm in diam., epicarp thin, hard with dense stellate indumentum. *Seeds* ellipsoid, indehiscent if not depressed from others, 1.5-2 by 1-1.5 cm enclosed with thin aril.

T h a i l a n d.—NORTHERN: Chiang Mai; SOUTH-EASTERN: Chanthaburi; PENINSULAR: Surat Thani, Phangnga, Krabi, Nakhon Si Thammarat, Phatthalung, Pattani, Yala.

D i s t r i b u t i o n.—Burma (type), Malaysia, Indonesia, Philippines.

E c o l o g y.—Tropical evergreen rain forest, on sandstone bedrock; altitude 50-800 m (most commonly 80-400 m). Flowering June-July; fruiting February-August (most commonly May-August).

V e r n a c u l a r.—Sang kried (สังเครียด), Sang ka tong (สังกะโต้ง) (Peninsular).

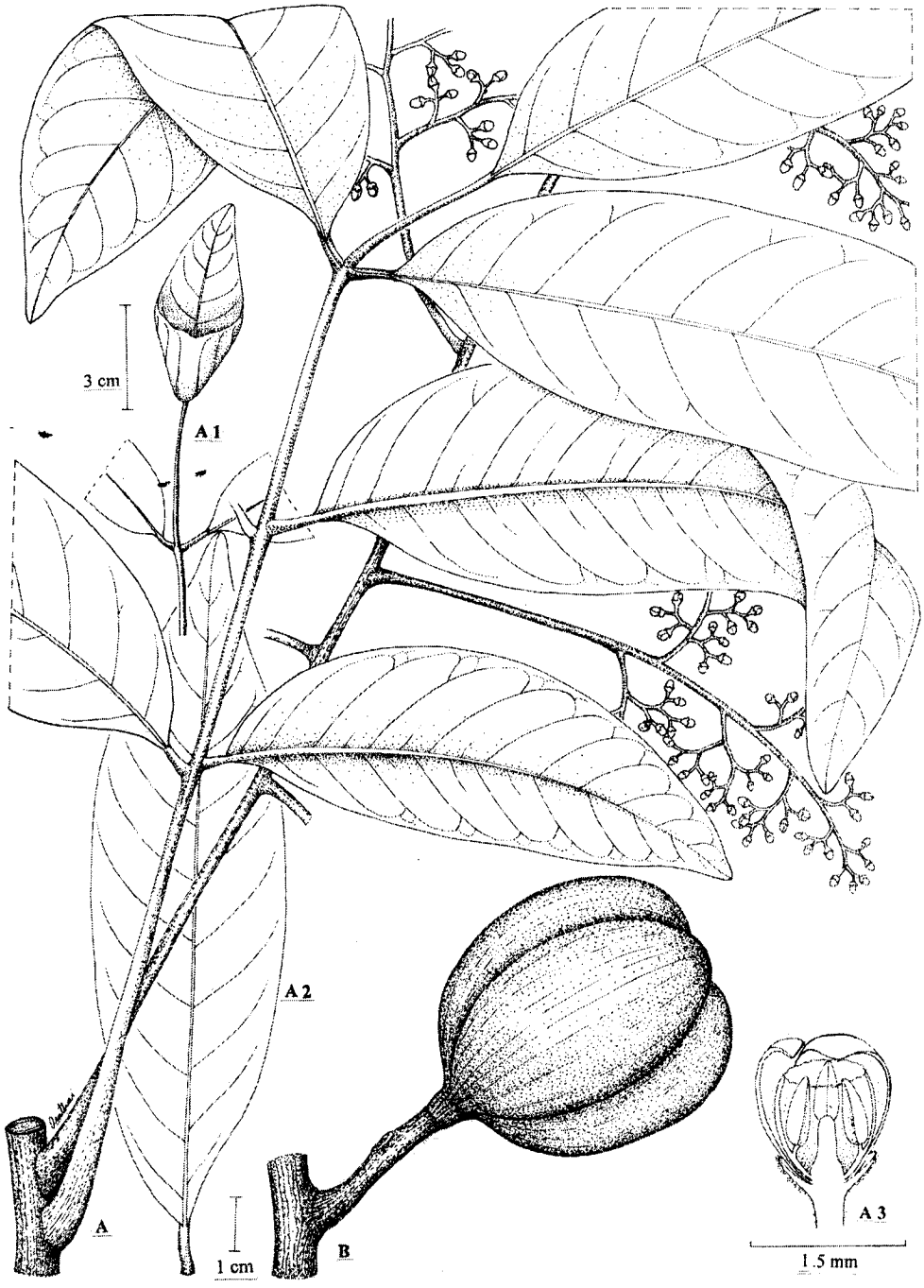

Fig. 7. *Aglaia cucullata* (Roxb.) Pellegr.: A. twig with inflorescences, A.1 pocket form of terminal leaflet, A.2 another form of leaflet, A.3 longitudinal section of flower(T. Santisuk 3479); B. infructescence (Pipat 363).

4. Aglaia cucullata (Roxb.) Pellegr. in Lecomte, Fl. Indo-Chine 1: 771. 1911; Pannell in Tree Fl. Malaya 4: 214. 1989 et in Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 58, f. 3. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 213. 1995.—*Amoora cucullata* Roxb., Pl. Coromandel 3: 54, t. 258. 1820; Hiern in Hook.f., Fl. Brit. India. 1: 560. 1875; Pierre, Fl. Forest Cochinch. Fasc. 22: t. 344. 1896; King, J. Asiat. Soc. Bengal 64(2): 55. 1895; Ridl., Fl. Malay Penins. 1: 399. 1922; Backer & Bakh.f., Fl. Java 2: 126. 1965.—*Aglaia tripetala* Merr., J. Straits Branch Roy. Asiat. Soc. 76: 88. 1917.

Trees 6-15(-30) m high, 50-70(-100) cm girth; terminal buds fringed, up to 2 cm long, densely reddish scales and glandular hairs. *Twigs* densely round indumentum. *Bark* grey; inner bark reddish; sapwood yellowish brown or pinkish. *Leaves* imparipinnate, 15-40 cm long; spirally arranged, glabrous; leaflets 2-5 pairs, oblong, ovate to obovate, usually curved to one side, 10-15 by 3-4.5 cm, opposite or slightly opposite, coriaceous, glossy green upside, pale beneath, the apical one usually reduced to a small size and folded at the base to form a pocket on the upper surface; apex acute, obtuse or emarginate; base strongly oblique (except the top most one); margin entire or slightly undulate: midrib prominent beneath, depressed upside; secondary nerves 6-18 pairs, more or less anastomosing; other veins not conspicuous. *Petiole* 5-11 cm long, slender and swollen near base, scaly then glabrescent; petiolules 0.3-1(-1.5) cm long, glabrous. *Inflorescence* a thyrse compound, subbranches thyrse-formed; axillary or supraaxillary, (10-)30-40 cm long, pale brown scaly, then glabrescent; peduncles 5-10 cm long; pedicels 1-2 mm long brownish, scaly then glabrescent; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 3, broadly campanulate, all ca. 1 mm long, lobes ca. 1/3 of all length, scaly outside, glabrous inside, ciliate. *Corolla* 3, free, slightly obovate, 1.5-2 mm long, glabrous, yellow or orange. *Staminal tube* slightly obconical, ca. 1 mm long, glabrous, margin slightly undulate. *Stamens* 6, the apical of anthers slightly protruding the marginal tube, filaments raised up lower the middle of tube inside. *Ovary* slightly tubular, up to 1 mm long, glabrous; 3-(4) loculi, each locule with 1 ovule; style and stigma indistinct. *Infructescence* upper leaf-scars or axillary, erected, 3-5 cm long, scaly then glabrescent. *Capsules* obovoid or globose, 4-5.5 by 4-5 cm, brown with strongly 2-3 longitudinal lobes. *Seeds* ellipsoid ca. 3.5 by 3 cm enclosed a part with yellowish aril.

T h a i l a n d.—CENTRAL: Bangkok; PENINSULAR: Ranong, Nakhon Si Thammarat, Trang.

D i s t r i b u t i o n.—Bangladesh, India (type), Vietnam, Malaysia, Singapore, Indonesia, Philippines.

E c o l o g y.—In back mangrove or mangrove forest to lowland evergreen forest; altitude 0-50 m. Flowering February-December (most commonly November-December); fruiting February-April.

V e r n a c u l a r.— Nieng nok hook (เหนียงนกฮูก) (Peninsular).

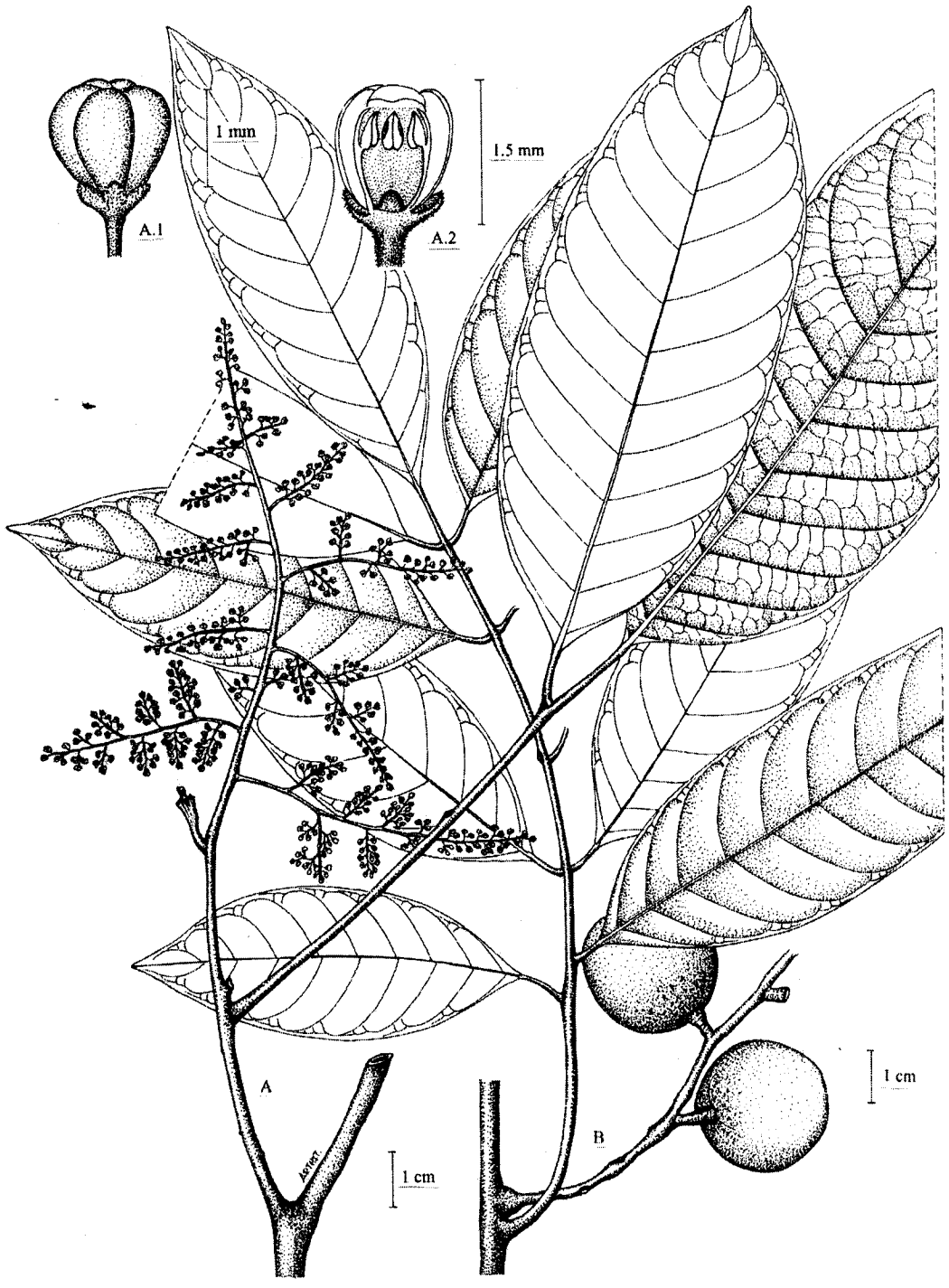

Fig. 8. *Aglaia edulis* (Roxb.) Wall.: A. inflorescences, A.1 flower, A.2 longitudinal section of male flower (S. Phusomsaeng 178); B. twig with infructescence (S. Phusomsaeng 229).

5. Aglaia edulis (Roxb.) Wall., Calc. Gard. Rep.: 26. 1840; Hiern in Hook.f., Fl. Brit. India 1: 556. 1875; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 229. 1992; Mabb. & Pannell Fl. Males. ser. I, 12(1): 272. 1995.—*Milnea edulis* Roxb., Hort. Bengal: 18. 1814, nom. nud. et Fl. Ind., ed Carey & Wall., 2: 430. 1824.—*Nyalelia racemosa* Dennst., in Schlüssel, Hort. Malab.: 14, 23, 30. 1818; Hiern in Hook.f., Fl. Brit. India 1: 554. 1875.—*Aglaia sulingi* Blume, Bijdr. Fl. Ned. Ind.: 170. 1825; Backer & Bakh.f., Fl. Java 2: 128. 1965.—*A. latifolia* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 42. 1868; Backer & Bakh.f., Fl. Java 2: 129. 1965.—*A. khasianus* Hiern in Hook.f., Fl. Brit. India 1: 554. 1875.—*A. pirifera* Hance, J. Bot. 6: 331. 1877.—*Milnea cambodiana* Pierre, Fl. Forest Cochinch. Fasc. 21: t. 334. 1895.—*Aglaia acida* Koord. & Valeton in Meded. Lands Plantentuin 16: 143. 1896; Backer & Bakh.f., Fl. Java 2: 128. 1965.

Trees (2-)5-20(-25) m high, (20-)60-100(-120) cm girth. *Bark* grey to greyish brown; inner bark reddish; sapwood white; heartwood brown to reddish brown. *Leaves* imparipinnate, 10-25 cm long, spirally arranged; leaflets 2-6 pairs, elliptic-oblong, obovate-oblong, 6-23 by 3-7.5 cm, opposite or slightly opposite; coriaceous to subcoriaceous, glossy green upside, sparsely hairy indumentum then glabrescent on both sides, pale beneath; apex acute; base obtuse with slightly cuneate and oblique; margin entire; midrib prominent and densely indumentum beneath, depressed and glabrescent upside; secondary nerves 5-16(-20) pairs, arched and anastomosing near margin, scalariform veins conspicuous beneath. *Petiole* rather slender, 3-10 cm long, minutely swollen near base; petiolules 0.5-1.5 cm long, all with indumentum throughout, then glabrescent. *Inflorescence* a thryse compound, subbranches a spike-liked; axillary or supraaxillary, 12-20 cm long, many branchlets; peduncles 4-10 cm long, pedicels ca. 0.5 mm long, densely hairy, then glabrescent; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 1/2 of all length, stellate tomentose outside, glabrous inside, ciliate. *Corolla* 5, free, slightly obovate ca. 1.5 mm long, glabrous, yellow to reddish brown. *Staminal tube* slightly tubular, ca. 1 mm long, glabrous, margin smooth or minutely undulate. *Stamens* 5, as same level of marginal tube, filaments raised up higher than the upper half of tube inside. *Ovary* not conspicuous gynophore, obcupuliform, ca. 0.2 mm long, glabrous or sparsely glandular hairs; 3-(5) loculi, each locule with 1 ovule; style and stigma indistinct. *Infructescence* upper leaf scars or axillary, 4-15 cm long, erected or slightly recurved, indumentum and stellate hairs throughout. *Capsules* globose, 2-3 cm in diam; distinct 2 valves, greenish brown, brownish or yellowish, densely indumentum and hairy, indehiscent. *Seeds* 2, 1 seed per a valve, 1.5-2 cm long, 1-2 cm wide and 0.5-1 cm thick enclosed with white or brownish aril, edible.

T h a i l a n d.—NORTH-EASTERN: Sakon Nakhon; SOUTH-WESTERN: Kanchanaburi; EASTERN: Nakhon Ratchasima; CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Prachin Buri, Chon Buri, Chanthaburi, Trat; PENINSULAR: Ranong, Surat Thani, Krabi, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Songkhla, Yala.

D i s t r i b u t i o n.—India (type), Bhutan, China, Burma, Vietnam, Cambodia, Malaysia, Indonesia, Philippines, Samoa.

E c o l o g y.—In evergreen or mixed deciduous forest, nearby stream, on granite or limestone bedrock; altitude 30-480 (most commonly 50-400 m). Flowering February-October (commonly April-September); fruiting January-December (commonly April-June).

V e r n a c u l a r.—Khee phueng (ขี้ผึ้ง) (Eastern); Sang kried sai (สังเครียดสาย), Sang kried ai kong (สังเครียดอ้ายก้อง), Khang khao (ค้างคาว) (Peninsular).

U s e s.—Aril edible.

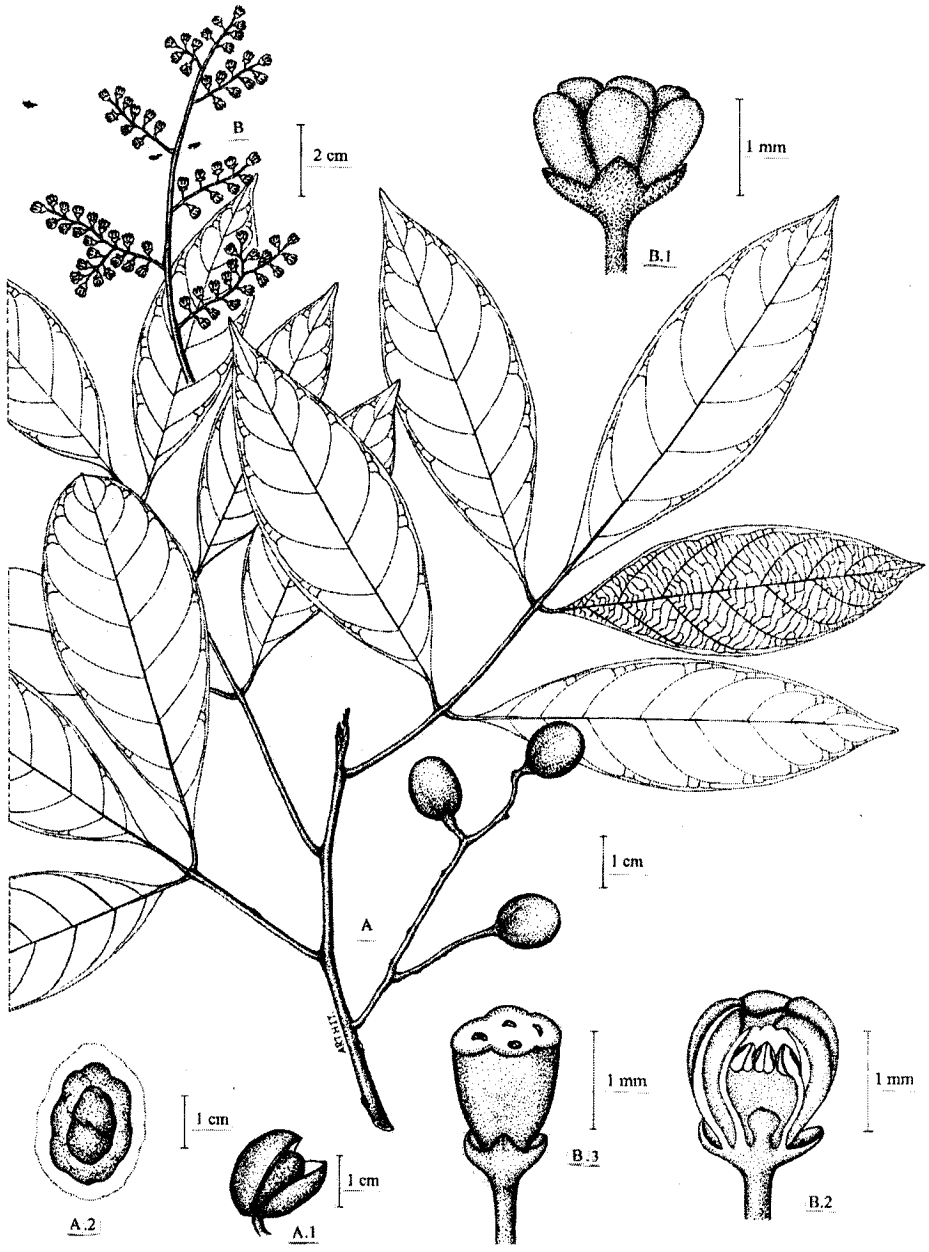

Fig. 9. *Aglaia elaeagnoidea* (A. Juss.) Benth.: A. twig with infructescence, A.1 drupe, A.2 seed (C. Niyomdham 296); B. inflorescences, B.1 flower (d), B.2 longitudinal section of flower, B.3 cross section of female ovary (D.J. Middleton 191).

6. Aglaia elaeagnoidea (A. Juss.) Benth., Fl. Austral. 1: 383. 1863; Backer & Bakh.f., Fl. Java 2: 128. 1965; Mabb. in Fl. Nouv.-Caléd. et Dép. 15: 75. 1988; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 140. 1992: Mabb. & Pannell, Fl. Males. ser. I, 12(1): 243. 1995.—*Nemedra elaeagnoidea* A. Juss., Bull. Sci. Nat. Géol. 23: 239. 1830.—*Aglaia odoratissima* sensu Benth. in Hook., London J. Bot. 2: 213. 1843.—*A. roxburghiana* (Wight & Arn.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 41. 1868; Hiern in Hook.f., Fl. Brit. India 1: 555. 1875; Kurz, J. Asiat. Soc. Bengal 44(2): 147. 1875.—*Milnia roxburghiana* Wight & Arn., Prodr.: 119. 1834.

Small to medium-sized trees (2-)5-15(-25) m high, (20-)50-60(-120) cm girth. *Twigs* densely indumentum with stellate hairs then glabrescent, sparsely lenticels. *Bark* dark brown or grey and rusty brown patches; inner bark pink. Sapwood white to creamy; heartwood dark brown. *Leaves* imparipinnate, 5-15 cm long, spirally arranged, leaflets (1-)2-3 pairs, elliptic, elliptic-oblong rarely ovate-oblong or obovate-lanceolate, 5-10 by 2.5-3.5 cm; opposite or slightly opposite, chartaceous to subcoriaceous, glossy green upside, pale beneath, glabrous on both sides, except sparsely indumentum along midrib beneath; apex acuminate to slightly caudate, rarely obtuse; base acute to cuneate, obtuse sometime; margin entire; midrib flatten or slightly depressed upside, prominent with sparsely indumentum with hairs on lower surface; secondary nerves 5-8 pairs, arched and anastomosing with conspicuous beneath and depressed upside, other veins hardly distinct. *Petiole* 2-7 cm long, slender, glabrescent except near base, minutely swollen and indumentum near base. *Inflorescence* a thyrse compound, subbranches spike-liked; axillary or supraaxillary, 5-15 cm long, many branchlets, densely reddish brown indumentum; peduncles 1-3 cm long, pedicels ca. 1 mm long, all hairy, then glabrescent; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 2/3 of all length, densely hairy indumentum outside, glabrous inside, ciliate. *Corolla* 5, free, slightly obovate, ca. 1.5 mm long, glabrous, yellowish or white, fragrant; staminal tube slightly urceolate; base as a bottom of glass, without androgynophore; all ca. 1 mm long, glabrous, margin undulate. *Stamens* 5, glabrous apical of anthers not protrude the marginal tube; filaments raised up on the upper half of tube inside. *Ovary* with conspicuous gynophores, oval shape, ca. 0.3 mm in diam., glabrous; 3 loculi, each locule with 1 ovule, usually developed one; style and stigma indistinct. *Infructescence* upper leaf-scars or on twigs, 5-15 cm long erected, densely indumentum throughout. *Capsules* ovoid or ellipsoid, dark brown indumentum with short tomentose hairs; 1-4 by 1-3 cm, indehiscent but brittle when dry. *Seeds* elliptical 0.5-3 by 0.5-2 cm undulate skin, enclosed with sweet aril, edible.

T h a i l a n d.—NORTH-EASTERN: Loei, Nakhon Phanom, EASTERN: Nakhon Ratchasima, Ubon Ratchathani; SOUTH-WESTERN: Kanchanaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Prachin Buri, Chon Buri, Trat; PENINSULAR: Ranong, Nakhon Si Thammarat, Trang, Satun, Yala.

D i s t r i b u t i o n.—India, Sri Lanka, Taiwan, Vietnam, Cambodia, Malaysia, Indonesia, Philippines, Australia (type).

E c o l o g y.—In evergreen forest, nearby stream, on limestone or granite bedrock; altitude 30-800 m (most commonly 50-400 m). Flowering January-November (commonly September-November); fruiting December-July (commonly March-July).

V e r n a c u l a r.—Daeng khao (แดงขาว), Kraduuk khied (กระดูกเขียด) Ta maew (ตาแมว) (Southeastern); Sang kried dam (สังเครียดดำ) (Peninsular); Nam phueng (น้ำผึ้ง), Chang kru (จังครู) (Eastern).

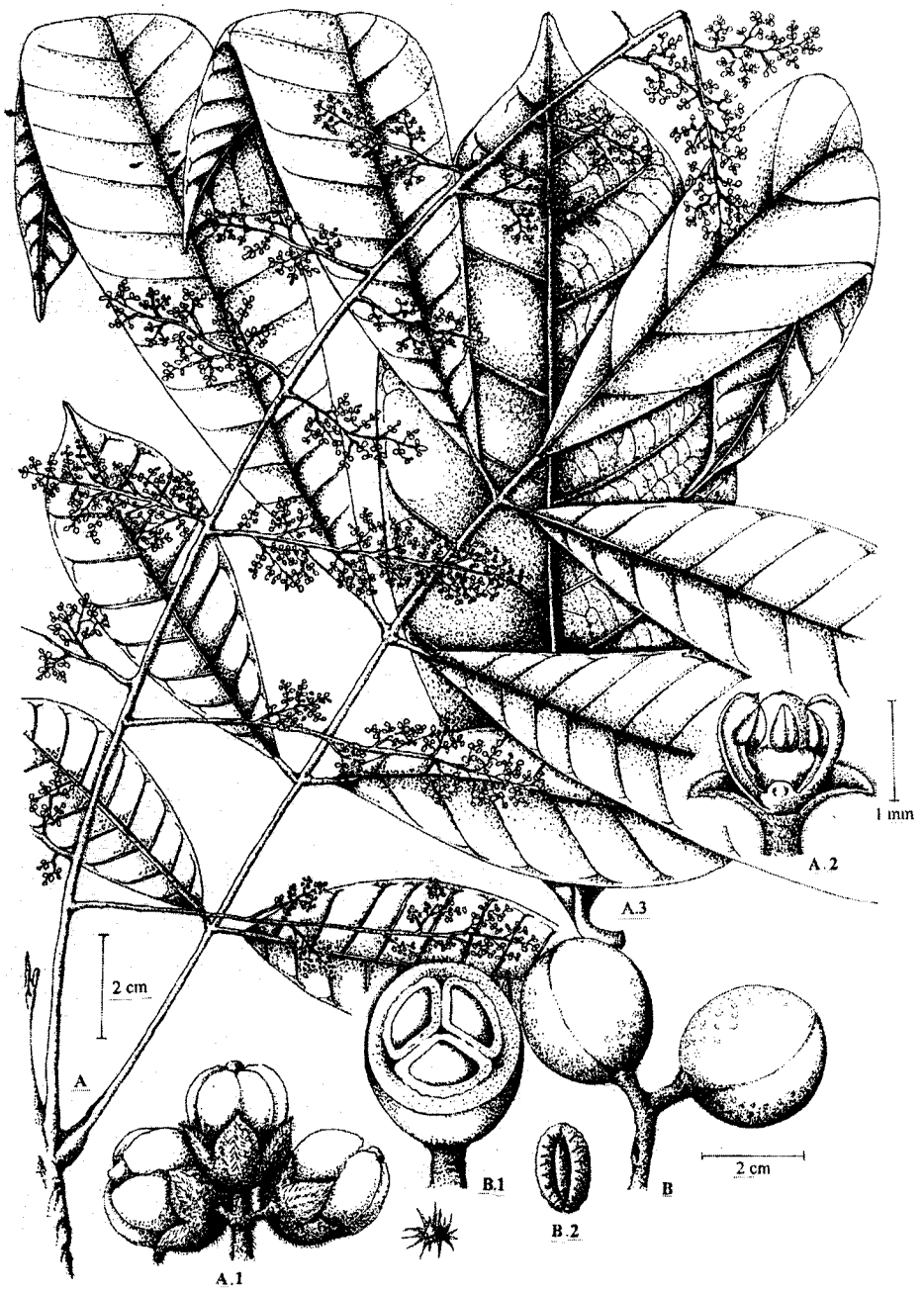

Fig. 10. *Aglaia elliptica* Blume: A. twig with inflorescences, A.1 male flowers, A.2 longitudinal section of male flower, A.3 another form of leaflet (A.F.G. Kerr 7809); B. part of infructescence, B.1 cross section of drupe, B.2 seed (C. Niyomdham 304).

7. Aglaia elliptica Blume, Bijdr. Fl. Ned. Ind.: 171. 1825; Backer & Bakh.f., Fl. Java 2: 126. 1965; Pannell in Tree Fl. Malaya 4: 214. 1989, et Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 275. 1992; Mabb. & Pannell, Fl. Males. ser I, 12(1): 288. 1995.—*A. ovata* Teijsm. & Binn., Natuurk. Tijdschr. Ned. Indië 27: 43. 1864.—*A. apoana* Merr. in Philipp. Govt. Lab. Bur. Bull. 35: 30. 1906.—*A. pauciflora* Merr. in Philipp. Govt. Lab. Bur. Bull. 35: 31. 1906.—*A. lagunensis* Merr. in Philipp. J. Sci. Bot. 9: 537.1915.—*A. marginata* Craib, Bull. Misc. inform. Kew: 343. 1926.

Trees (3)5-20(-25) m high, 70-120 cm girth. *Twigs* densely reddish brown indumentum and stellate hairs then glabreseent, yellow lenticels. *Bark* grey, reddish brown, finely cracked; inner bark red or white. *Leaves* imparipinnate, 10-25 cm long, spirally arranged; leaflets 3-7 pairs, oblanceolate, obovate-oblong or elliptic, 7-19 by 2.5-7 cm, opposite or slightly opposite, chartaceous to subcoriaceous, glossy green and sparsely indumentum then glabrous upside, pale beneath; apex acuminate, shortly caudate to acute; base slightly cuneate; margin entire; midrib finely prominent beneath, depressed upside; secondary nerves 7-15 pairs, arched and anastomosing near margin, distinct beneath, hardly conspicuous upside; other veins hardly distinct or slightly beneath. *Petiole* 4-10 cm long, swollen near base, densely tomentose stellate hairs, then glabrescent. *Inflorescence* a thyrse compound, subbranches in thyrse-formed; axillary or supraaxillary, 20-40 cm long, many branchlets; peduncles 4-7 cm long, pedicels ca. 1 mm long, stellate hairs, glabrescent; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all. ca. 1 mm long, lobes ca. 1/2 of all length, stellate tomentose outside, glabrous inside, ciliate. *Corolla* 5, free, slightly obovate, ca. 1 mm long, glabrous, yellowish to yellow, scented. *Staminal tube* obconical or cupuliform, ca. 0.5 mm long, glabrous, margin slightly undulate. *Stamens* 5, anthers on the marginal tube, all ca. 1 mm long. *Ovary* not conspicuous gynophores, obcupuliform, ca. 0.2 mm long, glabrous; 3-(5) loculi, each locule with 1 ovule; style and stigma indistinct. *Infructescence* upper leaf scars or axillary, slightly recurved, 10-20 cm long, stellate tomentose hairs then glabrescent. *Capsules* globose to slightly obovoid, ca. 3 cm in diam., with thick brown indumentum; yellowish brown; slightly 3-longitudinal lobes, indehiscent. *Seeds*, usually 3, ellipsoid; 1.7-2 cm long, 0.7-1 cm wide and 1 cm thick, enclosed with orangish brown aril.

T h a i l a n d.—NORTHERN: Nan; SOUTH-WESTERN: Kanchanaburi; PENENSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Krabi, Nakhon Si Thammarat, Trang.

D i s t r i b u t i o n.—Burma, Malaysia, Indonesia (type), Philippines.

E c o l o g y.—In tropical evergreen forest to dry evergreen forest, nearby stream, on limestone or granite or sandstone bedrock; altitude 30-1,400 m (commonly 50-800 m). Flowering February-November (commonly April-July); fruiting January-December (commonly March-July).

V e r n a c u l a r.—Sang kried (สังเครียด), Sang khong (สังโค้ง), Sang kried cho (สังเครียดช่อ) (Peninsular).

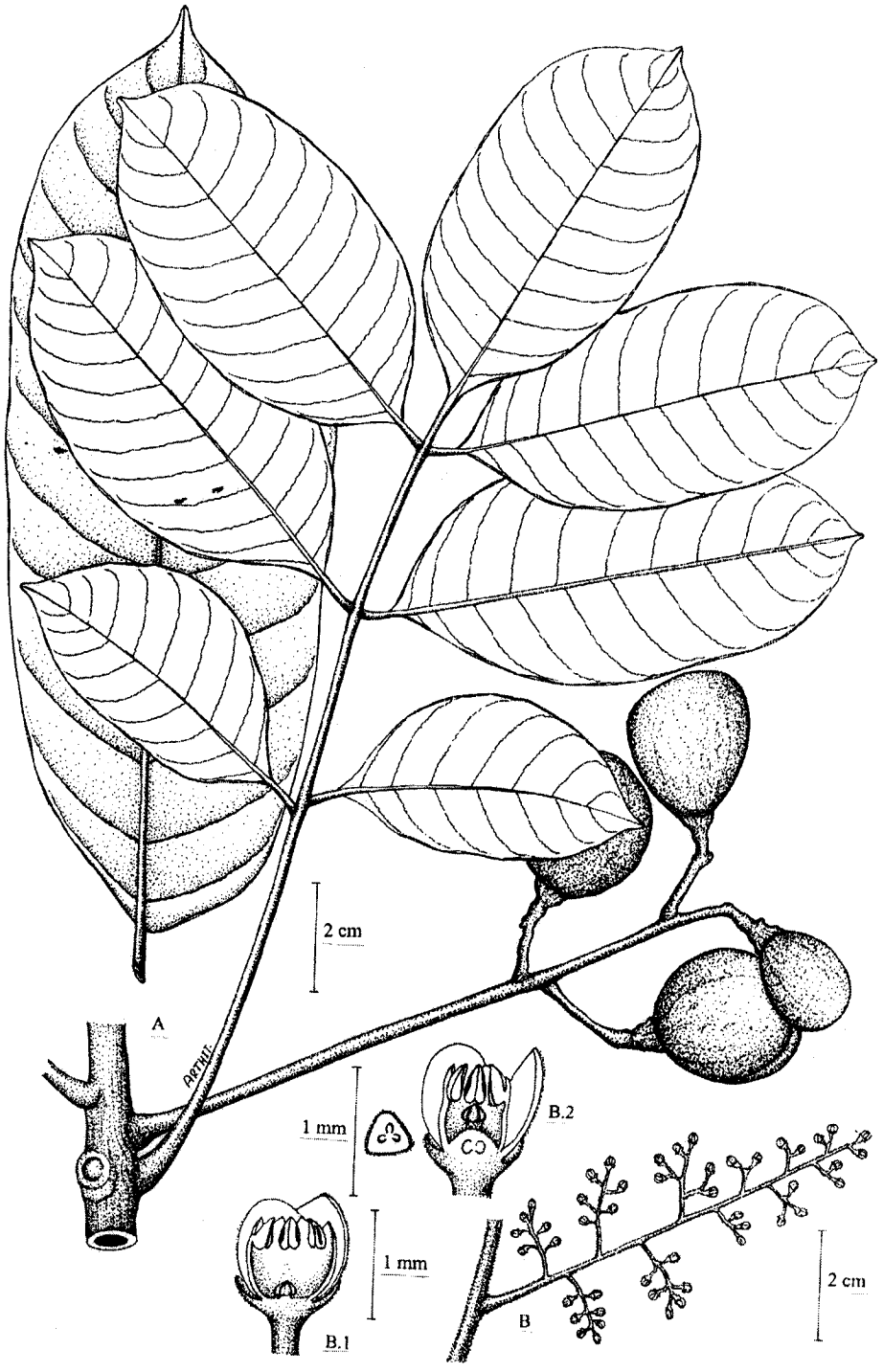

Fig. 11. *Aglaia erythrosperma* Pannell: A. twig with infructescence (C.F. van Beusekom & C. Phengklai 1014); B. part of inflorescence, B.1 & B.2 longitudinal section of male and female flower (A. Kostermans 6670).

8. Aglaia erythrosperma Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 76. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 219. 1995.

Trees 10-25 m high, 100-140 cm girth; terminal buds lanceolate, oblong ca. 1.5 cm long, 4 longitudinal angles, reddish brown indumentum and simple white hairs; lateral buds lanceolate, ca. 4 mm long, reddish brown indumentum. *Twigs* densely greyish brown to reddish brown indumentum. *Bark* smooth, greyish brown, pinkish brown, with reddish brown and grey patches, lenticellate and longitudinal cracked; inner bark dark orange with white stripes; sapwood pink or pinkish brown. *Leaves* imparipinnate, 19-35 cm long, spirally arranged; leaflets 3-4 pairs, elliptic, elliptic-oblong to oblong, 8-20 by 4-7.5 cm, opposite or slightly opposite, coriaceous, glossy green upside, glabrous or sparsely indumentum beneath; the apical one oblong and never reduce; apex acute, obtuse or acuminate; base obtuse to slightly oblique; margin entire, recurved, some slightly serrate; midrib prominent beneath, flat to subdepressed upside; secondary nerves 7-15 pairs, rather undulate and narrow ridge sometime; other veins hardly distinct. *Petiole* 9-16 cm long, flat and swollen near base, petiolules ca. 1 cm long, all glabrous or glabrescent. *Inflorescence* a thyrse compound, subbranches in thyrse-formed; axillary or supraaxillary, up to 20 cm long, many branches, pedicels 1-2 mm long; all covered with stellate scales; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 3, broadly campanulate, all ca. 1 mm long lobes, ca. 2/3 of all length, densely stellate scales outside, glabrous inside. *Corolla* 3, free, slightly obovate, ca.1 mm long, few to densely stellate scales outside and glabrous inside, yellowish. *Staminal tube* slightly tubular up to 1 mm long, glabrous, margin smooth or slightly undulate. *Stamens* 6(-8), the apical of anthers minutely protruding the marginal tube, filaments raised up higher the middle of tube inside. *Ovary* slightly curved up from base of tube, hairy; 3-5 loculi, each locule with 1 ovule, 1 or 2 developed; style tubular, very short, glabrous; stigma dilate with 3-4 lobes. *Infructescence* upper leaf scars or axillary, erected to slightly recurved, 10-25 cm long, greyish brown scaly indumentum then glabrescent. *Capsules* globose or obovate, 2.5-4(-10) by 2-3(-10) cm, densely reddish brown indumentum, bright orange or red, slight distinct 3 longitudinal lobes, dehiscing into 3 parts, each with 1 seed. *Seeds* up to 5 by 3.5 and 2 cm thick, completely enclosed with bright red or orange red aril.

T h a i l a n d.—PENINSULAR: Chumphon, Ranong, Nakhon Si Thammarat, Songkhla.

D i s t r i b u t i o n.—Malaysia (type), Indonesia.

E c o l o g y.—In tropical evergreen forest or in mixed deciduous forest, along ridges, on granite or sandstone bedrock; altitude 20-1,000 m (commonly 200-500 m). Flowering February-March; fruiting March-May.

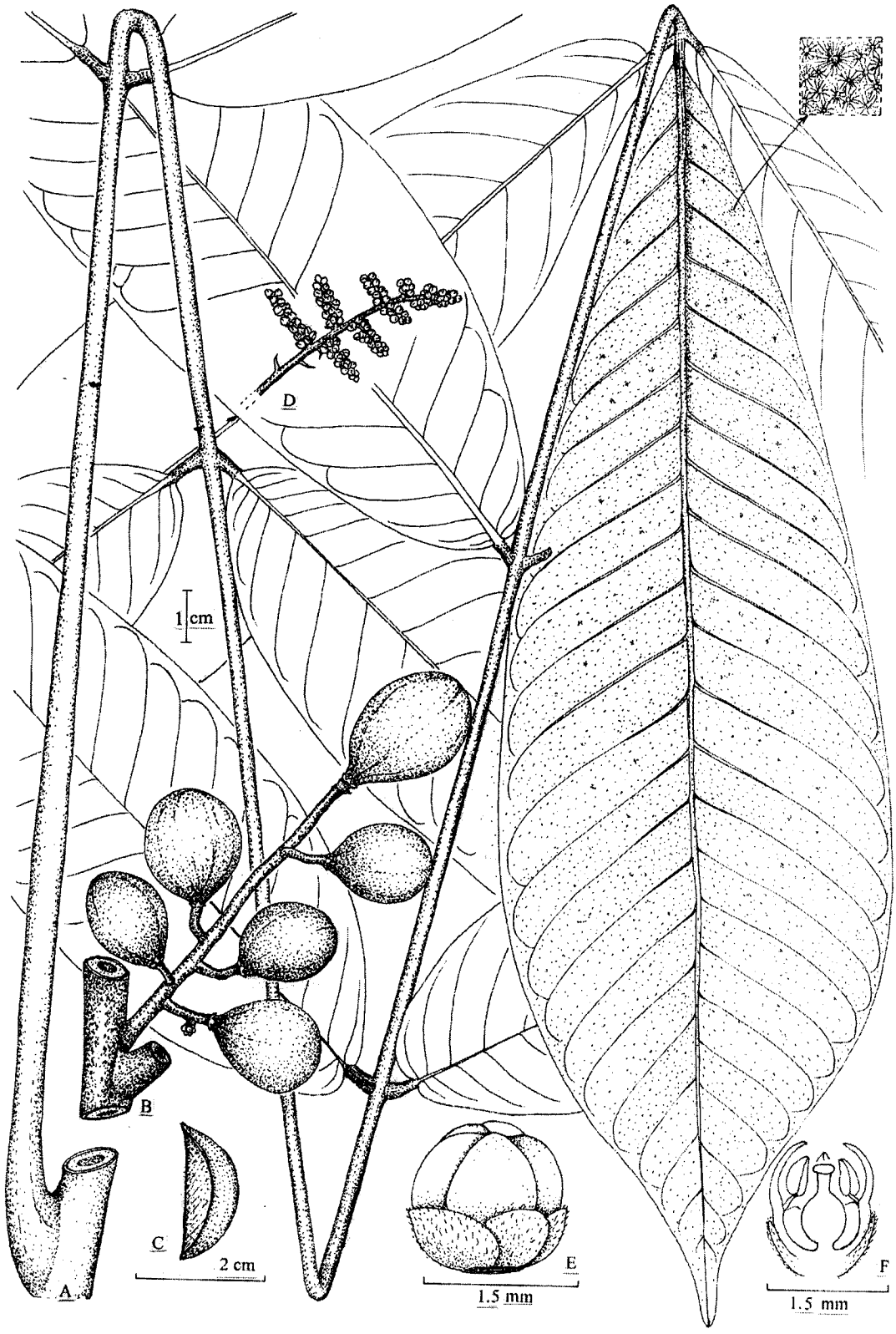

Fig. 12. *Aglaia eximia* Miq.: A. twig (B. Hansen et al. 11980); B. infructescence; C. seed (D.J. Middleton et al. 466); D. part of inflorescence; E. flower; F. longitudinal section of flower (J.F. Maxwell 86-730).

9. Aglaia eximia Miq., Fl. Ind. Bat. Suppl. 1: 197, 506. 1861; Pannell in Tree Fl. Malaya 4: 215. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 121. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 236. 1995.—*Aglaia argentea* Blume var. *eximina* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 55. 1868; King, J. Asiat. Soc. Bengal 64(2): 70. 1895; Ridl., Fl. Malay Penins. 1: 405. 1922.—*Aglaia argentea* Blume var. *hypoleuca* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 55. 1868.—*Aglaia argentea* Blume var. *curtisii* King, J. Asiat. Soc. Bengal 64(2): 71. 1895.

Trees (3-)5-20(-25) m high; (20-)60-100 cm girth. *Bark* dark brown, lenticellate, furrowed; inner bark red, orange to brownish, sap red. *Leaves* imparipinnate. 50-100 cm long. spirally arranged; leaflets 3-12 pairs, oblong, oblanceolate or lanceolate-oblong; 10-30 by 5-8.5 cm, opposite or slightly opposite, chartaceous, silvery and sparsely simple, stellate hairs indumentum beneath, glabrous and glossy green upside; apex acuminate or acute; base obtuse, oblique, cordate to ear-shaped; margin entire or slightly undulate; midrib prominent beneath, depressed and sparsely simple and stellate hairs beneath; secondary nerves 15-30 pairs, sharp ridge beneath, depressed upside, arched and anastomosing near margin; other veins hardly distinct. *Petiole* 20-60 cm long, slender and swollen near base; petiolules 0.5-1 cm long, wrinkle when dry; all with brown indumentum and sparsely simple and stellate hairs. *Inflorescence* a thyrse compound, subbranches as spike-liked; axillary or supraaxillary, 15-30 cm long, many branches; bracts and bracteoles narrowly triangular, ca. 2 by 0.5 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1.5 mm long, lobes ca. 3/4 of all length or free, indumentum outside, glabrous inside, ciliate. *Corolla* 5, free, ovate, ca. 2 mm long, glabrous, yellowish, slightly ciliate. *Staminal tube* cupuliform ca. 1 mm long, glabrous, margin entire, or slightly undulate. *Stamens* 5, filaments raised up over the tube. *Ovary* on gynophores, ovate, ca. 0.5 mm long, glabrous; 3 loculi, each locule with 1-(2) ovule; style ca. 0.2 mm long, stigma dilate, round and flat top, all glabrous. *Infructescence* upper leaf scars or axillary; erected, up to 10 cm long, coppery brown indumentum. *Capsules* ellipsoid or obovoid, 2.5-3 by 1.5-2 cm; slightly with 3 longitudinal lobes; yellow and densely with coppery indumentum, indehiscent without press. *Seeds* usually 3, 1.5-1.7 long, ca. 1 mm broad and 5-7 mm thick.

T h a i l a n d.—SOUTH-WESTERN: Kanchanaburi, Prachuap Khiri Khan; PENINSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Krabi, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Songkhla.

D i s t r i b u t i o n.—Vietnam, Malaysia, Indonesia (type), Philippines.

E c o l o g y.—Common nearby streams in evergreen forest, on limestone or granite bedrock, also distribute in mixed deciduous forest; altitude 30-900 m (commonly 100-250 m). Flowering March-October (most commonly July-October); fruiting January-December (commonly July-November).

V e r n a c u l a r.—Sang krod (สังกรด), Sang kried (สังเครียด), Sang kried ko (สังเครียดโก), Lang sad hin (ลางสาดหิน) (Peninsular).

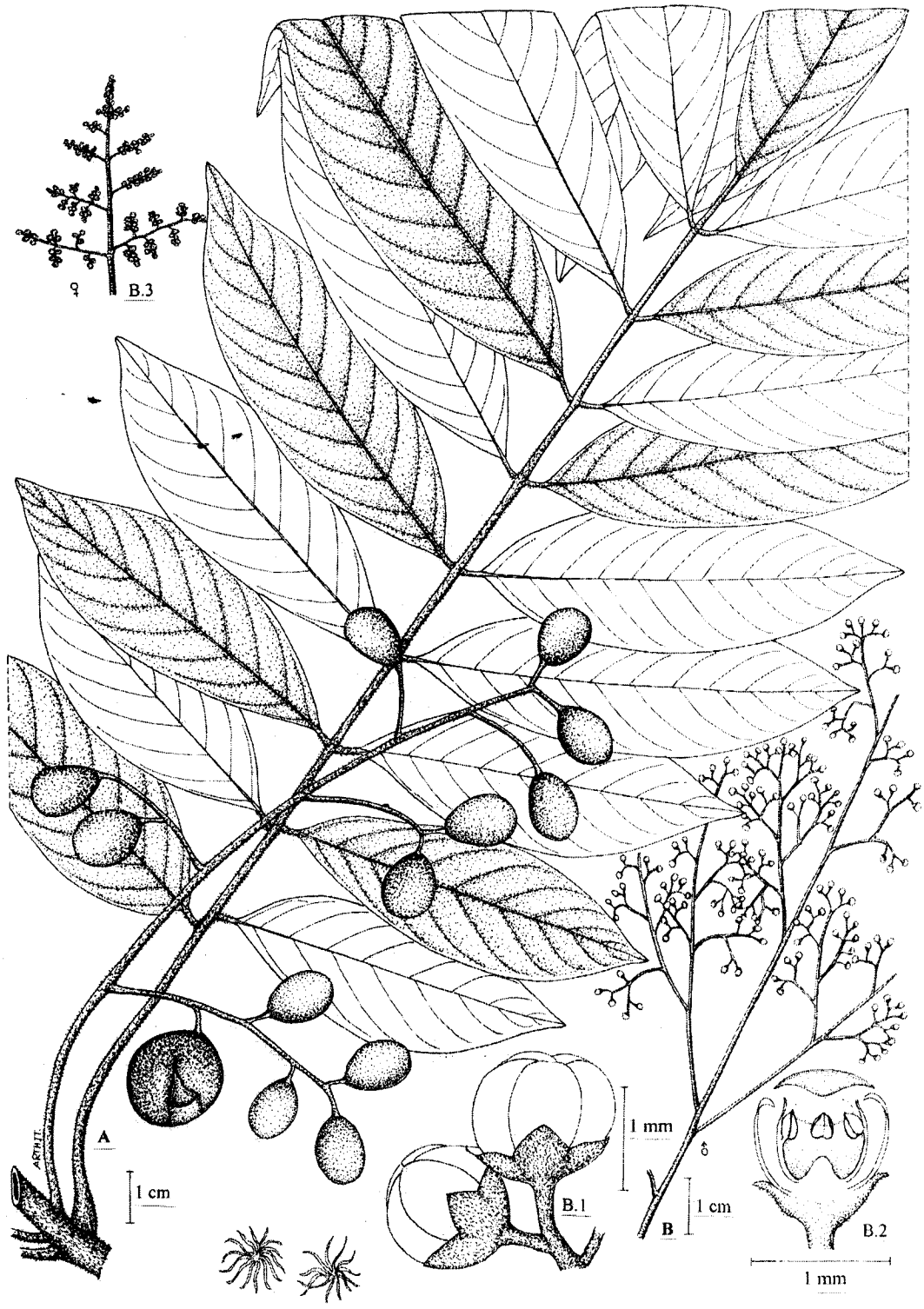

Fig. 13. *Aglaia exstipulata* (Griff.) Theob.: A. twig with infructescence (C. Niyomdham 297); B. part of male inflorescence, B.1 flowers, B.2 longitudinal section of male flower (A.F.G. Kerr 10288), B.3 part of female flower (J.F. Maxwell 86-753).

10. Aglaia exstipulata (Griff.) Theob. in Mason, Burma, ed. 3(2): 583. 1883; Balak., J. Bombay Nat. Hist. Soc. 67: 57. 1970; Pannell in Tree Fl. Malaya 4: 215. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 320. 1992; Mabb & Pannell, Fl. Males. ser. I, 12(1): 303. 1995.—*Euphoria exstipulata* Griff., Notul Pl. As. 4: 547. 1854; Ridl., Fl. Malay Penins. 1: 409. 1922.—*Aglaia longifolia* Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 27: 2. 1864.—*A minutiflora* Bedd. var. *griffithii* Hiern in Hook.f., Fl. Brit. India 1: 557. 1875.—*A. griffithii* (Hiern) Kurz, J. Asiat. Soc. Bengal 44(2): 146. 1875.

Trees (3-)10-20(-27) m high, (30-)70-150(-180) cm girth. *Twigs* dark brown. *Bark* flaky patches, dark brown, grey to creamy brown, vertical reddish brown lenticellate or smooth; inner bark creamy; white or yellow latex. *Leaves* imparipinnate (5-) 30-90 cm long, spirally arranged; leaflets (3-)5-12(-21) pairs, elliptic-oblong, oblong-lanceolate or ovate-oblong, 7-15 by 2.5-3.5(-4) cm, opposite or slightly opposite, chartaceous to subcoriaceous, puberulous to glabrous upside, densely reddish brown with simple hairs beneath; apex acuminate, caudate to acute; base slightly oblique; margin entire, undulate and recurved (young leaflets usually serrulate); midrib and secondary nerves prominent and densely simple reddish brown and depressed hairs on both sides; secondary nerves 10-15 pairs, arched but not anastomosing; other veins hardly distinct. *Petiole* 3-7.5 cm long, slender and swollen near base; petiolules 0.5-1.5 cm long, all densely hairs. *Inflorescence* a thyrse compound, subbranches thyrse-formed; axillary or supraaxillary, 15-30 cm long, many branches; peduncles 5-10 cm long, pedicels ca. 2 mm long, all hairy; bracts and bracteoles narrowly triangular ca. 2 by 0.5 mm caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 1/2 of all length, hairy outside, glabrous inside. *Corolla* 5, free, ovate, ca. 1 mm long, glabrous, white, yellowish to reddish, fragrant. *Staminal tube* cupuliform, ca. 1 mm, long, glabrous, margin slightly 5-lobed. *Stamens* 5, as long as the tube, filaments raised up more or less at the middle of tube inside. *Ovary* a half ovate, less than 0.5 mm long; 3 loculi, each locule with 1 ovule, always developed one, style and stigma indistinct. *Infructescence* upper leaf-scars or axillary, erected or slightly pendulous, 15-20 cm long, densely tomentose and indumentum all. *Capsule* ovoid or ellipsoid 1.5-2 by 1-1.7 cm densely orange brown, scaly indumentun and hairy, indehiscent without pressing. *Seeds* ellipsoid or round, enclosed with white aril, edible.

T h a i l a n d.—SOUTH-WESTERN: Phetchaburi; SOUTH-EASTERN: Chon Buri; PENINSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Krabi, Phatthalung, Trang, Satun, Songkhla, Yala.

D i s t r i b u t i o n.—Burma (type), Vietnam, Malaysia, Singapore, Indonesia, Brunei.

E c o l o g y.—Tropical evergreen forest, on limestone or granite bedrock; altitude 50-600 m (commonly 150-300 m). Flowering February-October (most commonly July-October); fruiting March-December (commonly June-July).

V e r n a c u l a r.—Sang kried (สังเครียด), Huad ngo (หวดเงาะ) (Peninsular).

U s e s.—White aril edible.

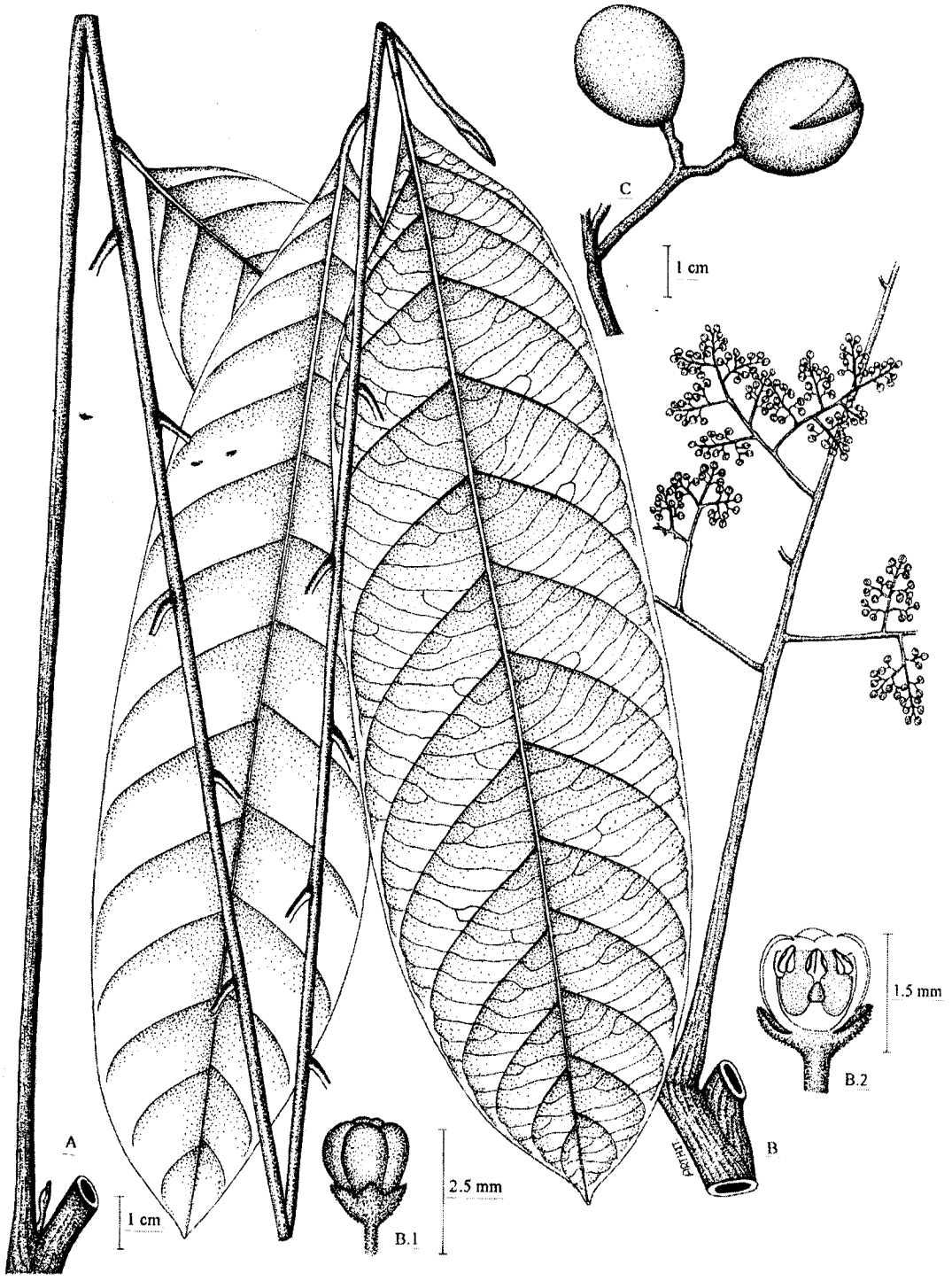

Fig. 14. *Aglaia forbesii* King: A. twig; B. inflorescences, B.1 flower, B.2 longitudinal section of flower (A.F.G. Kerr 7907); C. part of infructescence (C.F. Beusekom & C. Phengklai 796).

11. Aglaia forbesii King, J. Asiat. Soc. Bengal 64(2): 68. 1895; Ridl., Fl. Malay Penins. 1: 406. 1922; Pannell in Tree Fl. Malaya 4: 215. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 207. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 265. 1995.—*A. humilis* King, J. Asiat. Soc. Bengal 64(2): 69. 1895; Ridl., Fl. Malay Penins. 1: 407. 1992; Mabb. in Tree Fl. Malaya 4: 218. 1989; Pannell, Kew Bull., Add. Ser., 16, Taxon Monog. Gen. Aglaia: 207. 1992.

Trees 8-20 m high, 50-100 cm girth. *Bark* brown; inner bark yellow, scent. *Leaves* imparipinnate and lower lateral leaflets alternate, spirally arranged, 20-75 cm long; leaflets 5-7 pairs, oblong or obovate, 15-23 by 6-7 cm, coriaceous; apex acute to obtuse; base obtuse, slightly cuneate and rather strong oblique, not cordate; margin entire; midrib and secondary prominent beneath, depressed upside; secondary nerves 10-15 pairs, arched but not anastomosing; scalariform veins slightly or hardly distinct on both sides, all of them pinkish when dry. *Petiole* 10-28 cm slender; petiolules 0.5-2 cm, all pubescent then glabrescent. *Inflorescence* a thyrse compound, subinflorescence a spike-liked, 20-35 cm long, pubescent; axillary or supraaxillary, near end of twigs; peduncles 6-8.5 cm long, pedicels ca. 1 mm long or all glabrous or sparsely with reddish brown hairs; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate or cup-shaped, all ca. 1.5 mm long, lobes ca. 1/3 of all length, stellate outside, glabrous inside. *Corolla* 5, free, obovate-oblong, up to 2 mm long, glabrous, yellowish. *Staminal tube* cupuliform or bowl-shaped, ca. 1.5 mm long, glabrous, margin entire. *Stamens* 5(-6), as long as the tube, filament raised up from the staminal tube higher than the upper half of tube inside. *Ovary* slightly dome-shaped, ca. 2 by 1 mm, 2-3(-5) loculi, each locule with 1 ovule; sparsely hairs; style and stigma a pyramid-shaped ca. 1 mm long, dark colour, glabrous. *Infructescence* on upper leaf-scars or axillary, up to 20 cm long, stellate hairs indumentum throughout. *Drupes* ovoid or ellipsoid, 2-2.5 by 1.5-2 cm, glaucous, green to yellow. *Seeds* 1-2, ellipsoid, 1.5-3 cm long, 2-2.2 cm wide and ca. 1.5 cm thick, enclosed with yellow or pink, sweet and sour aril.

T h a i l a n d.—SOUTH-WESTERN: Kanchanaburi; PENINSULAR: Ranong, Nakhon Si Thammarat, Phatthalung, Pattani.

D i s t r i b u t i o n.—Burma, Malaysia (type), Indonesia.

E c o l o g y.—Nearby stream in evergreen forest, on sandstone bedrock; altitude 100-600 m. Flowering March-December (commonly March-April); fruiting May-November (commonly May-August).

V e r n a c u l a r.—Hom (หอม) (Peninsular).

U s e s.—Yellow to pink aril edible.

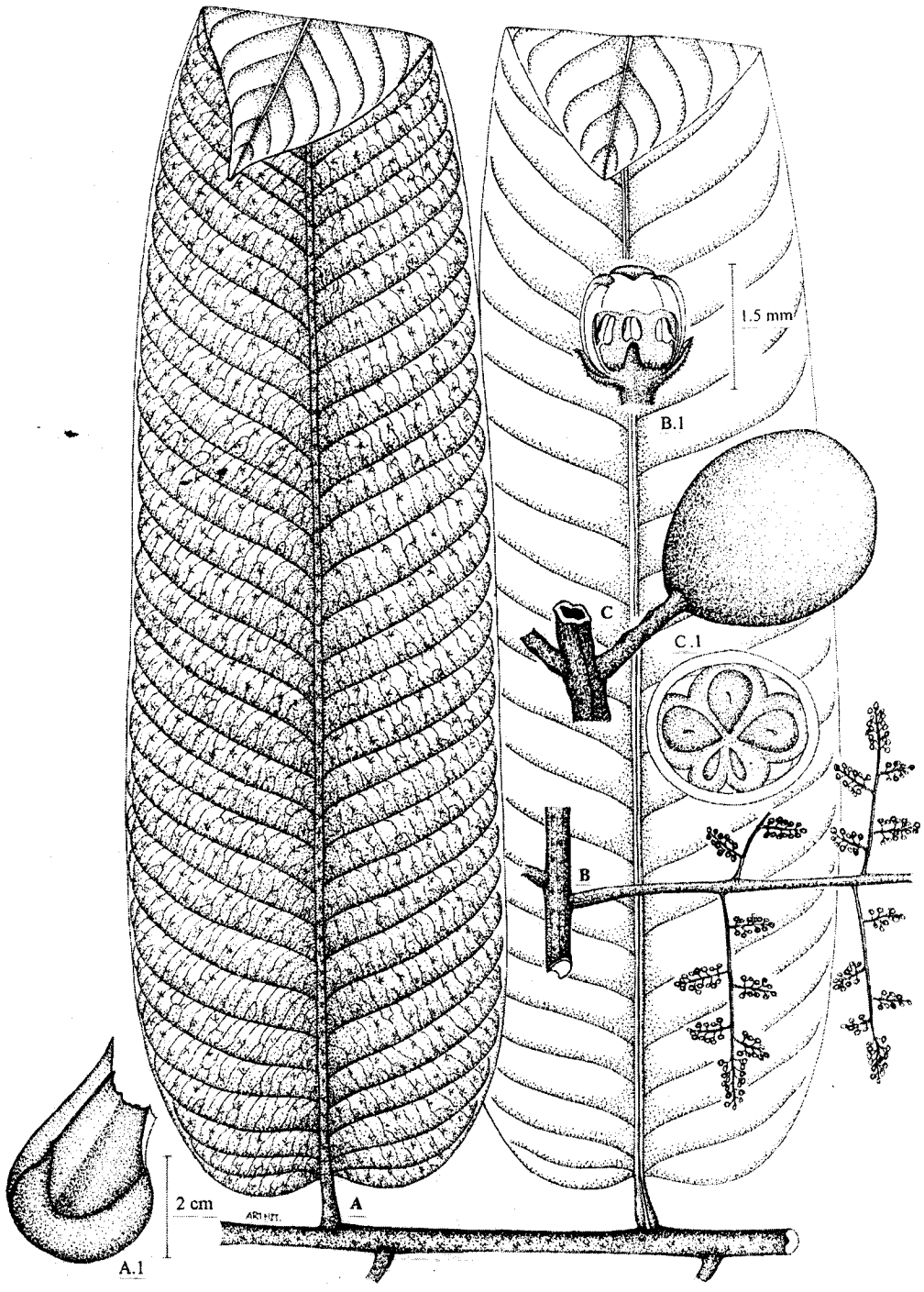

Fig. 15. *Aglaia grandis* Korth. ex Miq.: A. twig, A.1 base of petiole (T.D. Pennington 7992); B. part of inflorescence, B.1 longitudinal section of flower (Th. Wongprasert 046-108); C. part of infructescence, C.1 cross section of drupe (C. Niyomdham 1994).

12. Aglaia grandis Korth. ex Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 56. 1868; Pannell in Tree Fl. Malaya 4: 217. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 111. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 232. 1995.—*A. lanuginosa* King, J. Asiat. Soc. Bengal 64(2): 71. 1895; Ridl., Fl. Malay. Penins. 1: 407. 1922.—*Merostela grandis* (Korth. ex Miq.) Pierre, Fl. Forest Cochinch. Fasc. 21: t. 331. 1895.—*M. grandifolia* Pierre, Fl. Forest Cochinch. Fasc. 22: t. 342. 1896.—*Aglaia merostela* Pellegr. in Lecomte, Fl. Indo-Chine 1: 761. 1911.—*A. perfulva* Elmer in Leafl. Philipp. Bot. 9: 3302. 1937.

Trees (6-)12-20(-25) m high, 30-180 cm girth. *Twigs* stout, densely dark red stellate hairs and patching with leaf-scars. *Bark* reddish brown with grey patches interval, creamy orange, flaky and long corky lenticels; inner bark dull green; heartwood yellowish brown. *Leaves* imparipinnate and lower lateral leaflets alternate, spirally arranged, 1-1.5 m long; leaflets 8-15 pairs, oblong or oblong-lanceolate, 11-28 by 3.5-7.5 cm, coriaceous, densely indumentum and stellate hairs beneath; apex acute, obtuse or acuminate; base cordate, only the apical one slightly cuneate; margin entire and recurved; midrib and secondary nerves strongly prominent beneath and depressed upside; secondary nerves 20-40 pairs, first straight then arched and anastomosing near margin; scalariform veins conspicuous beneath. *Petiole* 25-40 cm long, grooved upside and much swollen near base; petiolules 1-1.5 cm long, all with densely hairs indumentum, especially on lower surface. *Inflorescence* a thyrse compound, 80-100 cm long, the last subinflorescence as a raceme or spike-liked, densely stellate hairs indumentum all parts; axillary or supraaxillary near end of twigs; peduncles 10-20 cm long, pedicels ca. 1 mm long or hardly noticed, covered with brown indumentum; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobes ca. 1/2 of all length, stellate outside, glabrous inside, ciliate. *Corolla* 5, free, lobes obovate, 1-1.5 mm long, glabrous, yellowish green to dark brown later. *Staminal tube* slightly cupuliform or tubular, 0.5-1 mm long, glabrous, margin undulate lobed. *Stamens* 5(-6), opposite and same level of marginal tube, filaments adnate the tube then raised up below anther. *Ovary* ovate, glabrous, ca. 0.2 by 0.1 mm, 3(-5) loculi, each locule with 1 ovule; style and stigma hardly distict. *Infructescence* erected or pendulous, 20-30 cm long, stellate hairs indumentum throughout. *Drupes* ovoid or ellipsoid, 3.5-4.5 by 3-4 cm, densely tomentose, orange brown. *Seeds* 1-3, elliptical and depressed on two longitudinal sides, enclosed with white and soft aril.

T h a i l a n d.—NORTH-EASTERN: Nong Khai; EASTERN: Si Sa Ket; SOUTH-WESTERN: Phetchaburi; SOUTH-EASTERN: Sa Kaeo, Chon Buri, Chanthaburi, Trat; PENINSULAR: Surat Thani, Nakhon Si Thammarat, Yala, Narathiwat.

D i s t r i b u t i o n.—Vietnam, Malaysia, Borneo (type), Philippines.

E c o l o g y.—In moist evergreen or mixed deciduous forest with bamboo, nearby stream, on sandstone bedrock; altitude 10-1,000 m (commonly 200-400 m). Flowering January-September (commonly June-September); fruiting January-March.

V e r n a c u l a r.—Khang khao yai (ค้างคาวใหญ่) (Southeastern).

U s e s.—Aril edible.

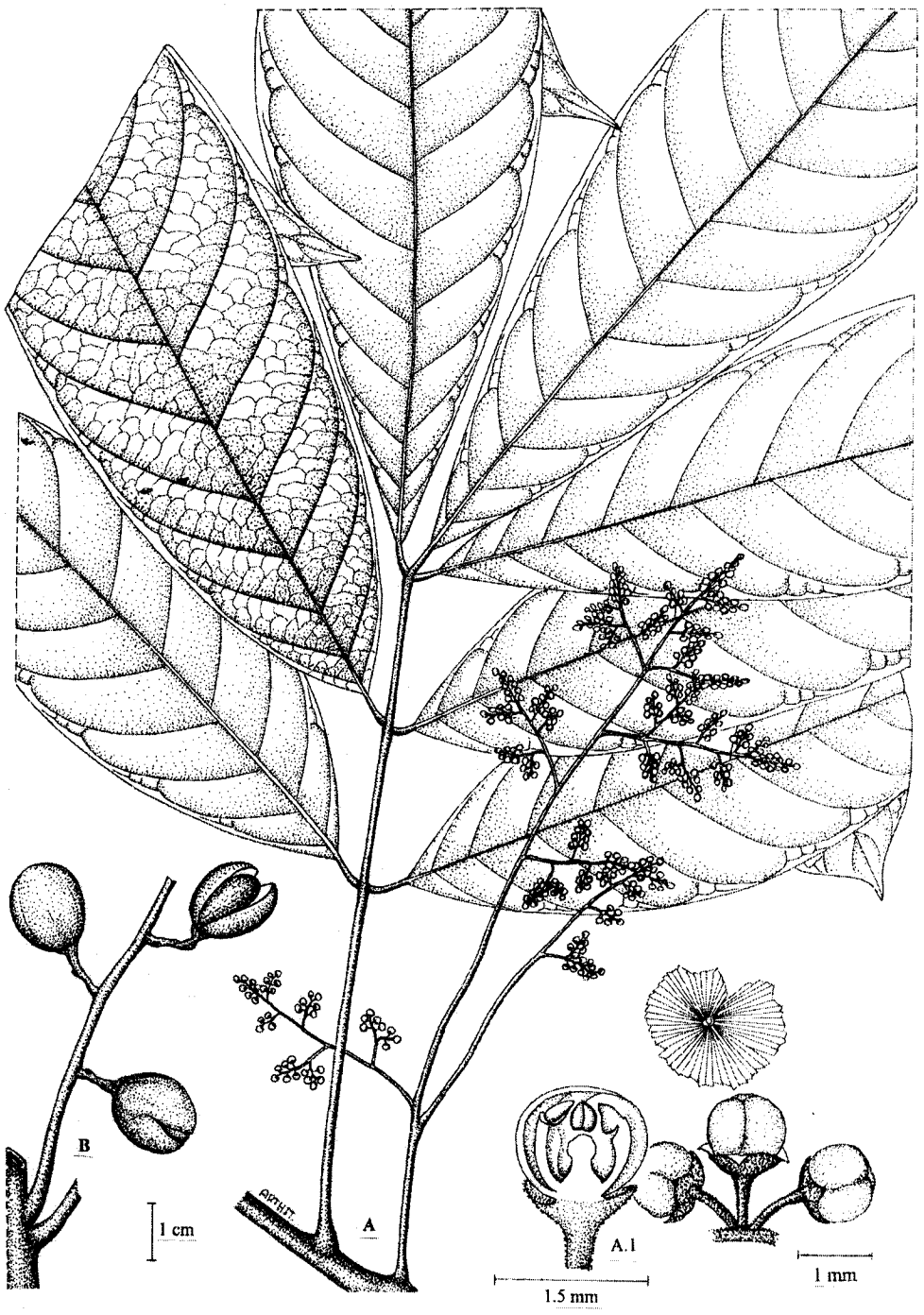

Fig. 16. *Aglaia korthalsii* Miq.: A. twig with inflorescences, A.1 longitudinal section of flower & cluster of flowers (A.F.G. Kerr 16913); B. infructescence (C. Niyomdham 1165).

13. Aglaia korthalsii Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 42. 1868; Corner, Wayside Trees Mal. 1: 457. 1940; Pannell in Tree Fl. Malaya 4: 228. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 167. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 251. 1995.—*Hearnia aquatic* Pierre, Fl. Forest Cochinch. Fasc. 21: t. 333b. 1895.

Trees 5-20(-30) m high, 50-120 cm girth. *Bark* dark brown, rough and scaly; inner bark reddish brown. *Leaves* imparipinnate, 6-15 cm long, spirally arranged; leaflets 1-3 pairs, oblong-lanceolate to oblanceolate, rarely elliptic, 10-18 by 4-5.5 cm, opposite or slightly opposite; subcoriaceous, sparsely indumentum then glabrous; apex acuminate, caudate, rarely acute; base obtuse to slightly cuneate; margin entire, recurved; midrib prominent beneath, depressed upside; secondary nerves 9-15 pairs, arched and anastomosing near margin, reticulate veins slightly or hardly distinct. *Petiole* 5-10 cm long, slender, minutely swollen near base; petiolules 1-1.5 cm long, all glabrous or glabrescent. *Inflorescence* a thyrse compound, subbranches still keep thyrse-formed; in axillary 10-20 cm long, many branches; peduncles 2-5 cm long, pedicels ca. 1 mm long, all sparsely hairy, then glabrous; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 1/2-3/4 of all length, stellate tomentose outside, glabrous inside, ciliate. *Corolla* 5, free, slightly obovate, ca. 1 mm long, pubescent outside, white or yellowish, scented. *Staminal tube* ovoid or cupuliform ca. 0.8 mm long, glabrous or puberulous inside, margin entire or slightly undulate. *Stamens* 5, apical of anthers protruding the marginal tube; filament more or less raised up on the marginal tube. *Ovary* with conspicuous gynophore, higher than broad, glabrous; 3 loculi, each locule with 1 ovule, always developed one; style and stigma indistinct. *Infructescence* on twigs, upper leaf-scars or axillary, 3-15 cm long, erected or slightly recurved, indumentum and stellate hairs throughout. *Capsules* ellipsoid or ovoid, 2-2.5 by 2-3 cm, slightly 4 longitudinal lobes; orange red; stellate hairs indumentum, indehiscent without pressing. *Seeds* 1-2, ellipsoid, ca. 1 by 1 cm, usually one seed per drupe; enclosed with yellow aril, edible.

T h a i l a n d.—SOUTH-WESTERN: Prachuap Khiri Khan; PENINSULAR: Ranong, Surat Thani, Phangnga, Narathiwat.

D i s t r i b u t i o n.—India, Bhutan, Burma, Vietnam, Malaysia, Indonesia (type), Philippines.

E c o l o g y.—In swamp forest to tropical evergreen forest, limestone or sandstone bedrock; altitude 0-5 m (one record up to 700 m). Flowering January-October (commonly January-April); fruiting January-March.

V e r n a c u l a r.—Ke ya (กียะ) (Peninsular).

U s e s.—Aril edible.

Fig. 17. *Aglaia lawii* (Wight) C.J. Saldanha ex Ramamoorthy: A. twig with inflorescences, A.1 flowers, A.2 longitudinal section of male flower, A.3 longitudinal of female flower (Put 4324); B. infructescence, B.1 another form of drupe, B.2 cross section of drupe (C.F. van Beusekom 2939).

14. Aglaia lawii (Wight) C.J. Saldanha ex Ramamoorthy in C.J. Saldanha & Nicolson, Fl. Hassan Dist.: 392. pl. 76. 1976; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 97. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 228. 1995. —*Nimmonia lawii* Wight, Calcutta J. Nat. Hist. 7: 13. 1847.—*Amoora lawii* (Wight) Bedd., Fl. Sylv. S. India: t. 133. 1871; Hiern in Hook.f., Fl. Brit. India. 1 561. 1875.—*Aglaia andamanica* Hiern in Hook.f., Fl. Brit. India. 1: 555. 1875.—*Lansium pedicellatum* Hiern in Hook.f., Fl. Brit. India. 1: 558. 1875.—*Amoora canarana* (Turcz) Hiern in Hook.f., Fl., Brit India 1: 560. 1875.—*Amoora maingayi* Hiern in Hook.f., Fl. Brit India. 1: 562. 1875; Ridl., Fl. Malay Penins. 1: 400. 1922.—*Amoora dysoxyloides* Kurz, J. Asiat. Soc. Bengal 44(2): 200. 1876.—*Aglaia tetrapetala* Pierre, Fl. Forest Cochinch. Fasc. 22: t. 337A. 1897.

Trees 5-20(-30) m high, (20-)50-100(-200) cm girth; terminal buds lanceolate or oblong. ca. 1.5 cm long, greyish brown indumentum. *Twigs* dark brown, lenticellate. *Bark* brownish to blackish, smooth or flaky off; inner bark orange or red; sapwood whitish; heartwood brown. *Leaves* imparipinnate, 15-30 cm long, spirally arranged; leaflets 3-7 pairs, lanceolate, oblanceolate or oblong, 8-22 by 3-7 cm, opposite or slightly opposite, coriaceous or subcoriaceous, glossy green and sparsely indumentum upside; sparsely white indumentum to glabrous except along midrib and secondary nerves beneath; apex acuminate caudate to acute; base cuneate to strongly oblique; margin entire, recurved; midrib strongly prominent beneath, flat to depressed upside; secondary nerves 7-15 pairs, straight then curved but not anastomosing; other veins hardly distinct. *Petiole* 3-9 cm long, slightly swollen near base, petiolules 2-10 mm long, grooved upside, all with orange or greyish green indumentum, then glabrescent. *Inflorescence* a thyrse compound, subbranches in thyrse-formed; axillary or supraaxillary, 10-20 cm long, many branches; peduncles 2-5 cm long; pedicels 1-2 mm long, all covered with stellate scales; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* (4-)5, broadly campanulate, all ca. 0.5 mm long, lobes, ca. 2/3 of all length, tomentose stellate hairs indumentum outside, glabrous or sparsely indumentum inside. *Corolla* (4-)5, free, slightly obovate, ca. 1 mm long, glabrous, whitish yellow to orange. *Staminal tube* oblanceolate, ca. 0.5 mm long, glabrous, margin smooth or slightly undulate. *Stamens* 5, the apical of anthers minutely protruding the marginal tube, filaments raised up at or near base of tube inside. *Ovary* ovate or pyramid-liked, ca. 0.5 mm long, glabrous; 3 loculi, each locule with 1 ovule; style stout, short, glabrous, stigma dilate and curved. *Infructescence* upper leaf-scars or axillary, erected or slightly recurved, 10-20 cm long, densely reddish brown indumentum throughout. *Capsules* globose or slightly obovoid, ca. 3 by 3 cm; yellowish orange or orange brown; usually 2 valves, each with one seed. *Seed* enclosed with orange red aril, edible.

T h a i l a n d.—NORTHERN: Chiang Mai, Lampang, Phrae, Phitsanulok; NORTH-EASTERN: Phetchabun, Nong Khai; EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Uthai Thani, Kanchanaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL: Saraburi; SOUTH-EASTERN: Prachin Buri, Chon Buri, Chanthaburi, Trat; PENINSULAR: Chumphon, Surat Thani, Phangnga, Phuket, Krabi, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Songkhla, Yala, Narathiwat.

D i s t r i b u t i o n.—Bhutan, India (type), Burma, China, Taiwan, Laos, Vietnam, Malaysia, Indonesia, Philippines.

E c o l o g y.—Evergreen to mixed deciduous forest, nearby stream, on granite or sandstone or limestone bedrock; altitude 30-1,500 m (commonly 250-700 m). Flowering March-December (commonly March-August); fruiting May-July.

V e r n a c u l a r.—Ta suea (ตาเสือ) (Northern); Khang khao (ค้างคาว) (Eastern); Mak kong (หมากกอง) (Central); Sak ka ma (สักกะมา), Sang ka tong (สังกะโต้ง) (Southwestern); Mai hom (ไม้หอม), Sang kried (สังเครียด) (Peninsular).

U s e s.—Aril edible.

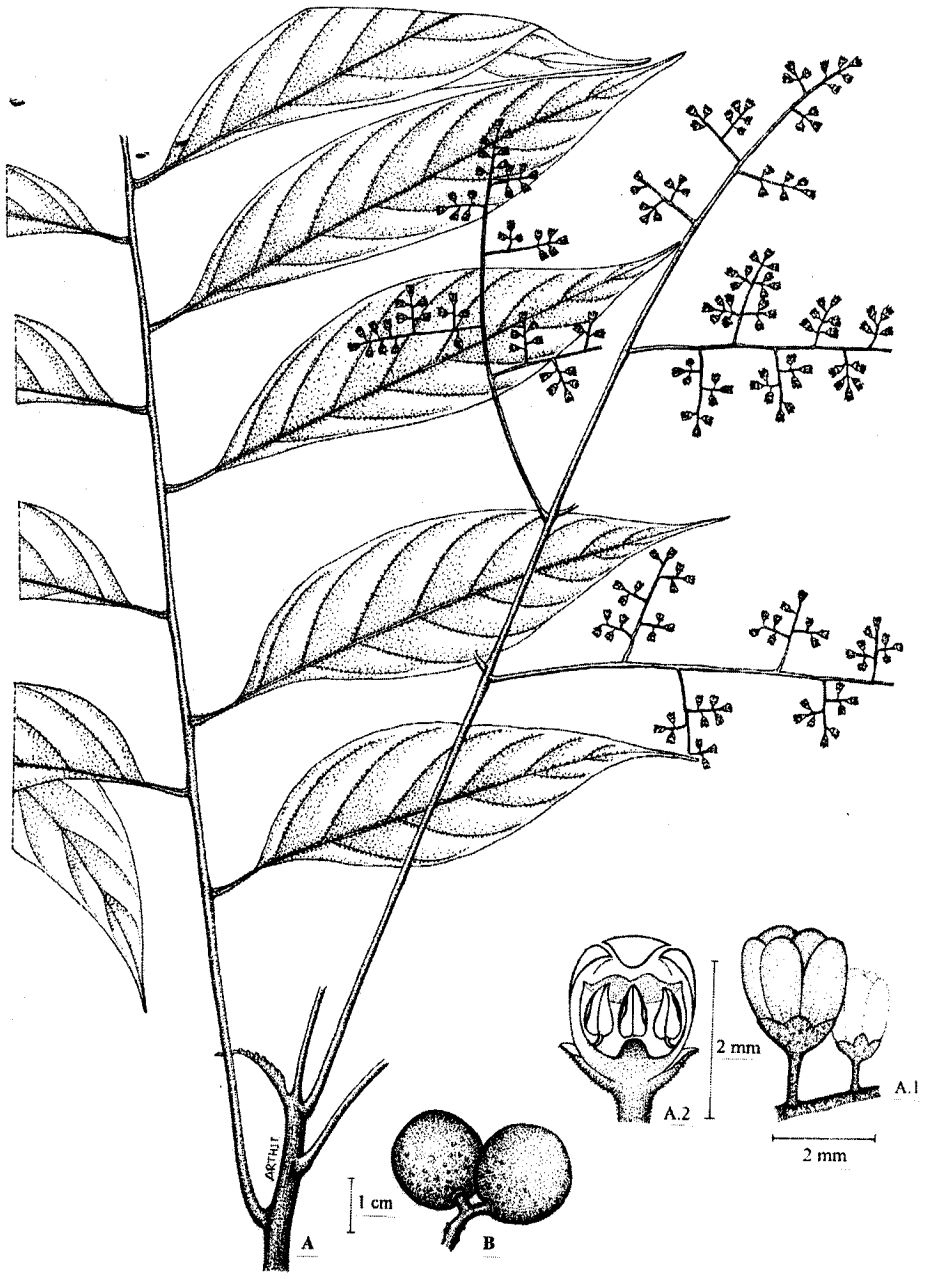

Fig. 18. *Aglaia leptantha* Miq.: A. twig with inflorescences, A.1 flower, A.2 longitudinal section of flower (P. Suvanakoses 407); B. drupes (A.F.G. Kerr 15476).

15. Aglaia leptantha Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 51. 1868; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 201. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 261. 1995.—*Aglaia glabriflora* Hiern in Hook.f., Fl. Brit. India 1: 555. 1875; Ridl., Fl. Malay Penins. 1: 404. 1922; Pannell in Tree Fl. Malaya 4: 217. 1989.

Trees 8-20 m high, 80-150 cm girth; terminal buds oblong-lanceolate 2-3 cm long, densely indumentum and tomentose hairs. *Twigs* slender with longitudinal wavy ridges, densely peltate indumentum. *Bark* pale grey, greenish brown or greyish green patches with longitudinal crack, lenticellate; sapwood pale brown or reddish brown; latex white. *Leaves* imparipinnate, 20-50 cm long, spirally arranged, lower lateral leaflets alternate; leaflets 5-11 pairs, sword-shaped, oblong-lanceolate, 8-13 by 2-3 cm, chartaceous to subcoriaceous; glossy green upside, pale and scales beneath; apex caudate; base strongly oblique, not cordate; margin entire; midrib prominent beneath, depressed upside; secondary nerves 6-10 pairs, arched and more or less anastomosing, all of them with scales or indumentum beneath then glabrous. *Petiole* 6-10 cm long, slender; petiolules 0.4-1 cm long dark scaly. *Inflorescence* a thyrse compound subinflorescence a spike-liked, up to 30 cm long, axillary or supraaxillary, near end of twigs; peduncles 8-10 cm, dark brown, pedicels ca. 0.5 mm long, scaly; bracts and bracteoles, narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, campanulate, all ca. 1 mm long, lobes ca. 1/2 of all length, sparsely or hairy outside, glabrous inside. *Corolla* 5, free, lanceolate or oblanceolate, ca. 1.5 mm long, glabrous, white, yellow or dark orange. *Staminal tube* cupuliform, ca. 2/3 of corolla lobe; margin with 5 undulate lobed, glabrous. *Stamens* 5, ovoid; filaments raised up from the staminal tube lower from the half of tube inside. *Ovary* slightly dome-shaped, ca. 1 by 1 mm sparsely with scales; 1-2 loculi, each locule with 1 ovule; style and stigma hardly separate distinct. *Infructescence* on upper leaf-scars or axillary, up to 30 cm long, peduncles 3-10 cm long, densely indumentum throughout. *Drupes* ovoid or ellipsoid, 1.5-3 by 1.5-2.5 cm, densely hairs indumentum; exocarp thin to woody, brown or orange. *Seed* 1, ellipsoid, ca. 2 by 1 cm, enclosed with gelatinous sweet and sour aril.

T h a i l a n d.—PENINSULAR: Surat Thani, Nakhon Si Thammarat, Trang, Songkhla.

D i s t r i b u t i o n.—Cambodia, Malaysia, Singapore, Indonesia (type), Philippines.

E c o l o g y.—In evergreen forest, on sandstone or limestone or granite bedrock; altitude 500-1,100 m. Flowering August-October; fruiting October-April.

V e r n a c u l a r.—Sang kried luead (สังเครียดเลือด), Sang ka tong (สังกะโต้ง) (Peninsular).

U s e s.—Aril edible.

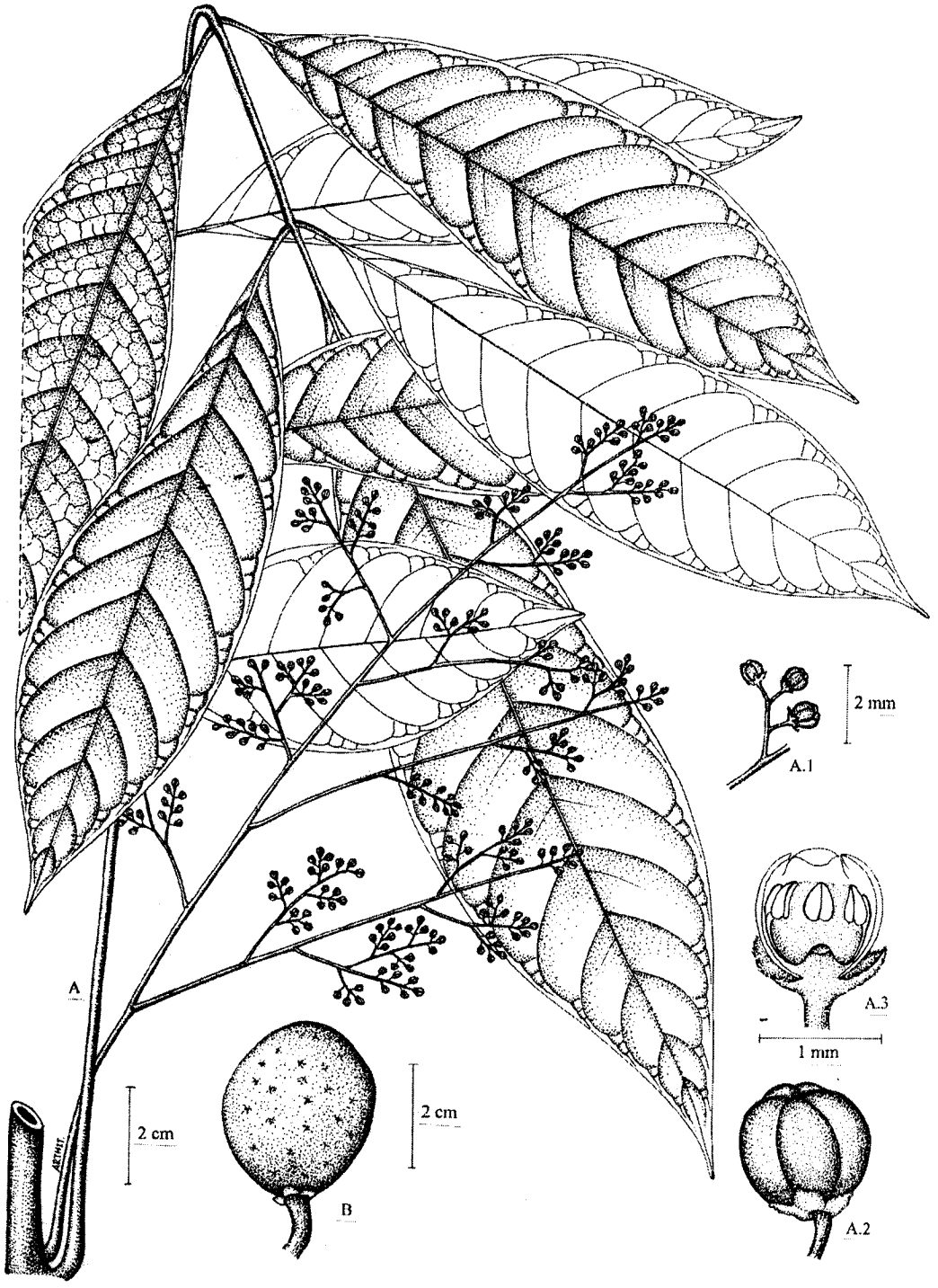

Fig. 19. *Aglaia leucophylla* King: A. twig with inflorescences, A.1 part of inflorescence, A.2 flower, A.3 longitudinal section of male flower (B. Sangkachand 1256); B. drupe (C. Niyomdham 5016).

16. Aglaia leucophylla King, J. Asiat. Soc. Bengal, 64(2): 66. 1895; Ridl., Fl. Malay Penins. 1: 403. 1922; Pannell in Tree Fl. Malaya 4: 218. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 266. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 271. 1995.—*A. kunstleri* King, J. Asiat. Soc. Bengal 64(2): 69. 1895.—*A. heteroclita* King, J. Asiat. Soc. Bengal 64(2): 78. 1895; Ridl., Fl. Malay Penins. 1: 410. 1922.

Trees 5-15(-20) m high, (35-)70-90 cm girth. *Twigs* densely covered with golden brown stellate scales or indumentum or glabrous. *Bark* greyish brown, grey or creamy brown, longitudinal lenticellate, longitudinal furrowed; inner bark orange or brown, with exudate. *Leaves* imparipinnate, 25-35 cm long, spirally arranged; leaflets 3-12 pairs, lanceolate or oblanceolate, 9-20 by 3-5 cm, opposite or slightly opposite, chartaceous, glossy green upside pale beneath, glabrous on both sides or sparsely then glabrous beneath; apex caudate or acuminate; base cuneate to strongly unequal, rarely obtuse; margin entire; midrib finely prominent beneath, depressed upside; secondary nerves 10-17 pairs, arched and anastomosing, finely distinct beneath, depressed upside, reticulate veins conspicuous beneath. *Petiole* 10-15 cm long, slender, slightly swollen near base; petiolules 1-3.5 cm long; all glabrous. *Inflorescence* a thyrse compound, subbranches a raceme-liked, axillary or supraaxillary, 30-40 cm long many branches; peduncles 7-14 cm long; pedicels ca. 1 mm long; all with yellow indumentum all parts; bracts and bracteoles narrowly triangular, ca. 1 by 0.5 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 1/2 of all length, yellow indumentum outside, glabrous inside. *Corolla* 5, free, oblong, ca. 1.5 mm long, glabrous, yellowish to yellow. *Staminal tube* cupuliform, ca. 0.5 mm long glabrous, margin undulate. *Stamens* 5, the apical of the anthers same level of the marginal tube, filaments raised up at the middle half of tube inside. *Ovary* pyramid-liked, or broadly expand, ca. 0.5 mm long, glabrous; 3 loculi, each locule with 1 ovule; style indistinct; stigma as a nipple-liked on top of ovary. *Infructescence* upper leaf-scars or axillary slightly recurved, 10-20 cm long, reddish brown indumentum throughout. *Capsules* ovoid or slightly obovoid, ca. 3 by 3 cm, yellow, pale orange or brown, densely golden stellate hairs and indumentum 2(-3) valves, each with one seed. *Seed* ellipsoid, ca. 2.3 by 1 cm, enclosed with white or pinkish to dark purple aril, edible.

T h a i l a n d.—SOUTH-EASTERN: Chachoengsao; PENINSULAR: Ranong, Phangnga, Nakhon Si Thammarat, Songkhla, Narathiwat.

D i s t r i b u t i o n.—Malaysia (type), Brunei, Indonesia, Philippines.

E c o l o g y.—In evergreen forest, nearby stream, on limestone bedrock; altitude 100-300 m. Flowering June-December (commonly June-September); fruiting November-May.

V e r n a c u l a r.—Ma khuang (มะข่วง) (Southeastern); Sang ka tong (สังกะโต้ง) (Peninsular).

U s e s.—Aril edible.

Fig. 20. *Aglaia macrocarpa* (Miq.) Pannell: A. twig with infructescence, A.1 another form of leaf (N. Wirawan 334); B. part of inflorescence, B. longitudinal section of flower, B.2 ovary & cross section of ovary (C. Niyomdham 861).

17. Aglaia macrocarpa (Miq.) Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 65. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 215. 1995.—*Epicharis macrocarpa* Miq., Fl. Ind. Bat., Suppl. 196, 505, 1861.—*Aglaia pycnocarpa* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 45. 1868.—*Amoora rubescens*, Hiern in Hook.f., Fl. Brit. India 1: 561. 1875; Ridl. Fl. Malay Penins. 1: 399. 1922.—*Amoora trichanthera* Koord. & Valeton, Bijdr. Boomsoort. Java 3: 123. 1896.—*Aglaia trimera* Ridl. in Kew Bull. 368. 1930.—*Aglaia triplex* Ridl. in Kew Bull. 215. 1938.—*Aglaia rubescens* (Hiern) Pannell, Malaysian Forester 45: 455. 1982; Pannell in Tree Fl. Malaya 4: 223. 1989.

Trees 3-20(-40) m high, 80-150 cm girth. *Twigs* rather stout, densely covered with reddish brown or grey peltate scales then falling off. *Bark* reddish brown or grey; lenticellate; inner bark dark red or pinkish brown. *Leaves* imparipinnate 14-50 cm long, spirally arranged, glabrous; leaflets 3-8 pairs, obovate, ovate-oblong to oblong-lanceolate; apical leaf obovate up to 13 by 4.5 cm, glabrous all, 6-13 by 4-4.5 cm, the apical one up to 13 by 4.5 cm; opposite or slightly opposite, subcoriaceous to chartaceous, glabrous on both sides, glossy green upside, pale beneath; the apical one always obovate or oblanceolate; apex acuminate or caudate; base cuneate, obtuse, oblique to auriculate; margin entire; midrib prominent beneath, depressed upside, pinkish when dry; secondary nerves 5-22 pairs, arched and more or less anastomosing near margin. pinkish when dry; reticulate veins distinct on both sides. *Petiole* 5-20 cm long, slender and swollen near base, glabrous, petiolules ca. 1 cm long, glabrous. *Inflorescence* a thyrse compound, pendulous, subbranches thyrse-formed; axillary or supraaxillary, up to 30 cm long, many branches; peduncles up to 10 cm long; pedicels 1-5 mm long; indumentum all; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 3, broadly campanulate, all ca. 5 mm long, lobes ca. 2/5 of all length, sparsely to densely simple hairs indumentum then glabrescent outside, glabrous inside. *Corolla* 3, free, linear to oblanceolate, 2-5 mm long, alternate with calyx-lobes, densely simple hairs outside glabrous inside; whitish to yellowish, scented. *Staminal tube* short tubular, ca. 4 mm long, glabrous, margin smooth. *Stamens* 5(-10), as long as tube, filaments raised up around the middle of tube inside. *Ovary* half-ovate, up to 2 mm long, glabrous; 3 loculi, each locule with 1 ovule; style ovate-oblong, up to 2 mm long, glabrous; stigma indistinct. *Infructescence* upper leaf-scars, erect, 4-8 cm long, few capsules. *Capsules* obovoid with strongly 3 longitudinal lobes, 5-6 by 4-5 cm, covered with reddish brown indumentum. *Seed* one seed per lobe, ca. 4.5 cm long, 2-2.5 cm wide, 1.5 cm thick, enclosed a part with red aril.

T h a i l a n d.—NORTHERN: Chiang Rai (cultivated); SOUTH-WESTERN: Kanchanaburi; PENINSULAR: Surat Thani, Krabi, Phatthalung, Pattani.

D i s t r i b u t i o n.—Vietnam, Malaysia, Singapore, Indonesia (type).

E c o l o g y.—In tropical evergreen to mixed deciduous forest, on limestone bedrock; altitude 50-1,000 m (commonly 50-200 m). Flowering February-August (commonly February-May); fruiting April-May.

V e r n a c u l a r.—Cha sadao (ช้าสะเดา) (Northern); Thiam dong (เทียมดง) (Peninsular).

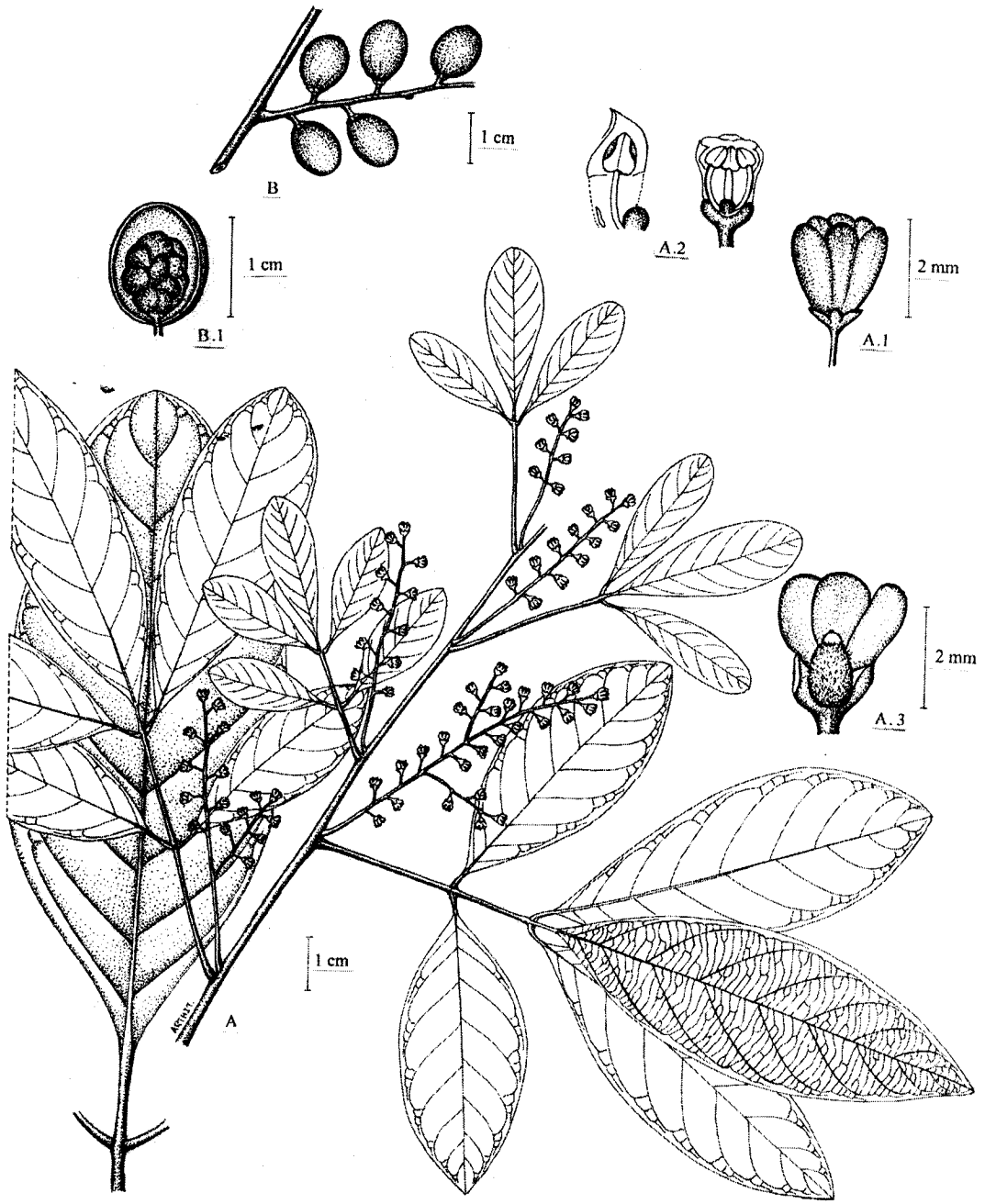

Fig. 21. *Aglaia odorata* Lour.: A. twig with inflorescences, A.1 flower, A.2 stamen, A.3 ovary (A.F.G. Kerr 16139); B. infructescence, B.1 longitudinal section of drupe (D.J. Collins 1575).

18. Aglaia odorata Lour., Fl. Cochinch. 1: 173. 1790; Hiern in Hook.f., Fl. Brit. India 1: 554. 1875; King, J. Asiat. Soc. Bengal 64(2): 62. 1895; Corner, Wayside Trees Mal. 1:456: 174. 1940; Backer & Bakh.f., Fl. Java 2: 128. 1965; C.Y. Wu, Fl. Yunnan. 1: 239. 1977; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 383. 1995.—*A. sinensis* Pierre, Fl. Forest Cochinch. Fasc. 21: t. 334. 1895.—*A. chaudocensis* Pierre, Fl. Forest Cochinch. Fasc. 22: t. 339B. 1896.—*A. repouensis* Pierre, Fl. Forest Cochinch. Fasc. 22: t. 340B. 1896.—*A. duperreana* Pierre, Fl. Forest Cochinch. Fasc. 22: t. 341B. 1896.—*A. odorata* Lour. var. *chaudocensis* (Pierre) Pellegr. in Lecomte, Fl. Indo-Chine 1: 757. 1911.—*A. oblanceolata* Craib, Bull. Misc. Inform. Kew: 324. 1926.

Shrubs to small trees (1)4-9(-24) m high, (8-)30-50(-200) cm girth; terminal buds ovate, sparsely pubescent. *Twigs* glabrous, sparsely with lenticels. *Bark* smooth, grey, brownish or creamy yellow, and lenticellate; inner bark yellowish to reddish brown. *Leaves* imparipinnate, 4-10 cm long, spirally arranged; leaflets 1-3 pairs, oblanceolate, obovate or elliptical, (3-)7-9(-13) by (1-)2.5-3(-6) cm, opposite or slightly opposite, subcoriaceous, glossy green upside, glossy or dull green beneath, glabrous; apex obtuse, to acute; base slightly cuneate; margin entire; midrib prominent beneath, depressed upside; secondary nerves 5-9 pairs, arched and more or less anastomosing near margin; scalariform and reticulate veins distinct or slightly distinct beneath, indistinct upside. *Petiole* 2-4 cm long; petiolules 0.5-1 cm long; all glabrous. *Inflorescence* a thyrse compound, or spike-liked, without or few branchlets, axillary, 5-18 cm long, erected; peduncles 2-4 cm long; pedicels 1-2 mm long, glabrous or glabrescent; bracts and bracteoles narrowly triangular, ca. 1 by 0.5 mm caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobes ca. 3/4 of all length, glabrous on both sides, ciliate. *Corolla 5*, free. slightly obovate-oblong, 1.5-2 mm long, glabrous, yellow, fragrant. *Staminal tube* slightly tubular or glass-shaped, 1-1.5 mm long, glabrous, margin slightly 5 lobes, opposite with anthers. *Stamens* 5, apical same level of the marginal tube, filaments raised up from the base of tube. *Ovary* ovate or elliptical, ca. 1 mm long, densely hairs; 3 loculi, each locule with 1 ovule; style indistinct; stigma as a nipple-liked on top of ovary. *Infructescence* upper leaf-scars or axillary, erected, 5-8 cm long, indumentum throughout. *Capsules* ellipsoid ovoid or obovoid, 1-1.5 by 0.8-1 cm, brownish to orange red, usually with one seed. *Seed* ellipsoid ca. 0.5 by 0.3 cm, enclosed with white aril, edible.

T h a i l a n d.—NORTHERN: Chiang Mai, Tak, Kamphaeng Phet; NORTH-EASTERN: Sakhon Nakhon; EASTERN: Chaiyaphum, Buri Ram, Ubon Ratchathani; SOUTH-WESTERN: Kanchanaburi, Ratchaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL: Sing Buri, Saraburi, Nakhon Nayok, Bangkok; SOUTH-EASTERN: Sa Kaeo, Prachin Buri, Chon Buri, Rayong, Chanthaburi, Trat; PENINSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Krabi, Nakhon Si Thammarat, Phatthalung, Trang, Songkhla, Narathiwat.

D i s t r i b u t i o n.—India, China (type), Cambodia, Vietnam, Malaysia, Indonesia.

E c o l o g y.—Tropical evergreen to dry evergreen forest, on sandy soil to limestone bedrock; altitude 30-1,100 m (most commonly 80-500 m). Flowering all year round (commonly February-September); fruiting February-May.

V e r n a c u l a r.—Kai thien (ไก่เทียน) (Central); Ka sum nok (กาสุมนก) (Southwestern); Hom Klai (หอมไกล) (Peninsular).

U s e s.—Cultivated for its ornamental value; dried flowers used for scenting in tea, fruits eaten by wild animals.

Fig. 22. *Aglaia odoratissima* Blume: A. twig with inflorescences, A.1 cluster of flowers, A.2 flower, A.3 longitudinal section of flower (A.F.G. Kerr 12452); B. infructescence (Th. Wongprasert 046-18).

19. Aglaia odoratissima Blume, Bidjr. Fl. Ned. Ind.: 171. 1825; King, J. Asiat. Soc. Bengal 64(2): 67. 1895; Ridl., Fl. Malay Penins. 1: 404. 1922; Corner, Wayside Tree Mal. 1: 457. 1940; Backer et Bakh.f., Fl. Java 2: 128. 1965; Pannell in Tree Fl. Malaya 4: 221. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 237. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 276. 1995.—*A. diepenhorstii* Miq., Fl. Ind. Bat., Suppl. 1: 507. 1861.—*A. paniculata* Kurz, Prelim. Rep. Forest Pegu: 34. 1875.—*A. odoratissima* Blume var. *parvifolia* Koord. & Valeton, Bijdr. Boomsoort. Java 3: 150. 1896.—*A. odoratissima* Blume var. *forbesii* Baker f., J. Bot. Lond. 62. 19: 1924.—*A. cuspidella* Ridl., Kew Bull. 367: 1930.—*A. fraseri* Ridl., Kew Bull. 368: 1930.

Small to medium-sized trees 3-15(-20) m high, 30-100 cm girth. *Twigs* smooth, grey, lenticellate and reddish brown indumentum. *Bark* rather smooth, greyish; inner bark pink to orange; sapwood white; heartwood brownish. *Leaves* imparipinnate, 5-10 cm long, spirally arranged; leaflet 1-2(-3) pairs, obovate, oblanceolate, rarely obtuse, 7-13 by 3-5 cm, opposite or slightly opposite; chartaceous to subcoriaceous, glossy green upside, pale beneath, glabrous both sides except sparsely indumentum along midrib beneath; apex acuminate, rarely obtuse; base cuneate, rarely obtuse; margin entire; midrib prominent with sharp ridge beneath, flat or slightly depressed upside; secondary nerves 5-7 pairs, conspicuous beneath, hardly distinct especially in fresh stage upside, arched and more or less anastomosing near margin; other veins hardly distinct. *Petiole* 2-5(-9) cm long, slender, petiolules 0.5-2 cm long, all with dense dark brown indumentum throughout, then glabrescent. *Inflorescence* a thyrse compound, subbranches more or less keep thyrse-formed; axillary or supraaxillary, 10-40 cm long, many branchlets, hairy indumentum; peduncles 2-5 cm long, pedicels ca. 0.5 mm long, all hairy then glabrescent; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.2 mm long, lobes ca. 1/2 of all length, stellate tomentose outside, glabrous inside. *Corolla* 5, free, slightly obovate, ca. 0.5 mm long, glabrous, yellow, fragrant. *Staminal tube* obconical with androgynophore at base, all ca. 0.3 mm long, glabrous, margin entire or slightly undulate. *Stamens* 5, glabrous, apical of anther not protruded the marginal tube; filaments raised up around the middle of tube inside. *Ovary* with conspicuous gynophores, broader than height, glabrous or hairy; 3 loculi, each locule with 1 ovule always developed one; style and stigma indistinct. *Infructescence* upper leaf-scars or axillary, 10-20 cm long, erected or slightly recurved, indumentum and stellate hairs throughout. *Capsules* globose or ovoid, 1.5-2 by 1.5 cm, yellowish brown, stellate hairs indumentum, indehiscent. *Seeds* 1-2, ca. 1 cm in diam., enclosed with thin aril, edible.

T h a i l a n d.—NORTHERN: Chiang Rai, Lampang; NORTH-EASTERN: Loei; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Phetchaburi, Prachuap Khiri Khan; SOUTH-EASTERN: Sa Kaeo, Chon Buri; PENINSULAR: Chumphon, Ranong, Surat Thani, Nakhon Si Thammarat, Trang, Songkhla, Yala, Narathiwat.

D i s t r i b u t i o n.—Burma, Malaysia, Indonesia (type), Philippines.

E c o l o g y.—Evergreen to mixed deciduous forest, nearby stream, on granite bedrock; altitude 50-1,200 m (commonly 200-600 m). Flowering all year round (most commonly February-August); fruiting January-June.

V e r n a c u l a r.—Ma ti (มะตี) (Northern); Nuan paeng (นวลแป้ง), Khee hen (ขี้เห็น), Sang kried (สังเครียด), Sang kried luead (สังเครียดเลือด) (Peninsular).

U s e s.—Aril edible, timber for furnitures.

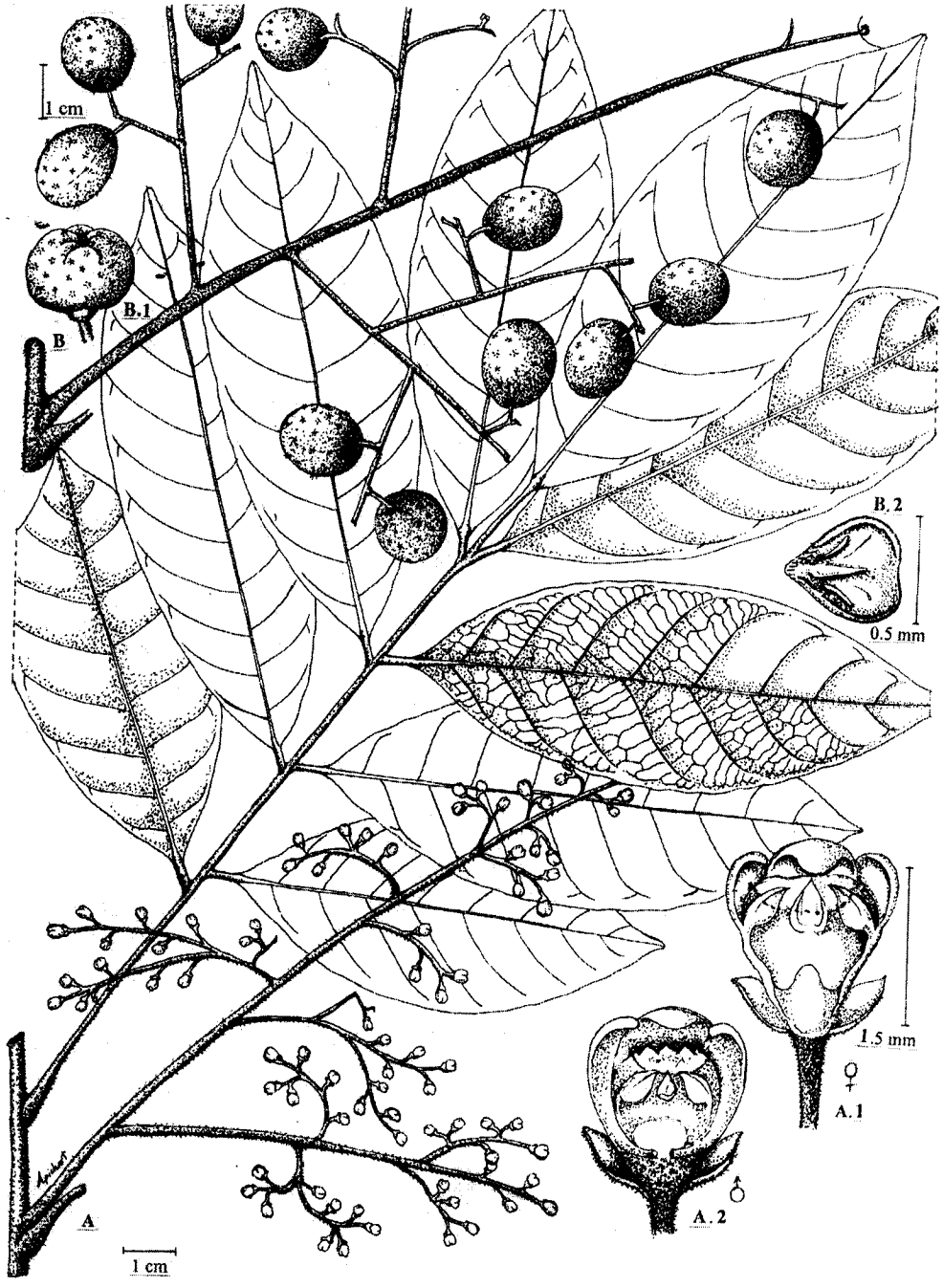

Fig. 23. *Aglaia oligophylla* Miq.: A. twig with inflorescences, A.1 longitudinal section of female flower & A.2 male flower (Put 1297A); B. infructescence, B.1 another form of drupe, B.2 cross section of seed (R. Geesink 7340).

20. Aglaia oligophylla Miq., Fl. Ind. Bat., Suppl. 1: 507. 1861; Pannell in Tree Fl. Malaya 4: 222. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 302. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 297. 1995.—*A. oligantha* C. DC. in DC., Monogr. Phan. 1: 603. 1878.—*A. pedicellata* C. DC. in DC., Monogr. Phan. 1: 607. 1878.—*A. glaucescens* King, J. Asiat. Soc. Bengal 64(2): 64. 1895.—*A. fusca* King, J. Asiat. Soc. Bengal 64(2): 62. 1895; Pannell in Tree Fl. Malaya 4: 215. 1989.—*A. euphorioides* Pierre, Fl. Forest. Cochinch. Fasc. 22: t. 338B. 1896.—*A. quocensis* Pierre, Fl. Forest Cochinch. Fasc. 22: t. 337B. 1896.

Trees (3-)5-10(-15) m high, (16-)30-70 cm girth; terminal buds oblong, 2-3 cm long, densely brownish hairs. *Bark* greyish brown to dark brown, smooth or slightly flaky; inner bark brownish to red. *Leaves* imparipinnate, 10-21 cm long, spirally arranged; leaflets 1-4 pairs, oblong, elliptic-oblong, obovate (apical one), 6-22 by 3-6 cm, opposite or slightly opposite; subcoriaceous to chartaceous, dull green both sides, sparsely hairs then glabrous; apex acuminate, caudate to acute; base obtuse, slightly oblique to slightly cuneate; margin entire or undulate sometime; midrib prominent beneath, depressed upside; secondary nerves 5-13 pairs, arched and anastomosing near margin, scalariform veins hardly distinct or conspicuous beneath. *Petiole* 2-13 cm long, slender and swollen near base; petiolules 0.3-1.5 cm, long, all with brown hairs indumentum throughout, then glabrescent. *Inflorescence* a thyrse compound, subbranches still keep thyrse-formed; on twigs or in axillary, 8-20 cm long, many branchlets; peduncles 3-5 cm long, pedicels ca. 2 mm long, all sparsely hairy, then glabrous; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 1/2 of all length, stellate tomentose outside, glabrous inside, ciliate. *Corolla* 5, free, slightly obovate, 1-1.5 mm long, glabrous, yellow. *Staminal tube* ovoid, ca. 1 mm long, glabrous, magin serrate. *Stamens* 5, apical of anthers slightly lower than the margin; filament raised up around the middle of tube inside. *Ovary* with conspicuous gynophores, broader than height, glabrous; 3 loculi, each locule with 1 ovule, always developed one; style and stigma indistinct. *Infructescence* upper leaf-scars or axillary, 15-20 cm long, erected or slightly recurved, indumentum and stellate hairs throughout. *Capsules* ellipsoid or round, ca. 1.5 by 1 cm, yellowish brown, stellate hairs indumentum, indehiscent without pressing. *Seeds* 1-2 seeds, ca. 1 cm in diam., enclosed with jelly pinkish red aril.

T h a i l a n d.—NORTH-EASTERN: Nakhon Phanom; EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Prachuap Khiri Khan; CENTRAL: Nakhon Nayok; SOUTH- EASTERN: Chachoengsao, Chanthaburi, Trat; PENINSULAR: Chumphon, Surat Thani, Phangnga, Phuket, Krabi, Nakhon Si Thammarat, Satun, Songkhla, Narathiwat.

D i s t r i b u t i o n.—Burma, Malaysia, Indonesia (type), Philippines.

E c o l o g y.—Nearby stream in evergreen forest, on limestone or granite bedrock; altitude 0-800 m (commonly 50-200 m). Flowering February-November (most commonly March-June); fruiting February-December (commonly April-August).

V e r n a c u l a r.—Ta maew pa (ตาแมวป่า).

U s e s.—Aril edible.

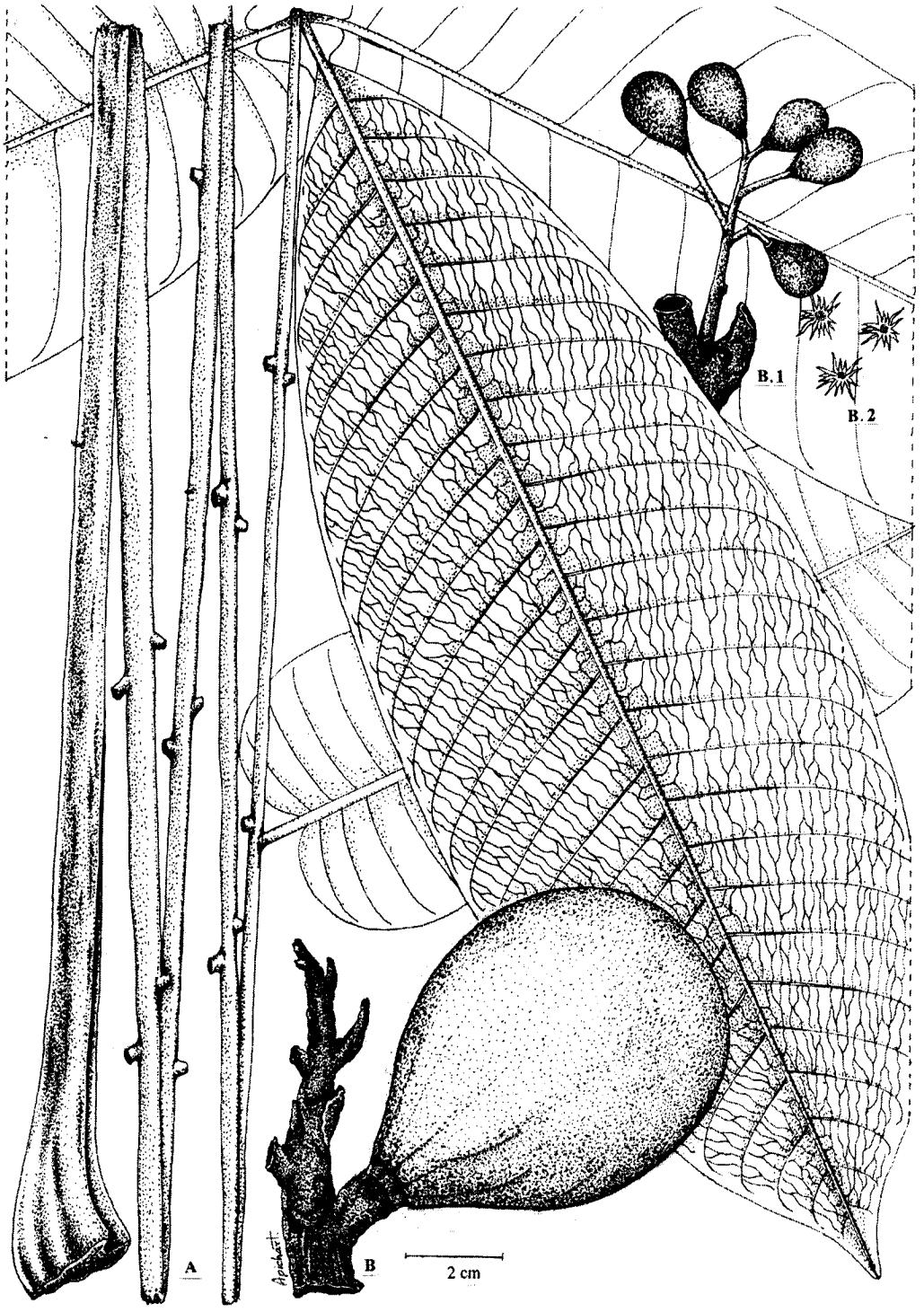

Fig. 24. *Aglaia pachyphylla* Miq.: A. twig; B.mature drupe (A.F.G. Kerr 17016), B.1 infructescence (young drupes), B.2 scales (R. Pooma 1392).

21. Aglaia pachyphylla Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 57. 1868; C. DC. in A. DC., Monogr. Phan. 1: 617. 1878; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 117. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 234. 1995.—*A. barbatula* Koord. & Valeton, Bijdr. Boomsoort. Java 3: 167. 1896; Backer & Bakh.f., Fl. Java 2: 126. 1965; Pannell in Tree Fl. Malaya 4: 213. 1989.

Trees 8-20 m high, 40-60 cm girth, slender and few branches; young shoots covered with dark orange brown hairs. *Twigs* stout, dark brown, stellate hairs, with longitudinal wavy ridges and prominently leaf-scars. *Bark* brown, greyish brown and longitudinal fissured; inner bark dark brown or pale yellowish brown; latex white; sapwood pinkish brown or pale brown; heartwood brown. *Leaves* imparipinnate, and lower lateral leaflets alternate, spirally arranged, 0.3-1.25 m long; leaflets 9-11 pairs, oblong, lanceolate, lanceolate-oblong, 11-31 by 4-8 cm, coriaceous, glossy green upside, pale to glaucous or reddish brown, hairy beneath; or glabrous on both sides; apex acuminate to acute; base cordate except the apical one, cuneate; margin entire; midrib and secondary nerves strongly prominent beneath and depressed upside; secondary nerves straight then arched near margin; scalariform veins conspicuous beneath. *Petiole* 15-30 cm long, grooved upside and much swollen near base, petiolules 0.5-1 cm long. *Inflorescence* a thyrse compound, 10-40 long, densely stellate hairs, and indumentum all parts; axillary or supraaxillary near the end of twigs; peduncles 5-10 cm long, pedicels up to 1 mm long, covered with brown indumentum; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobes ca. 1/2 of all length, stellate outside, glabrous inside. *Corolla* 5, free, lobes slightly obovate to ellipical, up to 2 mm long, yellowish. *Staminal tube*, slightly cupuliform, ca. 1 mm long, glabrous, margin with 5 serrate lobes. *Stamens* 5, opposite at same level of marginal tube, white hairs at apex, filaments adnate the tube. *Ovary* globose and depressed upside, ca. 0.5 mm long, 3(-4) loculi, each locule with 1 ovule; style up to 0.5 mm long, stigma dilate, flat top, glabrous. *Infructescence* 5-20 cm long, stout, indumentum then glabrescent. *Drupe* ovoid, or subobovoid, up to 7 by 6 cm, leathery, pericarp 3-5 mm, thick. *Seeds* 2-4, ca. 4 cm long, 1.5 cm, thick, each completely enclosed with fleshy orange aril.

T h a i l a n d.—NORTHERN: Chiang Mai; SOUTH-WESTERN: Kanchanaburi; CENTRAL: Lop Buri; PENINSULAR: Ranong, Phatthalung, Narathiwat.

D i s t r i b u t i o n.—Malaysia, Brunei, Indonesia (type), Philippines.

E c o l o g y.—In evergreen forest, mixed deciduous forest, also in swamp forest, on limestone or sandstone bedrock; altitude 50-700 m. Flowering May-July; fruiting February-March.

V e r n a c u l a r.—Ta suea (ตาเสือ) (Southwestern); Chom phu samet (ชมพู่เสม็ด) (Peninsular).

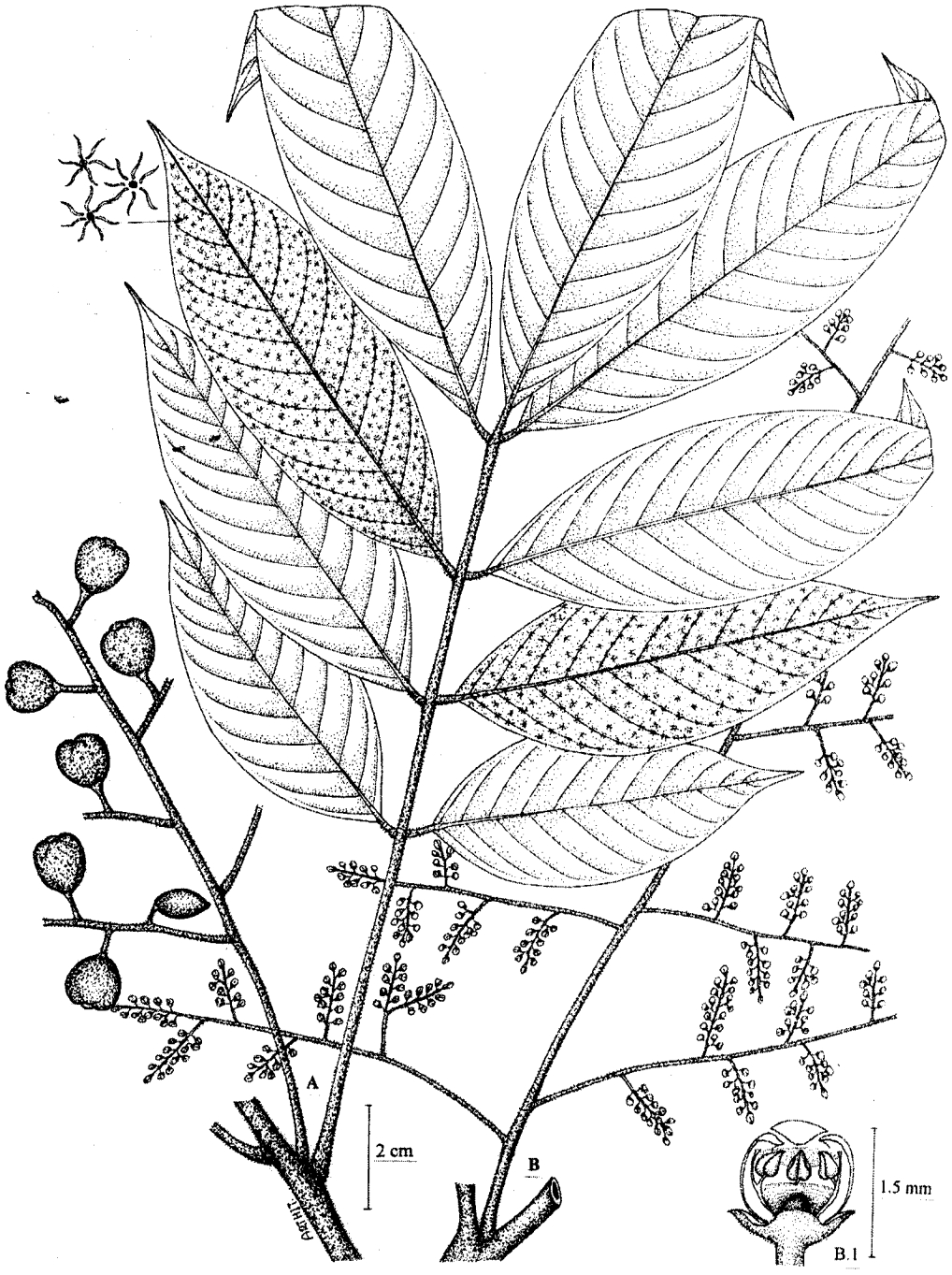

Fig. 25. *Aglaia palembanica* Miq.: A. twig with infructescence (S. Thawon 579); B. inflorescences, B.1 longitudinal section of flower (B. Sangkachand 696).

22. Aglaia palembanica Miq., Fl. Ind. Bat., Suppl. 1: 197, 507. 1861; Hiern in Hook.f., Fl. Brit. India 1: 557. 1875; King, J. Asiat. Soc. Bengal 64(2): 72. 1895; Ridl., Fl. Malay Penins. 1: 409. 1922; Corner, in Gard. Bull. Singapore, Suppl. 1: 131. 1978; Pannell in Tree Fl. Malaya 4: 223. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 323. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 304. 1995.—*Aglaia sipannas* Miq., Fl. Ind. Bat., Suppl. 1: 197, 506. 1861.—*Aglaia pamattonis* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 53. 1868.—*Aglaia palembanica* Miq. var. *longifolia* Craib.

Trees (5-) 10-20 m high, 50-70(-150) cm girth; young shoots tan brown. *Twigs* dark red with tomentose hairs indumentum. *Bark* smooth, brownish, reddish lenticels, or slightly flaky; inner bark yellow to reddish brown, fibrous. Wood fragrant. *Leaves* imparipinnate, 15-30 cm long, spirally arranged, simple and stellate hairs all parts; leaflets 2-10 pairs, elliptic-oblong, 7-12 by 2.5-3.5 cm, opposite or slightly opposite, chartaceous, dull dark green upside, pale with red stellate hairs beneath, glabrescent except along nerves; apex caudate to acuminate; base obtuse, slightly cuneate; margin entire or undulate, recurved; midrib prominent beneath, depressed upside densely hairs; secondary nerves 9-19 pairs, arched and more or less anastomosing, raised narrow ridge beneath, flat upside; scalariform conspicuous or hardly distinct beneath. *Petiole* 5-10 cm long, slender, petiolules 0.2-1.4 cm long, all densely hairs indumentum. *Inflorescence* a thyrse compound, subbranches spike-liked; axillary near end of twigs; 15-30 cm long, many branches; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 1/2 of all length, hairy outside, glabrous inside. *Corolla* 5, free, elliptic or obovate, 1-1.5 mm long, glabrous, white, scented. *Staminal tube* cupuliform, ca. 1 mm long, glabrous, margin slightly undulate. *Stamens* 5, as long as tube, filaments raised up around the middle of tube inside. *Ovary* a half ovate, less than 0.5 mm long; 3 loculi, each locule with 1(-2) ovule, always developed one, style and stigma hardly distinct. *Infructescence* upper leaf-scars or axillary, erected or pendulous, 10-15 cm long, tomentose hairs all parts. *Capsule* ovoid or slightly obovoid, usually retuse on top, 1-1.5 by 1 cm, indumentum and stellate hairs, then glabrescent; dull yellow to dark orange. *Seed* usually remain one, ellipsoid, ca. 1.5 by 1 cm, enclosed with thin aril.

T h a i l a n d.—NORTHERN: Chiang Mai; EASTERN: Nakhon Ratchasima; PENINSULAR: Chumphon, Ranong, Phangnga, Krabi, Nakhon Si Thammarat, Trang, Satun.

E c o l o g y.—In tropical evergreen forest, nearby stream, on granite bedrock; altitude 50-200 m. Flowering February-November (most commonly February-July); fruiting January-March.

V e r n a c u l a r.—Khoei lai (เขยหลาย) (Northern); Sang kried (สังเครียด) (Peninsular).

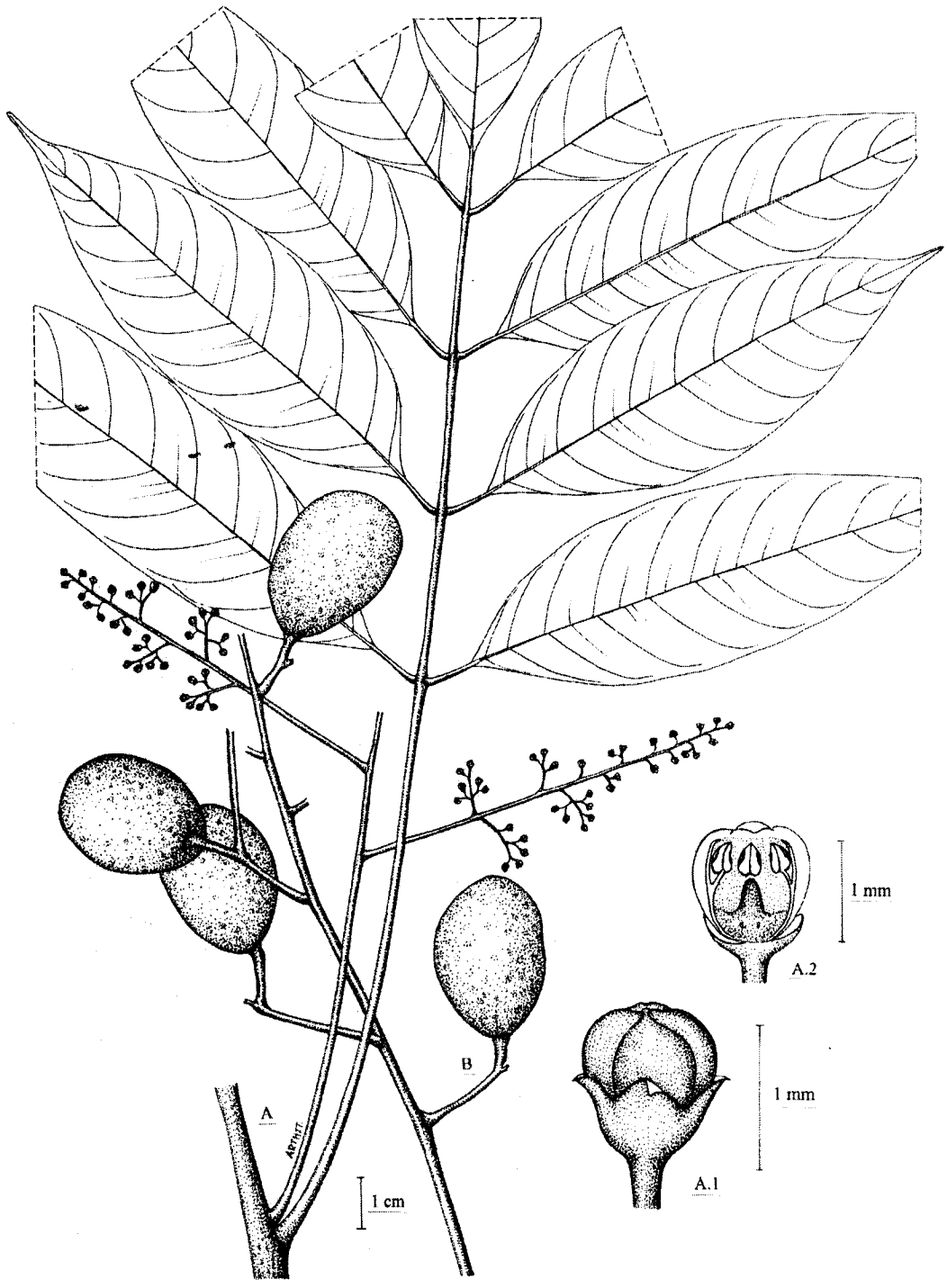

Fig. 26. *Aglaia perviridis* Hiern: A. twig with inflorescences, A.1 flower, A.2 longitudinal section of female flower (A.F.G. Kerr 13251); B. infructescence (C.F. van Beusekom & C. Phengklai 415).

23. Aglaia perviridis Hiern in Hook.f., Fl. Brit. India 1: 556. 1875; C. DC. in A. DC., Monogr. Phan. 1: 610. 1878; C.Y. Wu, Fl. Yunnan. 1: 239. 1977; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 198. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 260. 1995.—*A. kingiana* Ridl., J. Straits Branch Roy. Asiat. Soc. 82: 175. 1920, et Fl. Malay Penins. 1: 404. 1922.—*A. canarensis* Gamble, Kew Bull. 347.1915.

Trees (1.5-)5-15(-18) m high, (24-)40-80(-130) cm girth; terminal buds linear-oblong, 1-1.5 cm long, densely reddish brown indumentum and stellate hairs. *Twigs* densely reddish brown indumentum with stellate hairs then glabrescent, longitudinal lenticellate. *Bark* greyish to dark brown, rough and flaky; inner bark red or reddish brown. *Leaves* imparipinnate, 7-25 cm long, spirally arranged; leaflets 2-5 pairs, lanceolate to lanceolate-oblong, 8-12 by 2.5-3.5 cm, opposite or slightly opposite, chartaceous, glossy green and sparsely indumentum, then glabrous upside, pale beneath; apex acuminate, acute or minutely caudate; base obtuse, cuneate and slightly oblique; margin entire; midrib slightly prominent beneath, depressed upside; secondary nerves conspicuous on both sides or hardly distinct 7-10 pairs, other veins hardly distinct. *Petiole* 7-12 cm long, slender, slightly swollen near base, petiolules 1-1.5 cm long; all with indumentum, then glabrous. *Inflorescence* a thyrse compound, subbranches in thyrse-formed; axillary or supraaxillary, 20-30 cm long, many branchlets; peduncles 5-10 cm long, pedicels ca. 2 mm long, all sparsely indumentum, then glabrescent; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 0.5 mm long, lobes ca. 1/2 of all length, glabrous. *Corolla* 5, free, slightly obovate, ca. 1 mm long, glabrous, yellowish. *Staminal tube* cupuliform or slightly tubular, ca. 1 mm long, glabrous, smooth margin. *Stamens* 6 as long as marginal tube, filaments raised up around the middle of tube inside. *Ovary* dilate at base of tube, ca. 0.2 mm long, glabrous, 5 loculi, each locule with 1 ovule; style tubular ca. 0.3 mm long, glabrous, stigma indistinct. *Infructescence* upper leaf-scars or axillary, slightly recurved, 10-25 cm long, with reddish brown indumentum throughout, then glabrescent. *Capsules* ovoid or ellipsoid, 1.5-2.5 by 1.2-2 cm, densely reddish brown indumentum; yellowish to orange, hardly dehiscent. *Seed* usually 1, ellipsoid 2-2.5 cm long 1.5-2 cm wide and 1-1.5 cm thick, enclosed with brown aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai, Phitsanulok; SOUTH-WESTERN: Kanchanaburi, Phetchaburi; PENINSULAR: Krabi, Surat Thani.

E c o l o g y.—In mixed deciduous to evergreen forest, on limestone bedrock; altitude 180-1,350 m (commonly 400-900 m). Flowering April-October (most commonly April-July); fruiting November-August (most commonly March-July).

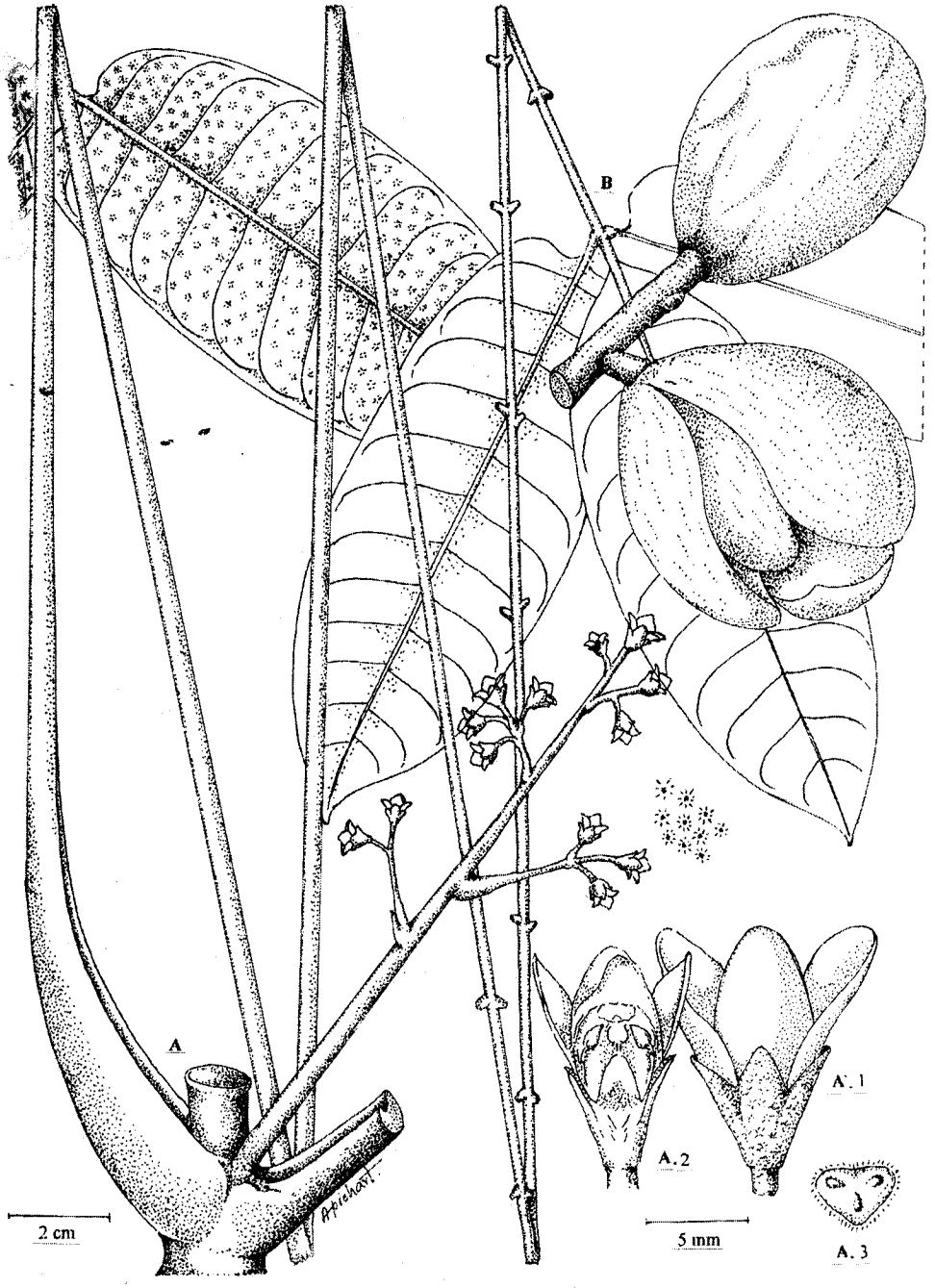

Fig. 27. *Aglaia rubiginosa* (Hiern) Pannell: A. twig with inflorescences, A.1 flower, A.2 longitudinal section of flower, A.3 cross section of ovary (A. Premrasami 32); B. part of infructescence (C. Niyomdham 802).

24. Aglaia rubiginosa (Hiern) Pannell, Malaysian Forester 45: 455. 1982; Pannell in Tree Fl. Malaya 4: 225. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 92. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 225. 1995.—*Amoora rubiginosa* Hiern in Hook.f., Fl. Brit. India 1: 561. 1875; King, J. Asiat. Soc. Bengal 64(2): 54. 1895; Ridl., Fl. Malay Penins. 1: 398. 1992; Corner, Gard. Bull. Singapore, Suppl. 1: 131, 198. 1978.—*Aglaia ignea* Valeton ex K. Heyne, Nutt. Pl. Ned.-Indië, ed. 1, 3: 59. 1917.

Trees 10-25 m high, 60-140 cm girth; young shoots dark orange brown. *Twigs* tomentose then glabrescent, smooth, sparsely with pale and round lenticels. *Bark* dull yellowish brown, the inner layer golden yellow. *Leaves* imparipinnate and lower lateral leaflets alternate, spirally arranged, 50-100 cm long (including petiole); leaflets 10-15 pairs, oblong and usually curved to one side, 10-15 by 3.5-5 cm, coriaceous, densely tomentose and pellucid dots, beneath; more or less glabrous and sparsely pellucid dots upside; apex acute to shortly caudate; base cordate (except the apical one obtuse); margin entire or slightly undulate and recurved; midrib and secondary nerves prominent beneath, depressed to subdepressed upside; secondary nerves 18-27 pairs, straight then curved near margin; other veins hardly distinct. *Petiole* 20-35 cm long, grooved upside and swollen near base; petiolules 0.5-1 cm long, wrinkled and dark when dry. *Inflorescence* a thyrse compound, 30-70 cm long, densely tomentose and indumentum all parts; axillary near end of twigs; peduncles 10-15 cm long, pedicels 2-3 mm long; bracts and bracteoles triangular 1.5-4 by 1-3 mm, caducous. *Flowers* polygamous. *Calyx* 3 obconical to slightly campanulate, all 4-5 mm long, lobes 1/3-1/2 of all length, tomentose outside, adpress hairs inside. *Corolla* 3, free, lobes oblong 4-5 mm long, glabrous and yellow. *Staminal tube* ovate, up to 3 mm long, glabrous, margin slightly undulate; or smooth. *Stamens* 6, anthers up to 3/4 of the tube, glabrous, filaments inconspicuous. *Ovary* obovoid, ca. 0.2 mm long, on a collar-liked, glabrous; 3 loculi, each locule with 1 ovule; style and stigma a nipple-liked on top. *Infructescence* erected or pendulous, 15-20 cm long, densely short tomentose hairs and lenticels. *Drupes* ovoid or slightly obovoid, 4.5-5.5 by 3.5-4.5 cm; densely tomentose and indumentum, epicarp leathery, ca. 0.5 cm thick; yellowish brown; dehiscing into 3-(4) longitudinal parts when mature. *Seeds* 1-3, ellipsoid, 3-3.5 by 2.5-3 cm, enclosed with orange aril.

T h a i l a n d.—CENTRAL: Nakhon Nayok; SOUTH-EASTERN: Trat; PENINSULAR: Surat Thani, Nakhon Si Thammarat, Phatthalung, Narathiwat.

D i s t r i b u t i o n.—Singapore, Malaysia (type).

E c o l o g y.—Lowland to peat swamp forest; altitude 0-400 m. Flowering March-July; fruiting December-May.

V e r n a c u l a r.—Ta suea (ตาเสือ) (Central); Chom phu samet (ชมพู่เสม็ด), Samui kaeng (สมุยแกง) (Peninsular).

Fig. 28. *Aglaia rufinervis* (Blume) Bentv.: A. inflorescences, A.1 longitudinal section of flower, A.2 stellate hairs; B. part of infructescence (Th. Wongprasert 078-73).

25. Aglaia rufinervis (Blume) Bentv., Acta Bot. Neerl. 11: 19. 1962; Backer & Bakh. f., Fl. Java 2: 127. 1965; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 317, f.96. 1992; Mabb. & Pannell, Fl. Males., ser. I, 12(1): 302. 1995.—*Trichilia rufinervis* Blume, Bijdr. Fl. Ned. Ind.: 164. 1825.—*Aglaia trichostemon* C. DC. in A. DC., Monogr. Phan. 1: 608. 1878; Ridley, Fl. Malay Penins. 1: 407. 1922; Pannell in Tree Fl. Malaya 4: 227. 1989.

Trees (4-)5-10 m high, 30-80 cm girth. *Twigs* dark brown, covered with dark brown stellate hairs. Sapwood pale orange brown. *Leaves* imparipinnate and lower lateral leaflets alternate or sub-alternate, spirally arranged, 30-100 cm long; leaflets 5-9 pairs, oblong or elliptical, 8-15 by 3-6 cm, subcoriaceous; apex caudate, acute to acuminate; base ovate with slightly oblique; margin entire; midrib and secondary nerves sharp and prominent beneath, strongly depressed upside; secondary nerves 8-12 pairs, arched and anastomosing; scalariform and reticulate veins conspicuous beneath. *Petiole* 10-15 cm long, much indumentum; petiolules 1-1.5 cm, densely pubescent. *Inflorescence* a thyrse compound, subinflorescence a spike-liked, 70-150 cm long, densely reddish stellate hairs; axillary near end of twigs; peduncles 8-15 cm long, pedicels more or less sessile or up to 1 mm long, all densely reddish hairs; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, obovoid or broadly campanulate, all ca. 1 mm long, lobes ca. 1/2 of all length, stellate hairs outside, glabrous inside. *Corolla* 5, free, obovate up to 2 mm long, glabrous, white or yellow. *Staminal tube* cupuliform, ca. 1 mm long, glabrous, margin entire. *Stamens* 5, as long as tube, filaments raised up from the staminal tube higher than the upper half of tube inside. *Ovary* ovate, ca. 1 by 1 mm, 2-3(-5) loculi, each locule with 1 ovule; more or less glabrous; style tubular, very short; stigma ovate, glabrous. *Infructescence* 1-2 m long, many branchlets, stellate hairs and indumentum throughout. *Drupes* ovoid or slightly obovoid ca. 1 cm diam. with one longitudinal persisted ridge; dark red to purple. *Seeds* ellipsoid enclosed with white or yellow aril.

T h a i l a n d.—PENINSULAR: Phangnga, Trang.

D i s t r i b u t i o n.—Singapore, Malaysia (type), New Guinea.

E c o l o g y.—In evergreen forest, preferred nearby stream, on granite bedrock; altitude 30-80 m. Flowering July-October; fruiting January-March.

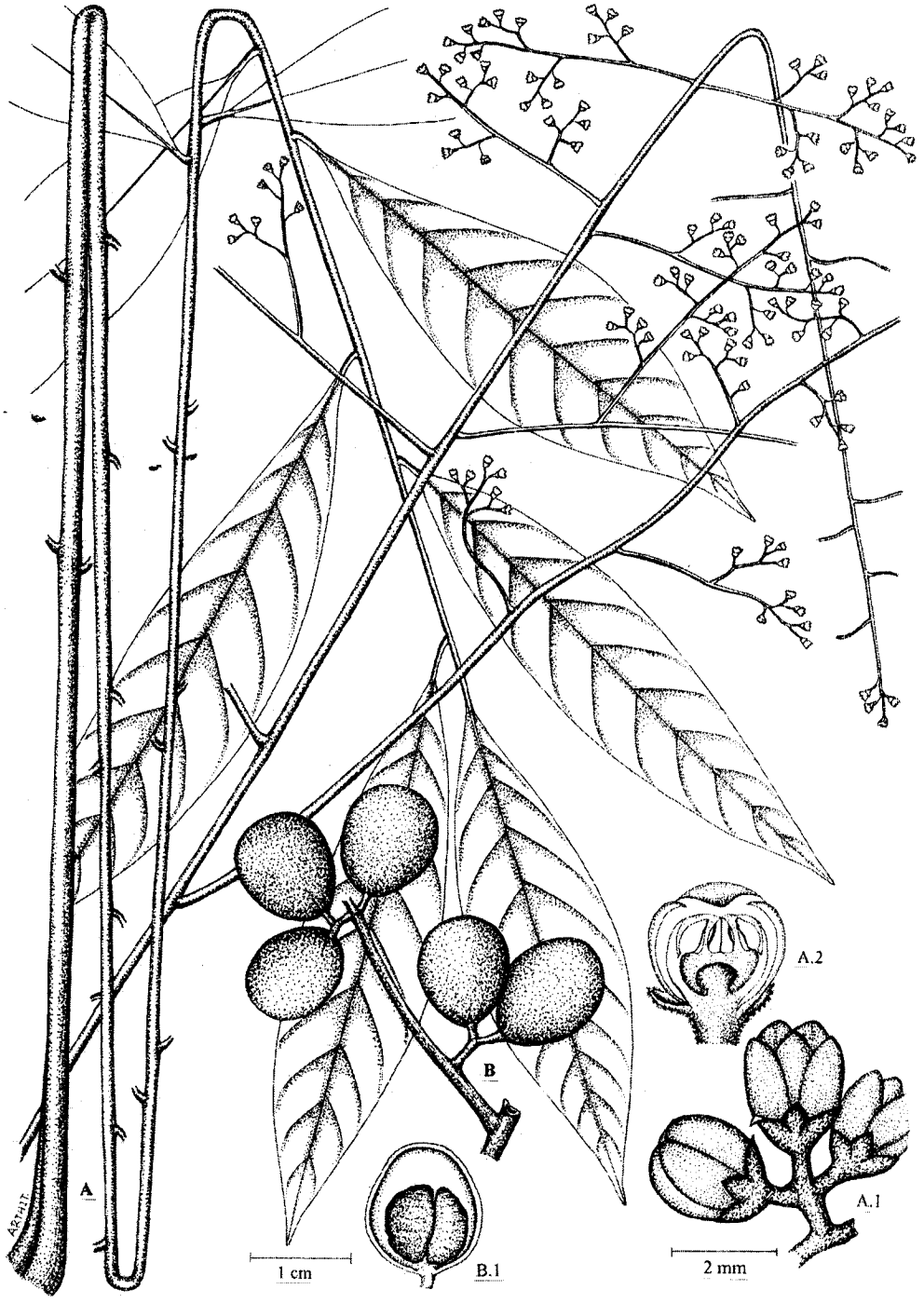

Fig. 29. *Aglaia sexipetala* Griff.: A. twig with inflorescences, A.1 flowers, A.2 longitudinal section of flower, (A.F.G. Kerr 12088); B. part of infructescence, B.1 longitudinal of drupe. (A.D.E. Elmer 11804).

26. Aglaia sexipetala Griff., Not. Pl. Asiat. 4: 505. 1854.—*Aglaia aspera* Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indie 27: 42. 1864; Backer & Bakh.f., Fl. Java 2: 127. 1965; Pannell in Tree Fl. Malaya 4: 211. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 217. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 268. 1995.—*A. acuminatissima* Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 27: 42. 1864.—*A. polyphylla* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 56. 1868.—*A. calelanensis* Elmer in Leafl. Philipp. Bot. 9: 3283. 1937.

Trees 8-15 m high, 40-80 cm girth. *Twigs* slender, smooth, dark brown, densely with reddish brown stellate scales, hairy. *Bark* smooth, greyish brown, or reddish brown, with pale brown lenticels. Sapwood yellowish brown, latex white. *Leaves* imparipinnate, 70-100 cm long, spirally arranged; leaflets 3-6 pairs, the lower lateral leaflets alternate; lanceolate-oblong; 7-10 by 3-3.5 cm, subcoriaceous, glabrous, glossy green upside, pale beneath; apex acuminate; base strongly oblique; margin entire; midrib prominent beneath; secondary nerves 7-14 pairs, first ascending then curved upward near margin, subconspicuous beneath; other veins hardly distinct. *Petiole* 10-20 cm long, petiolules 0.5-1 cm long, indumentum throughout. *Inflorescence* a thyrse compound, axillary near end of twigs, 25-40 cm long, subinflorescence a thyrse-formed, peduncles 10-15 cm long, slender, pedicels 2-3 mm long, scales or indumentum slightly glabrous; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobes ca. 1/2 of all length, hairy and indumentum outside, glabrous inside. *Corolla* 5, free, elliptic-oblong ca. 1 mm long, glabrous, yellow. *Staminal tube* broadly obovoid, 1-2 mm long, glabrous, margin entire or slightly undulate. *Stamens* 5, filaments raised up from staminal tube higher than the upper half of tube, apical of anthers more or less same level of marginal tube. *Ovary* ovoid or obovoid, ca. 0.5 mm 2(-4) loculi, each locule with 1 ovule; glandular hair; style and stigma hardly distinct. *Infructescence* on upper leaf-scars or axillary, up to 20 cm long, pendulous. *Drupes* globose or obovoid. 2-3 by 1.5-2 cm, epicarp thin, usually indehiscent, densely short hairs or scales; yellow to reddish brown. *Seeds* 1-2, ellipsoid, stony ca. 1.5 by 1 cm, enclosed with edible white aril.

T h a i l a n d.—NORTHERN: Phitsanulok; PENINSULAR: Chumphon.

D i s t r i b u t i o n.—Malaysia, Indonesia (type), New Guinea, Philippines.

E c o l o g y.—In evergreen forest; altitude 100-400 m. Flowering January-March; fruiting October-December.

U s e s.—Aril edible.

Fig. 30. *Aglaia silvestris* (M. Roem.) Merr.: A. twig with female inflorescences, A.1 female flower (A.F.G. Kerr 9681), A.2 part of male inflorescence; B. part of infructescence (T.G. Hartley 10521).

27. Aglaia silvestris (M. Roem.) Merr., Interpr. Herb. Amboin.: 210. 1917; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 193. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 259. 1995.—*Lansium silvestre* Roem., Fam. Nat. Syn. Monogr. 1: 99. 1846.—*Aglaia ganggo* Miq., Fl. Ind. Bat., Suppl. 1: 506. 1861; King, J. Asiat. Soc. Bengal 64(2): 65. 1895; Backer & Bakh.f., Fl. Java 2: 129. 1965; Pannell in Tree Fl. Malaya 4: 216. 1989.—*Aglaia pyramidata* Hance, J. Bot. (N.S.) 6: 331. 1877.—*Amoora manni* King ex Brandis, Indian Trees: 142. 1906.—*Aglaia baillonii* (Pierre) Pellegr. in Lecomte, Fl. Indo-Chine 1: 774. 1911.—*Aglaia acuminata* Merr., Phillipp. J. Sci., Bot. 9: 531. 1915.—*Aglaia micropora* Merr., Univ. Calif. Publ. Bot. 15: 129. 1929.

Trees (6-)10-20 m high, 60-130 cm girth. *Twigs* brown to reddish brown, puberulous to glabrous. *Bark* grey or light brown, smooth to scaly thick; inner bark red with white latex; sapwood brownish; heartword reddish brown, scented. *Leaves* imparipinnate, 20-70 cm long, spirally arranged; leaflets 4-10 pairs, alternate to sub-opposite, the lower lateral leaflets alternate; lanceolate, or ovate-lanceolate, 8-19 by 3-5.5 cm, subcoriaceous to chartaceous, glabrous, glossy green upside, golden brown beneath; apex acuminate to caudate; base cuneate; margin entire; midrib and secondary nerves prominent beneath, depressed upside; secondary nerves 10-15 pairs, arched but not anastomosing; other veins hardly distinct. *Petiole* 8-15 cm, slender and swollen near base; petiolules 0.3-1 cm, glabrescent. *Inflorescence* a thyrse compound, axillary or supraaxillary near end of twigs, 30-50 cm long, subinflorescence a thyrse-formed; peduncles 5-10 cm, long, slender; pedicels 2-3 mm long, scaly or indumentum to glabrous; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobes ca. 1/3 of all length, densely scales and indumentum outside, glabrous inside. *Corolla* 5, free, slightly oblanceolate, ca. 2 mm long, glabrous, greenish yellow to dark yellow. *Staminal tube* ovate, ca. 1.5 mm diam., glabrous, margin entire or slightly undulate. *Stamens* 5, filaments raised up from staminal tube higher than half of tube, apical of anthers up to the marginal tube. *Ovary* obcupuliform or slightly ovoid, ca. 1 mm diam.; 2-(4) loculi, each locule with 1 ovule, style and stigma hardly distinct. *Infructescence* upper leaf-scars or axillary, up to 30 cm long, pendulous. *Drupes* globose, ellipsoid or obovoid, 2.5-3.5 by 1.5-2.5 cm, epicarp thin, usually indehiscent, densely short hairs and scales; green, greenish brown to yellowish red. *Seeds* ellipsoid, stony, ca. 1.5 by 1 cm, enclosed with edible white aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai, Tak; EASTERN: Chaiyaphum; SOUTH-WESTERN: Kanchanaburi, Phetchaburi; SOUTH-EASTERN: Chanthaburi, Trat; PENINSULAR: Chumphon, Ranong.

D i s t r i b u t i o n.—Laos, Cambodia, Vietnam, Malaysia, Indonesia, New Guinea, Philippines (type).

E c o l o g y.—In evergreen to mixed deciduous forest, preferred nearby stream, on sandstone or limestone bedrock; altitude 50-1,300 m (most commonly 100-400 m). Flowering all year round (most commonly July-December); fruiting December-August (commonly March-July).

V e r n a c u l a r.—Chan cha mod (จันทน์ชะมด) (General); Sang kried kho ngong (สังเครียดคอโง้ง) (Southeastern).

U s e s.—Aril edible.

Fig. 31. *Aglaia simplicifolia* (Bedd.) Harms: A. twig with inflorescences, A.1 flower, A.2 staminal tube & outer part of stamen (C. Phengklai 74); B. infructescence (A.F.G. Kerr 3628).

28. Aglaia simplicifolia (Bedd.) Harms in Engl. & Prantl, Nat. Pflanzenfam. 3, 4: 300. 1896; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 306. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 298. 1995.—*Beddomea simplicifolia* Bedd., Fl. Sylv. S. India 1: t. 135. 1871.—*Beddomea simplicifolia* Bedd. var. *parviflora* Bedd., Fl. Sylv. S. India 1: 135. 1871.—*Beddomea simplicifolia* Bedd. var. *racemosa* Bedd., Fl. Sylv. S. India 1: 135. 1871.—*Beddomia racemosa* Ridl., J. Fed. Malay States Mus. 4: 10. 1909.—*Aglaia meliosmoides* Craib, Kew Bull. 68. 1913; Pannell in Tree Fl. Malaya 4: 219. 1989.—*Aglaia gagnepainiana* Pellegr., Bull. Soc. Bot. France 93: 320. 1946.

Shrubs to small trees (1-)5-10 m high, 20-80 cm girth. *Twigs* greyish brown, lenticellate, sparsely stellate hairs indumentum. *Leaves* simple, oblong or oblanceolate, 9-22 by 4-6.5 cm, spirally arranged, subcoriaceous, glabrous except along midrib beneath, glossy green upside, pale beneath; apex acuminate, acute, rarely broadly acute or retuse; base cuneate, obtuse or slightly oblique; margin entire, rarely crenate; midrib prominent beneath, depressed upside; secondary nerves 15-20 pairs, arched and more or less anastomosing near margin; scalariform veins subconspicuous beneath. *Petiole* 1-2(2.5) cm long, sparsely stellate hairs, usually, geniculate and swollen at both ends. *Inflorescence* a thyrse compound, axillary near end of twigs, 3-5(-10) cm long, densely tomentose all parts; peduncles 1-2 cm long, pedicels 2-2.5 mm long, hairy; bracts and bracteoles narrowly triangular, ca. 1 mm long, caducous. *Flowers* polygamous. *Calyx* (4-)5, broadly campanulate, all ca. 2 mm long, lobes ca. 2/3 of all length, pubescent outside, glabrous inside. *Corolla* 5, free, obovate or elliptic, ca. 2 by 1 mm, glabrous, yellowish. *Staminal tube* slightly urceolate, 1-2 mm long, glabrous, margin serrate or undulate. *Stamens* 5, lower than marginal tube. *Ovary* ovoid, hairy, 5-7 by 4-5 mm; 5 loculi, each locule with 1 ovule; style 2-3 mm long, sparsely hairs. *Infructescence* on upper leaf scars or axillary, up to 5 cm long, erected, with tomentose hairs. *Drupes* ovoid or ellipsoid, 15-2 by 1.2-1.5 cm, epicarp thin, leathery, usually indehiscent, densely short tomentose hairs throughout; persisted calyx united near base, hairy outside; fruit-stalk 2-4 mm long, tomentose. *Seeds* stony, 4 seeds, compacted, ovoid or ellipsoid 1-1.5 by 0.5 cm, enclosed with aril.

T h a i l a n d.—NORTHERN: Lampang, Phrae, Uttaradit; NORTH-EASTERN: Loei; PENINSULAR: Surat Thani, Trang.

D i s t r i b u t i o n.—India (type), Laos, Malaysia, Indonesia, N. Borneo, Philippines.

E c o l o g y.—In evergreen forest; on granite or limestone or sandstone bedrock; altitude 20-500 m (most commonly 100-400 m). Flowering February-April; fruiting April-August.

V e r n a c u l a r.—Hom klai (หอมไกล), Pra yong (ประยงค์), Kra duuk ling (กระดูกลิง), Hom khoi (หอมค่อย) (Northern); Dee ngu (ดีงู) (Peninsular).

U s e s.—Aril use as herb.

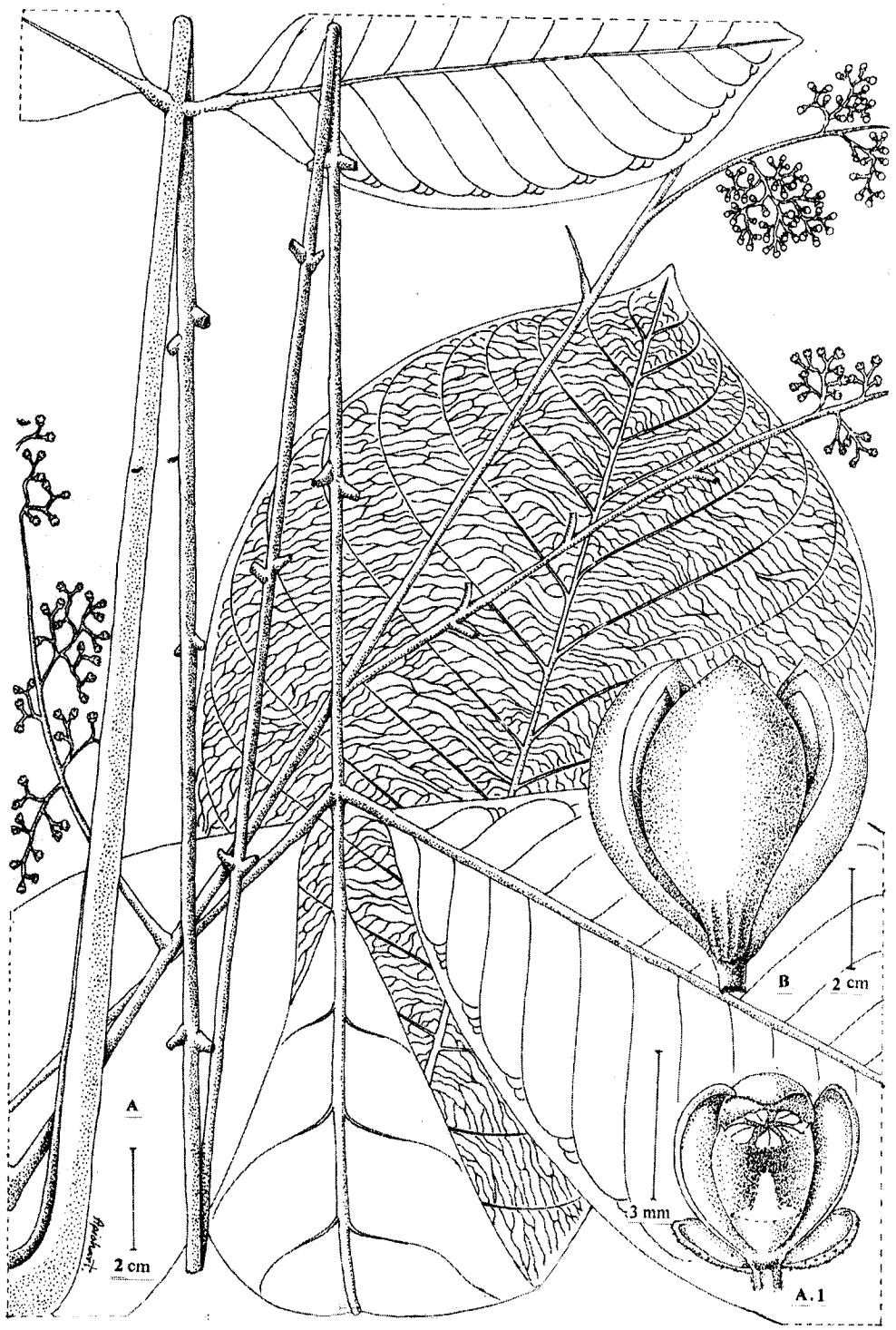

Fig. 32. *Aglaia spectabilis* (Miq.) Jain & Bennet: A. twig with inflorescences, A.1 longitudinal section of flower (C. Niyomdham 6310); B. drupe (R. Pooma 435).

29. Aglaia spectabilis (Miq.) Jain & Bennet, Indian J. Forest 9(3): 271. 1987; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 79. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 221. 1995.—*Amoora spectabilis* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 37. 1868; Hiern in Hook.f., Fl. Brit. India 1: 561. 1875.—*Amoora gigantean* Pierre in Laness., Pl. Util. Col. Franc.: 311. 1886, & Fl. Forest Cochinch. Fasc. 22: t. 343A. 1896.—*Amoora ridleyi* King, J. Asiat. Soc. Bengal 64(2): 56. 1895; Ridl., Fl. Malay Penins. 1: 398. 1922.—*Amoora wallichii* King, J. Asiat. Soc. Bengal 64(2): 56. 1895.—*Aglaia gigantean* (Pierre) Pellegr. in Lecomte, Fl. Indo-Chine 1: 769. 1911.—*Aglaia ridleyi* (King) Pannell, Malaysian Forester 45: 455. 1982; Pannell in Tree Fl. Malaya 4: 223. 1989.—*Amoora stellatosquamosa* C. Y. Wu, Fl. Yunnan. 1: 233. 1977.

Trees (7-)10-25(-40) m high, 50-150(-240) cm girth; terminal buds oblong, 4-5 cm long, with longitudinal angulars, densely stellate tomentose indumentum. *Twigs* stout, yellowish brown of stellate indumentum, then glabrescent. *Bark* brownish, rough, longitudinal lenticellate, roughly flaky; inner bark with red and white stripes. *Leaves* imparipinnate, 20-100 cm long, spirally arranged, glabrous or sparsely puberulous indumentum, then glabrescent; leaflets 6-10 pairs, oblong, lanceolate- oblong to obovate; apical leaf obovate, not less than 25 by 7.5 cm; opposite or slightly opposite, subcoriaceous to chartaceous; glabrous, with many pellucid-liked dots upside; glabrous or sparsely stellate hairs, then glabrescent beneath; the apical one always obovate or oblanceolate; apex acute, acuminate or obtuse; base cuneate, obtuse, slightly oblique; margin entire, recurved; midrib prominent beneath, slightly stellate, indumentum and depressed upside; secondary nerves 17-20 pairs, first straight then curved and more or less anastomosing near margin; other veins hardly distinct. *Petiole* 15-23 cm long, slender, sparsely with indumentum; petiolules 1-2.5 cm, sparsely stellate indumentum then glabrous. *Inflorescence* a thyrse compound, slightly pendulous, many branches, subbranches thyrse-formed; axillary or supraaxillary, 20-80 cm long; peduncles up to 10 cm long, pedicels 1-2 mm, long, orange brown or olive green; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 3, broadly campanulate, all ca. 1.5 mm long, lobe ca. 2/3 of all length, sparsely stellate hairs indumentum then glabrescent outside, glabrous inside. *Corolla* 3, free, linear to oblanceolate, ca. 3 mm long, alternate with calyx lobes, yellow to yellowish orange. *Staminal tube* obconical, ca. 2 mm long, glabrous, margin smooth. *Stamens* 5, as long as tube. *Ovary* obconical or obtriangular, ca. 1 mm long, glabrous, style tubular ca. 1 mm long, glabrous; stigma not conspicuous. *Infructescence* upper leaf-scars, 5-14 cm long, erected, few capsules. *Capsules* ovoid or obovate with strongly 3 longitudinal lobes, 4-6 by 4-6 cm; orange brown to bright orange, tomentose, dehiscent. *Seed*, 1 seed per lobe, ca. 3.5 cm long 2-2.5 cm wide and 1.5 cm thick, enclosed a part with red aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Nan; NORTH-EASTERN: Nakhon Phanom; EASTERN: Nakhon Ratchasima; SOUTH-EASTERN: Chon Buri; PENINSULAR: Ranong, Phangnga, Nakhon Si Thammarat, Phatthalung, Satun.

D i s t r i b u t i o n.—India (type), Sikkim, China, Burma, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, Australia.

E c o l o g y.—In evergreen forest preferred nearby streams, on sandstone bedrock; altitude 130-1,600 m (commonly 100-600 m). Flowering June-November; fruiting December-October (commonly March-June).

V e r n a c u l a r.—Mu do (มูโด), Ta suea (ตาเสือ) (Peninsular).

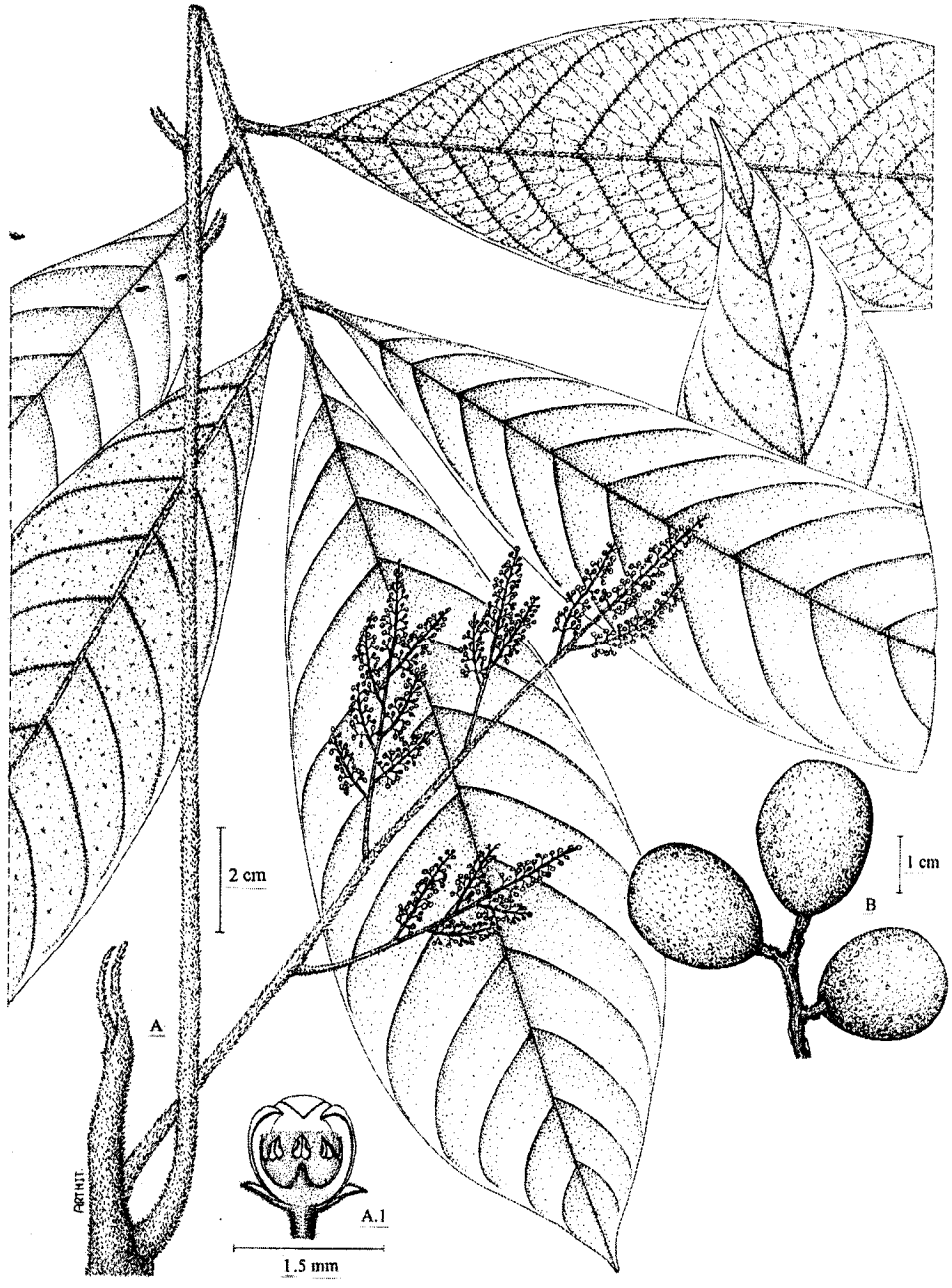

Fig. 33. *Aglaia tenuicaulis* Hiern: A. twig with inflorescences, A.1 longitudinal section of flower (D. Prapat 43); B. part of infructescence (K. Chayamarit et al. 2588).

30. Aglaia tenuicaulis Hiern in Hook.f., Fl. Brit. India 1: 556. 1875; King, J. Asiat. Soc. Bengal 64(2): 76. 1895; Ridl., Fl. Malay Penins. 1: 408. 1922; Pannell in Tree Fl. Malaya 4: 226. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 313. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 301. 1995.—*Aglaia acuminatissima* Teijsm. & Binn. var. *kambangana* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 48. 1868.

Trees 5-12 m high, 30-70 cm girth; terminal buds lanceolate 2-3.5 cm long, densely tomentose and stellate hairs. *Twigs* densely stellate tomentose; young shoots orange brown, tomentose. *Bark* brown, smooth; inner bark creamy with interval red stripes; sapwood whitish. *Leaves* imparipinnate 30-100 cm long, spirally arranged, lower lateral leaflets alternate; densely reddish brown tomentose hairs; leaflets 2-5(-6) pairs, oblong or lanceolate-oblong; 18-30 by 6-10 cm, chartaceous, densely stellate tomentose beneath, puberulous to glabrous upside; apex caudate, acuminate to acute sometime; base slightly cuneate or oblique, not cordate; margin entire, recurved; midrib strongly prominent beneath, depressed upside; secondary nerves 10-21 pairs, arched and more or less anastomosing; scalariform veins conspicuous or hardly distinct beneath, all densely tomentose and stellate hairs. *Petiole* 20-30 cm long, hairy, swollen near base; petiolules 1-1.5 cm long, hairy. *Inflorescence* a thyrse compound, subinflorescence a spike-liked, axillary near terminal, 15-30 cm long, densely stellate indumentum all parts; peduncles 5-10 cm long, hairy; pedicels ca. 1 mm long, hairy; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all ca. 1 mm long, lobes ca. 1/2 of all length, densely hairs outside, glabrous inside. *Corolla* 5, free, slightly obovate, ca. 1 mm long, glabrous, yellowish. *Staminal tube* cupuliform, ca. 0.5 mm long, margin entire, glabrous, filaments raised up from the staminal tube around half or lower from the half of tube inside. *Ovary* triangular-tubular, ca. 1.5 by 1 mm, glabrous; 1-2 loculi, each locule with 1 ovule; style and stigma hardly distinct. *Infructescence* on upper leaf scars or axillary, up to 10 cm long, many branches, erected, stellate tomentose throughout. *Drupes* ovoid or ellipsoid, 2-3.5 by 2-3 cm, epicarp thin but hard, densely stellate indumentum, more or less indehiscent. *Seeds* ellipsoid, depressed both sides; 1.5-2 by 1.4-1.7 wide and 1.2-1.4 thick enclosed with thin aril.

T h a i l a n d.—NORTHERN: Chiang Mai; PENINSULAR: Ranong, Surat Thani, Phangnga, Phatthalung.

D i s t r i b u t i o n.—Malaysia (type), Singapore, Indonesia, Philippines.

E c o l o g y.—In evergreen forest, preferred nearby stream, on granite or limestone bedrock; altitude 30-700 m (most commonly 30-120 m). Flowering March-August; fruiting August-February.

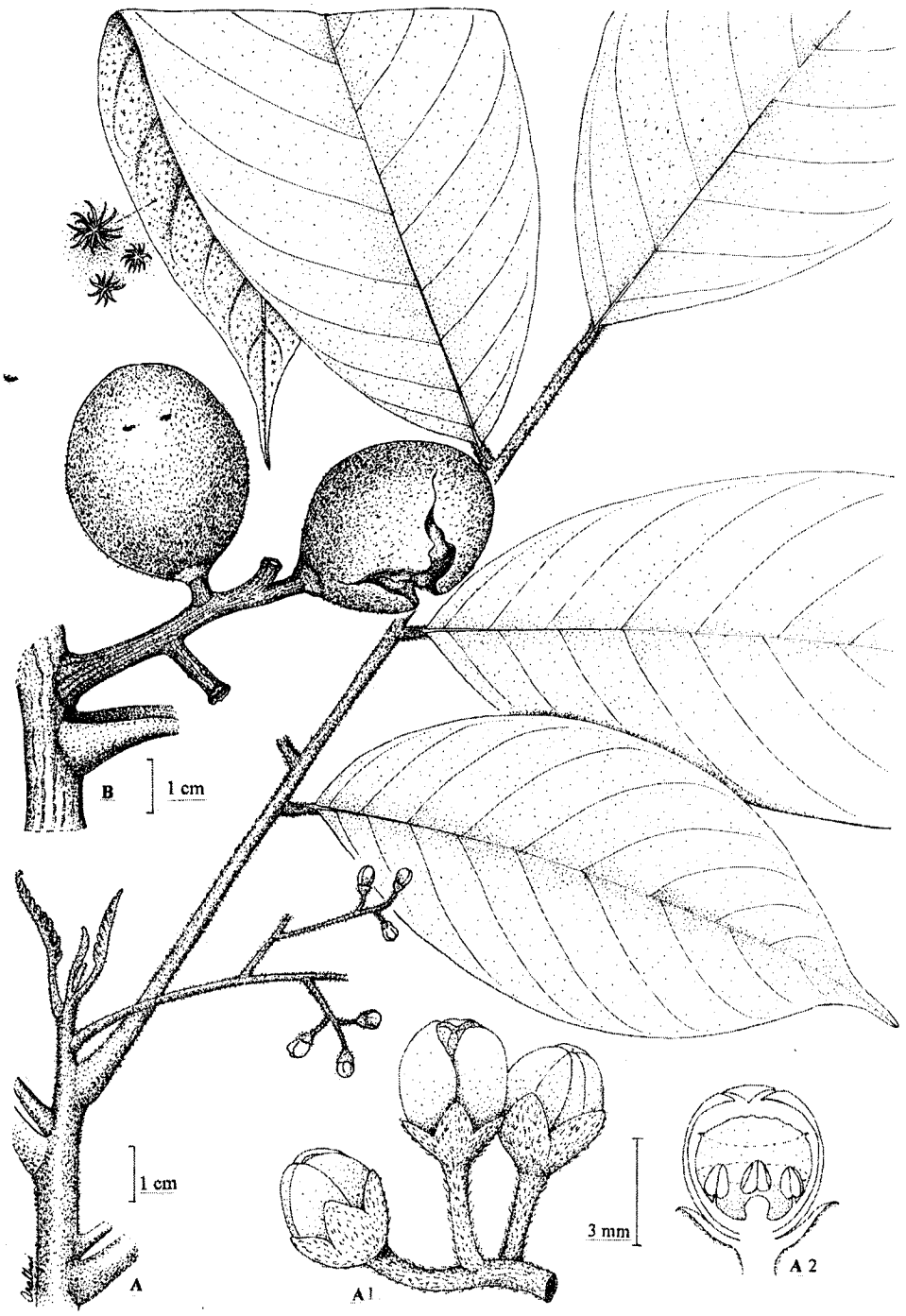

Fig. 34. *Aglaia teysmanniana* (Miq.) Miq.: A. twig with female inflorescences, A.1 cluster of flowers, A.2 longitudinal section of flower (A.F.G. Kerr 18219); B. infructescence (D.J. Middleton et al. 1371).

31. Aglaia teysmanniana (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 48. 1868; Pannell in Tree Fl. Malaya 4: 226. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia: 108. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 231. 1995.—*Amoora teysmanniana* Miq., Fl. Ind. Bat., Suppl. 1: 196. 503. 1861.—*Aglaia heptandra* Koord. & Valeton, Bijdr. Boomsoort. Java 3: 132. 1896; Backer & Bakh.f., Fl. Java 2: 126. 1965.—*Amoora stellata* C.Y. Wu, Fl. Yunnan. 1: 234. 1997.

Shrubs to medium-sized trees (2-)5-15(-20) m high, (20-)50-80(-120) cm girth; terminal buds oblong 1-2 cm long, densely stellate tomentose. *Twigs* densely stellate tomentose hairs. *Bark* brown or grey, smooth or scaly; sapwood brownish. *Leaves* imparipinnate, 15-50(-100) cm long, spirally arranged; leaflets 1-5 pairs, alternate; the lower lateral leaflets alternate; oblong, oblanceolate, elliptic or ovate, 12-33 by 6-11 cm, chartaceous, glabrous and dull green upside, pale and much stellate tomentose hairy beneath; apex caudate acuminate to acute; base obtuse, slightly cuneate and oblique; margin entire, recurved; midrib prominent beneath, depressed upside; secondary nerves 10-23 pairs, arched and more or less anastomosing at margin, all densely short stellate hairs; other veins hardly distinct. *Petiole* 9-21 cm, swollen near base; petiolules 0.5-2 cm long, all densely stellate tomentose hairs. *Inflorescence* a thyrse compound, axillary or supraaxillary near end of twigs, 8-15 cm long; subinflorescence a thyrse-formed; peduncles, 3-5 cm long, slender; pedicels 3-5 mm long; all dense hairs throughout; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate, all 1-1.5 mm, lobes ca. 1/2-2/3 of all length; densely hairs outside, glabrous inside. *Corolla* (3-)5, free, slightly obovate, 2-3 mm long, glabrous or sparsely pubescent outside, yellowish. *Staminal tube* cupular, ca. 2 mm long, glabrous, margin slightly undulate. *Stamens* 5-(6-7), filaments raised up from staminal tube lower from the half of tube inside, apical of anthers not protruding the marginal tube. *Ovary* round, ca. 1 mm diam.; glabrous; (2-) 3 loculi, each locule with 1-2 ovules; style and stigma not conspicuous. *Infructescence* upper leaf-scars or axillary, erected or slightly pendulous, 5-25 cm long. *Drupes* ovoid or ellipsoid, 3-4 by 2-3 cm, short and stellate hairs then glabrescent, creamy brown to reddish brown when mature. *Seeds* 1-5 enclosed with dark red aril.

T h a i l a n d.—NORTHERN: Chiang Mai; NORTH-EASTERN: Loei; SOUTH-WESTERN: Kanchanaburi; SOUTH-EASTERN: Trat; PENINSULAR: Chumphon, Ranong, Surat Thani, Trang.

D i s t r i b u t i o n.—China, Vietnam, Malaysia, Indonesia (type), Philippines.

E c o l o g y.—In evergreen to mixed deciduous forest, preferred nearby stream, on granite or sandstone or limestone bedrock; altitude 10-1,200 m (commonly 80-400 m). Flowering February-June; fruiting April-January (commonly April-August).

V e r n a c u l a r.—Sang kried yai (สังเครียดใหญ่) (Southeastern); Mod sang rong hai (มดสังร้องไห้) (Peninsular).

U s e s.—Aril edible.

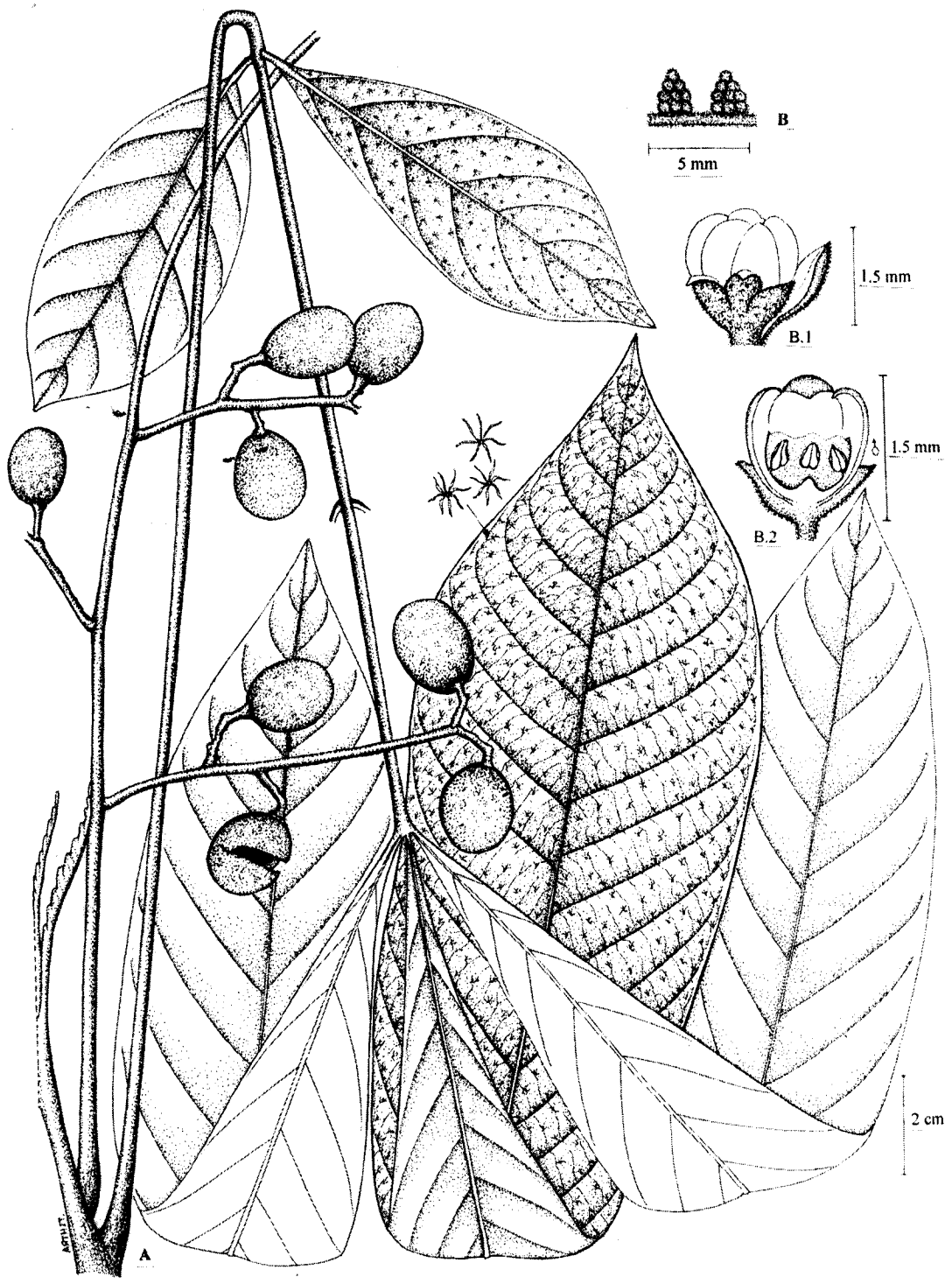

Fig. 35. *Aglaia tomentosa* Teijsm. & Binn.: A. twig with infructescences (C.F. van Beusekom et al. 310); B. part of inflorescence, B.1 flower, B.2 longitudinal section of male flower (A.F.G. Kerr 17121).

32. Aglaia tomentosa Teijsm. & Binn., Natuurk. Tijdschr. Ned-Indië 27: 43. 1864; Pannell in Tree Fl. Malaya 4: 226. 1989; Pannell, Kew Bull., Add. Ser. 16, Taxon Monog. Gen. Aglaia : 331. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 306. 1995.—*Aglaia minutiflora* Bedd., Icon. Pl. Ind. Or. 1: 44, t. 193. 1874; Hiern in Hook.f., Fl. Brit. India 1: 557. 1875.—*Aglaia minutiflora* Bedd. var. *travancorica* Hiern in Hook.f., Fl. Brit. India. 1: 557. 1875—*Aglaia cordata* Hiern in Hook.f., Fl. Brit. India 1: 557. 1875; King, J. Asiat. Soc. Bengal 64(2): 73. 1895; Ridl., Fl. Malay Penins. 1: 409. 1922; Pannell in Tree Fl. Malaya 4: 214. 1989.—*Milnea harmandiana* Pierre, Fl. Forest Cochinch. Fasc. 21: t. 333. 1895.—*Aglaia palembanica* Miq. var. *longifolia* Craib, Fl. Siam Enum. 1: 258. 1926.

Shrubs to small trees (2-)5-10(-12) m high, (20-)40-60 cm girth; terminal buds lanceolate 2-3 cm long, densely tomentose, stellate hairs indumentum throughout, same as the twigs. *Bark* smooth or flaky, brown, pinkish brown, dark brown or grey; inner bark yellowish or yellowish cream; heartwood reddish brown. *Leaves* imparipinnate, 10-80 cm long, spirally arranged, densely stellate tomentose hairs on both sides and persisting on lower surface; leaflets 2-9 pairs, obovate, oblanceolate to oblanceolate-oblong, 7-29 by 3.5-7 cm, opposite or slightly opposite, chartaceous, green with sparsely stellate indumentum, then glabrescent upside, densely tomentose stellate hairs indumentum beneath, especially along nerves; apex acuminate, caudate to acute; base cuneate to acute; margin entire, recurved; midrib prominent beneath, faintly upside; secondary nerves (5-)7-23(-30) pairs, first straight then curved and more or less anastomosing near margin, scalarifom veins conspicuous beneath or hardly distinct. *Petiole* 5-30 cm long, densely tomentose, stellate hairs; petiolules sessile to 0.5 cm long, hairy. *Inflorescence* a thyrse compound, subbranchlets a head-liked or spike-liked; axillary or supraaxillary, 8-30 cm long, many branches; peduncles 5-15 cm long; pedicels sessile or up to 1 mm long, all densely tomentose stellate hairs; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* (3-)5 broadly campanulate, all ca. 1 mm long, lobes ca. 1/2 of all length, stellate indumentum outside, glabrous inside. *Corolla* 5, free, ovate, ca. 1.5 mm, long, glabrous, white to yellowish or pinkish white, fragrant. *Staminal tube* cupuliform, ca. 1 mm long, glabrous, margin shallowly 5 lobes. *Stamens* 5, shorter than tube, filaments raised up more or less at the middle of tube inside. *Ovary* slightly curved up at the buttom of tube, less than 0.5 mm long glabrous; 3-4 loculi, each locule with 1 ovule, always developd one; style and stigma indistinct. *Infructescence* upper leaf-scars or axillary, erected or slightly pendulous, 20-30 cm long, densely short tomentose hairs indumentum. *Capsule* globose or ellipsoid (1-)1.5-2 by 1-2 cm, short hairs indumentum, indehiscent without pressing, brown, orange or yellowish orange. *Seed* ellipsoid, usually one, enclosed with orange red to dark brown aril, edible.

T h a i l a n d.—NORTHERN: Kamphaeng Phet; SOUTH-WESTERN: Kanchanaburi, Prachuap Khiri Khan; PENINSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Phuket, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Pattani.

D i s t r i b u t i o n.—India, Laos, Vietnam, Malaysia, Singapore, Indonesia, Philippines, Australia.

E c o l o g y.—In evergreen and mixed deciduous forest, nearby stream, on granite or limestone or sandstone bedrock; altitude 0-1,050 m (commonly 100-500 m).

Flowering February-November (commonly June-September); fruiting April-December (commonly December-May).

V e r n a c u l a r.—Sang kried (สังเครียด), Nuai Fai (หน่วยฝ้าย), Huad ngo (หวดเงาะ) (Peninsular).

U s e s.—Aril edible.

2. APHANAMIXIS

Aphanamixis Blume, Bijdr, Fl. Ned. Ind.:169.1825; Penn. in Blumea Bijdr. Fl. Ned. Ind.: 485. 1975; Mabb. Blumea 31.1: 136. 1985; Mabb. & Pannell, Fl. Males. ser.I, 12(1): 187. 1995.

Tree, indumentum of simple or sometimes basally bifid and stellate hairs. *Leaves* imparipinnate, leaflets opposite. *Inflorescence* axillary to supraaxillary; male flowers in panicles, female and hermaphrodite in long spikes or racemes, rarely panicles (in Thailand only in spikes). *Male flowers* distinctly smaller than female. *Calyx* deeply 5-lobed, lobes imbricate. *Petals* 3, imbricate, united with staminal tube basally. *Staminal tube* globose to deeply cyathiform; anthers 3-6, glabrous, inserted within tube. *Disk* absent. *Ovary* 3(4-) locular, each locule with (1)2 collateral to superposed ovules; style stout; stylehead conical to truncate, 3-angled or with impressions of anthers. *Drupe* 2-3-(4) valved, loculicidal, locule 1-2 seeded. *Seeds* arillate; cotyledons plano-convex, collateral united; radicle small, superior, included.

KEY TO THE SPECIES

1. Leaflets chartaceous. Stamens always 3 **2. A. sumatrana**
1. Leaflets coriaceous or subcoriaceous. Stamens always 6 **1. A. polystachya**

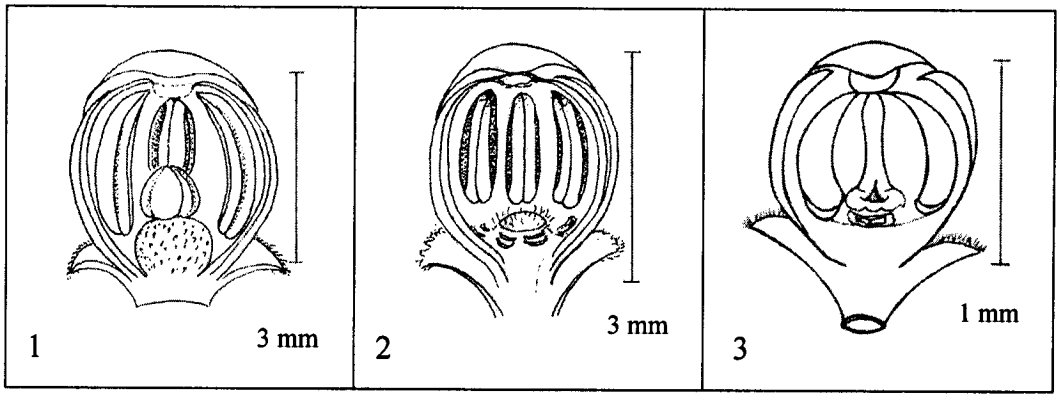

Fig. 36. Longitudinal section of flower in Genus *Aphanamixis*: 1) *Aphanamixis polystachya* ♀; 2) *A. polystachya* ♂; 3) *A. sumatrana*.

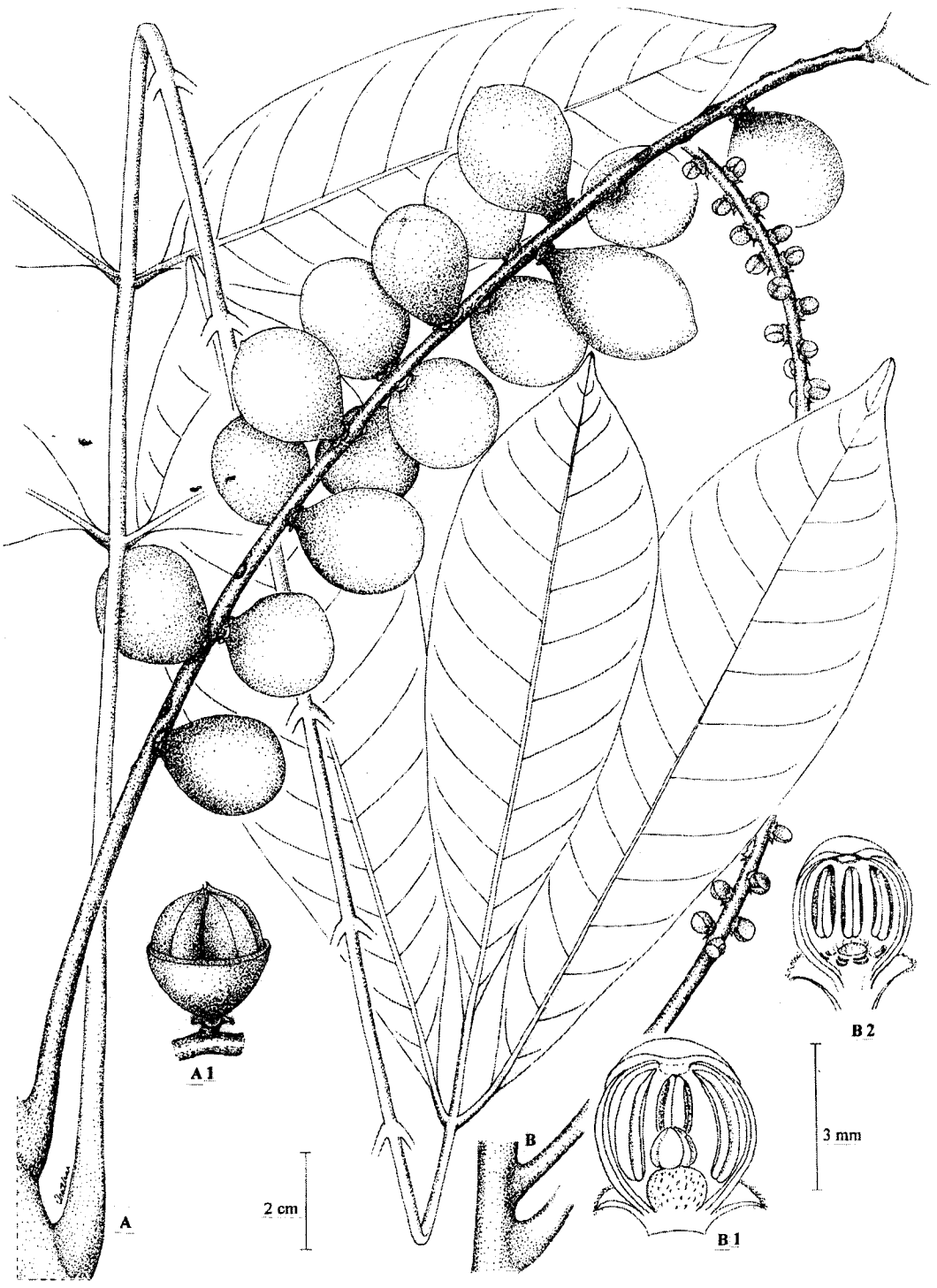

Fig. 37. *Aphanamixis polystachya* (Wall.) R. Parker: A. twig with infructescence, A.1 drupe shown seeds & aril (C.F. van Beusekom & C. Phengklai 2663); B. female inflorescence, B.1 longitudinal section of female flower, B.2 longitudinal section of male flower (R. Geesink 5068).

1. Aphanamixis polystachya (Wall.) R. Parker, Ind. For. 57: 486. 1931; Pellegr. in Fl. Indo-Chine, Suppl. 1: 714. 1948; C.Y. Wu, Fl. Yunnan 1: 230. 1977; Mabb. in Blum. 31: 137. 1985; Pannell in Tree Fl. Malaya 4: 230. 1989, et Fl. Males. ser. I, 12(1): 188. 1995.—*Aglaia polystachya* Wall. in Roxb. Fl. Ind. 2: 429. 1824.—*Amoora polystachya* (Wall.) Wight et Arn. ex Steud. Nomencl. ed. 2, 1: 78. 18740; Craib, Fl. Siam Enum. 1: 260. 1926.—*Amoora rohituka* (Roxb.) Wight et Arn. in Wight, Cat.: 24. 1833; Hiern in Hook.f., Fl. Brit. India 1: 559. 1875; Kurz, Forest Fl. Burma 1: 220. 1877; King, J. Asiat. Soc. Bengal 64.2: 53. 1895; Brandis, Indian Trees: 141. 1906.—*Aphanamixis grandifolia* Blume, Bijdr. Fl. Ned. Ind.: 165. 1825; Backer & Bakh.f., Fl. Java 3: 654. 1968.—*Aglaia aphanamixis* Pellegr. in Lecomte, Fl. Indo-Chine 1: 767. 1911.—*Dysoxylum cuneatum* Hiern in Hook.f., Fl. Brit. India 1; 549. 1875.—*Aphanamixis cochinchinensis* Pierre, Fl. Forest Cochinch. Fasc. 5: t. 343 B. 1897.—*Dysoxylum cauliflorum* (non Hiern) Ridl., Fl. Malay Penins. 1: 396. 1992.—*Aphanamixis sinensis* P.H. How & Chen, Acta Phytotax. Sin. 4: 29, t. 3. 1955.

Trees 10-20 m high, 60-120(-200) cm girth; terminal bud linear, ca. 1 cm long, hairy; exstipulate. *Twigs* drooping; outer bark rather smooth, finely fissured, greenish brown to reddish brown, flaking to peeling sometime; inner bark pinkish to reddish often with white latex; sapwood pinkish or white, heartwood pale to dark red. *Leaves* imparipinnate, sometime the terminal leaflet reduced, spirally arranged, 20-70(-90) cm long; leaflets (3-)5-17(-19), opposite, except the terminal one, obovate–oblong or oblong, 5-20 by 2.5-6 cm, coriaceous to subcoriaceous, dull dark green upside, pale beneath; glabrous; apex broadly obtuse then minutely short acute, and usually curved to one side; base cuneate and oblique; margin entire or undulate; midrib prominent beneath and depressed upside; seeondary nerves 7-17 pairs, slightly curved and anastomosing near margin, distinct beneath; other veins hardly distinct. *Petiole* 10-15 cm long, spacially pubescent then glabrescent; petiolules 0.5-1cm, except a terminal one up to 3 cm long. *Inflorescence* axillary to supraaxillary, male inflorescence in panicles, up to 50 cm long; female and hermaphrodite in a long spikes or racemes up to 80 cm long, male flowers always smaller. *Calyx* 5 lobes, ca. 1 by 1.5 mm, ciliate, glabrous inner part, pubescent outer part. *Corolla* 3 lobes, imbricate, free, lobe ca. 3 by 2 mm, glabrous inside and pubescent outer part, yellow, cream or yellowish white. *Staminal tube* ovoid, 1.5-2 by 1.5 mm, white, glabrous. *Stamen* (3-) 6 (-8), anther ± 2 mm long, same level of marginal tube. *Disk* absent. *Ovary* 3-(4) loculi, each locule with (1)–2 ovules; style stout, slightly 3-angled, stigma a dome–shaped with 3 lobed. *Infructescence* more accressent from female inflorescence, erected spike, peduncle up to 0.5 cm diam. *Capsule* globose, ovoid or obovoid, 2.5–3 by 2 cm, yellowish to pinkish white or whitish brown; fruiting calyx broadly ovate, 1-1.5 by 2-3 mm, fringed or undulate margin, pubescent outside, glabrous inside; fruit stalk stout, 2-3 mm long. *Seeds* glossy dark brown to blackish, enclosed with red to bright red aril.

T h a i l a n d.—NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Nan, Lamphun, Lampang, Phrae, Kamphaeng Phet; NORTH-EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Uthai Thani, Kanchanaburi, Prachuap Khiri Khan; CENTRAL: Bangkok, Nakhon Nayok; SOUTH-EASTERN: Chon Buri, Chanthaburi; PENINSULAR: Chumphon, Ranong, Phangnga, Nakhon Si Thummarat, Phatthalung, Trang, Satun, Songkhla, Pattani, Narathiwat.

D i s t r i b u t i o n.—Bhutan, India (type), Sri Lanka, China, Laos, Vietnam, Malaysia, Singapore, Indonesia, Philippines.

E c o l o g y.—Tropical evergreen to swampy forest nearby stream, mixed deciduous forest, on limestone or granite bedrock; altitude 10-1,360 m (commonly 100-800 m); Flowering April–October (commonly April-August); fruiting August-February (commonly August-March).

V e r n a c u l a r.—Khamin dong (ขมิ้นดง), Mahang kan (มะฮังก่าน), Lao hang (เลาหาง), Ma-a (มะอ้า) (Northern); Ta suea (ตาเสือ) (Central); Ta pu (ตาปู่) (Southeastern); Tum dong (ตุ้มดง), Sang kried kow hog (สังเครียดคอโฮก) (Peninsular).

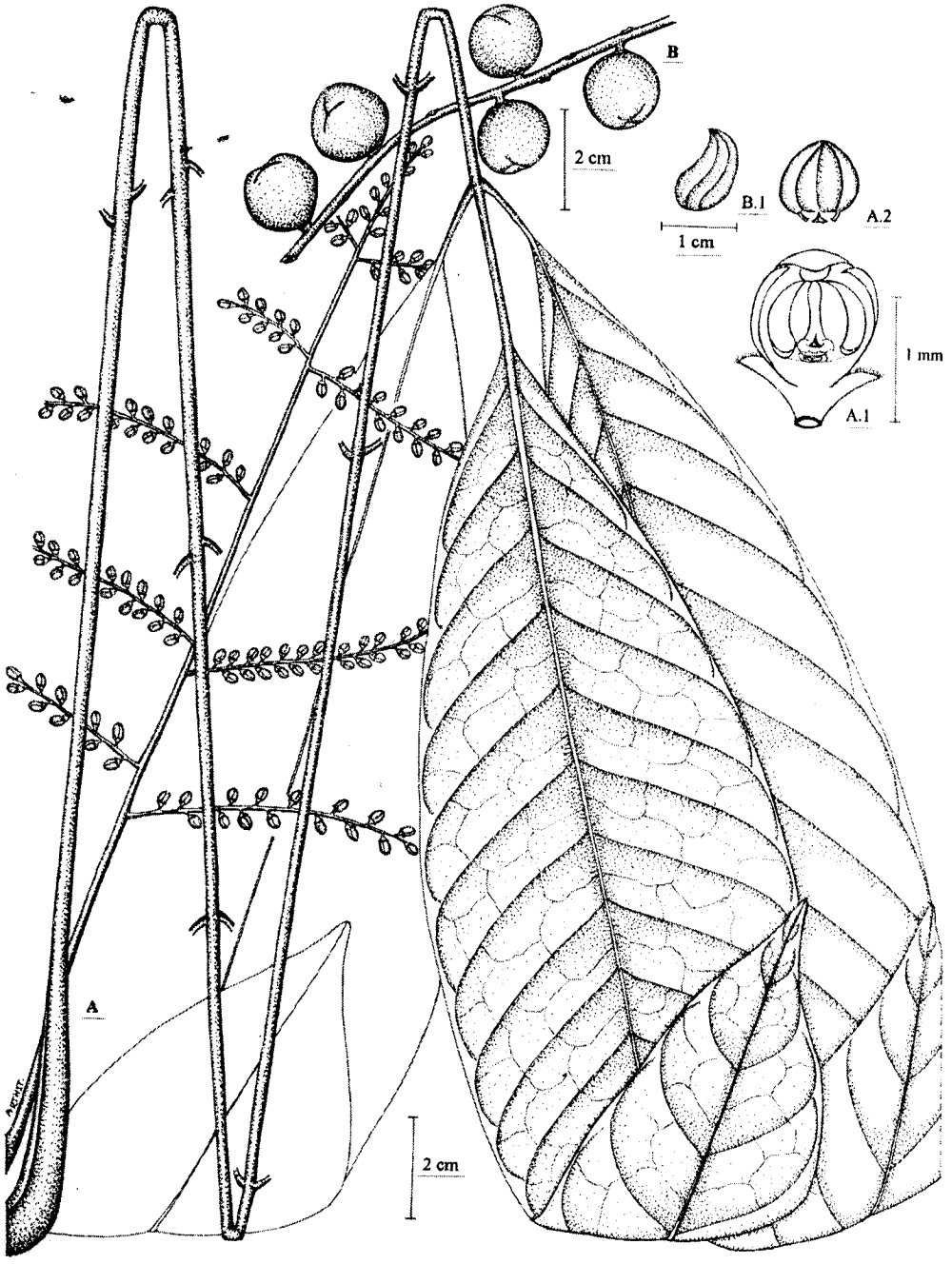

Fig. 38. *Aphanamixis sumatrana* (Mig.) Ridl.: A. twig with male inflorescences, A.1 male flower, A.2 stamens (K. Larsen 43146); B. part of infructescence, B.1 seed with aril.

2. Aphanamixis sumatrana (Miq.) Ridl., Fl. Malay Penins. 1: 400. 1992; Mabb., Blumea 31: 139. 1985; Pannell in Tree Fl. Malaya 4: 231. 1989, et Fl. Males. ser. I, 12(1): 194. 1995.—*Amoora sumatrana* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 35. 1868.

Trees 8-15 m high, 40-90 cm girth; terminal bud linear, ca. 1 cm long. hairy; twigs drooping. Outer bark rather smooth, finely fissured, greenish brown, occasionally peeling; inner bark pinkish to reddish, often with white latex. Sapwood pinkish or white, heartwood pale to dark red. *Leaves* imparipinnate, spirally arranged, 30-50(-80) cm long; leaflets 7-15, opposite or subopposite, except the terminal one, obovate-oblong, or obovate–lanceolate 8-20 by 4-7.5 cm, chartaceous, dull dark green upside, pale beneath; glabrous; apex broadly obtuse then minutely short acute, and usually curved to one side; base cuneate and oblique; margin entire or undulate; midrib prominent beneath and depressed upside; secondary nerves 9-18 pairs, curved and anastomosing near margin, distinct both sides; other veins hardly distinct. *Petiole* 10-15 cm long, spacially pubescent then glabrescent; petiolules 0.5-1 cm long, greenish pubescent. *Inflorescence* supraaxillary; male inflorescence in panicles up to 50 cm long; female and hermaphrodite inflorescences in a long spike or racemes, up to 50 cm long. Male flowers always smaller. *Calyx* 5 lobes ca. 1 by 1 mm, pubescent outside, glabrous inside. *Corolla* 3, imbricate, free, ca. 5 by 2 mm, glabrous, yellow. *Staminal tube* ovoid, 1.5-2 by 1.5 mm, white, glabrous. *Stamens* 3, anther ca. 2 mm long, the apical same level of marginal tube. *Disk* absent. *Ovary* 3 loculi, each locule with 2 ovules; style stout, stigma dilate, a dome-shaped with 3 lobed. *Infructescence* more accressent from female inflorescence, erected and slightly curved spike; peduncle ca. 10 cm long. *Capsule* globose or obovoid, conspicuous (2-)3 longitudinal lobes; 1.5-2.5 by 1-1.5 cm, woody and leathery, yellowish to pinkish; fruiting calyx minutely accresscent from calyx, undulate margin. *Seed* glossy dark brown to blackish, enclosed with red aril.

T h a i l a n d.—PENINSULAR: Narathiwat (K. Larsen et al. 43146) (a new record to Thailand).

D i s t r i b u t i o n.—Malaysia (type), Philippines.

E c o l o g y.—Tropical evergreen rain forest.

3. AZADIRACHTA

Azadirachta A. Juss., Bull. Sci. Nat. Géol. 23: 236. 1830; Jacobs, Gard. Bull. Singapore 18: 71. 1961; Penn., Blumea 22: 464, f.3. 1975; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 337. 1995.

Trees, all parts bitter. Buds thinly encrusted with resin. *Leaves* imparipinnate rarely paripinnate, pubescent or glabrous, usually with 2 pairs of glands at base of petiole. *Inflorescence* panicle. *Flowers* bisexual or polygamous, oblong or salverform in outline. *Calyx* 5-lobed to proximal half, the lobes imbricate. *Petals* 5, free, imbricate. *Staminal tube* cylindrical, slightly expanded at the upper most, margin (8-)10 lobed; lobes obtuse, truncate, emarginate or bifid; anthers (8-)10, glabrous, inserted at base and opposite lobes. *Disk* annular, united with base of ovary. *Ovary* ovoid, glabrous, 3 loculi, each locule with 2 ovules; style tubular with ovule tubular or with 3 acute stigmatic lobes. *Drupe* 1(-2) seeded; endocarp thin, cartilaginous. *Seed* ovoid or slightly ellipsoid, distally pointed; testa thin, membraneous with small adaxial sarcotesta.

KEY TO THE SPECIES
(based on flowering and leaf specimens)

1. Leaves with leaflets serrate
   2. Apical leaflet not reduced, leaflets strongly curved to one side. Staminal tube glabrous inside; Filaments glabrous all. Stigmata with 3 erect narrow point upward **2. A. indica** var. **indica**
   2. Apical leaflet usually reduced, leaflets only oblique side. Staminal tube hairy on upper half inside. Filaments hairy on upper half. Stigmata slightly lobed at apical **3. A. indica** var. **siamensis**
1. Leaves with leaflets entire margin. Staminal tube glabrous both sides. Stigmata a bell-shaped **1. A. excelsa**

KEY TO THE SPECIES
(based on fruiting and leaf specimens)

1. Leaves with leaflets serrate. Drupes up to 2.2 by 1.5 cm
   2. Apical leaflet not reduced, leaflets strongly curved to one side. Drupes dark yellow when ripe **2. A. indica** var. **indica**
   2. Apical leaflet usually reduced, leaflets only oblique side. Drupes yellow or glossy green when ripe **3. A. indica** var. **siamensis**
1. Leaves with leaflets entire margin. Drupes not less than 2.5 by 2 cm, seed ± 2.5 by 1.5-1.8 cm **1. A. excelsa**

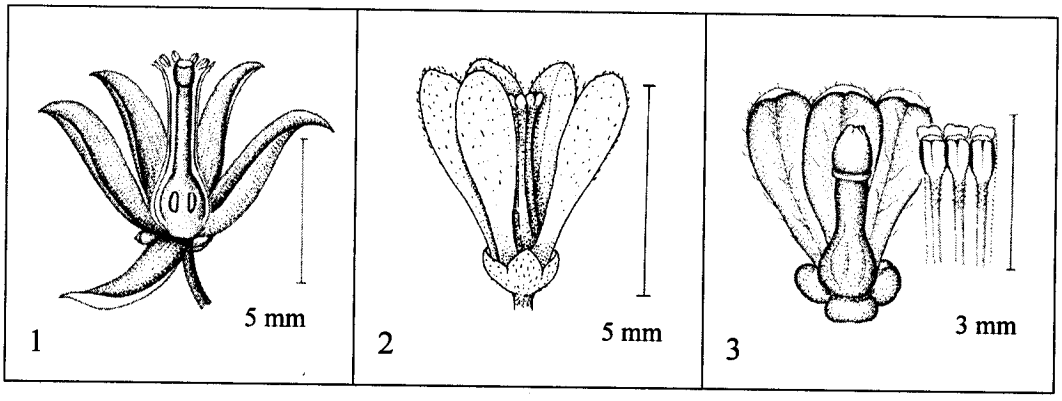

Fig. 39. Longitudinal section of flower in Genus *Azadirachta*: 1) *Azadirachta excelsa*; 2) *A. indica* A. Juss. var. *indica*; 3) *A. indica* A. Juss. var. *siamensis* Valeton.

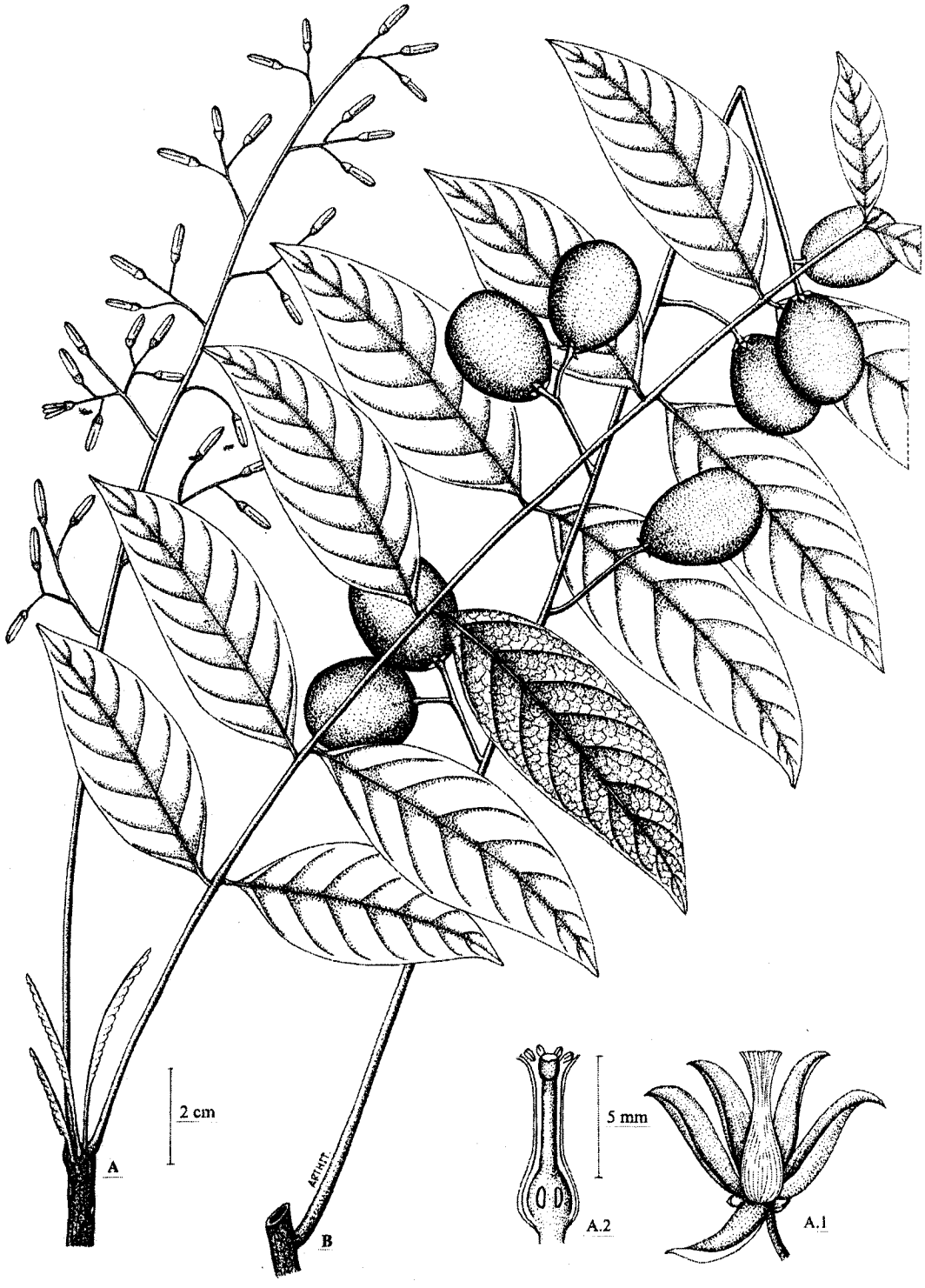

Fig. 40. *Azadirachta excelsa* (Jack) Jacobs: A. twig with inflorescences, A.1 flower, A.2 longitudinal section of male tube & ovary; B. infructescence [(K. Chiratanakorn s.n.) (BKF 91451)].

1. Azadirachta excelsa (Jack) Jacobs, Gard. Bull. Singapore 18: 75. 1961; Wong, Mal. For. Rec. 28 cum. Tab.: 81. 1976; Mabb. in Tree Fl. Malaya 4. f. 4.: 233 1989 ; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 337. 1995.—*Melia excelsa* Jack, Malayan. Misc. 11: 12. 1820; Corner, Gard. Bull. Straits. Settl. 10: 263, t. 1.2 1939.—*Trichilia excelsa* (Jack) Spreng., Syst. Veg. 4(2): 252. 1827.—*Azedarach excelsa* (Jack.) Kuntze, Rev. Gen. Pl. 1: 110. 1891.—*Azadirachta integrifoliola* Merr., Philipp. J. Sci., Bot. 4: 272. 1909.

Trees 10-40 m high, 150-300 cm girth, short buttressed; terminal buds ovoid, oily coat; young twigs with leaf scars, lenticellate with shot hairs. Outer bark grey, longitudinal peeling off (smooth in young stage) Sapwood white, heartwood pinkish, durable, resistant to termite and powderpost beetles. *Leaves* imparipinnate, 20-30-60 cm long, spirally arrangement, pubescent then glabrescent; leaflets 7-11 slightly alternate or opposite pairs, except the apical one; elliptic–oblong, oblong-lanceolate; 4-12 by 2-3.5 cm; chartaceous to subcoriaceous; puberulous then glabrous on both sides; usually curved to one side; apex acute base oblique to obtuse in outline; margin entire (except in seedling stage with serrate or undulate); midrib prominent beneath, subdepressed upside; secondary nerves 7-9 pairs, arched but not anastomosing, reticulate veins usually distinct beneath. *Petiole* 6-10 cm long, puberulous then glabrous, grooved at adaxial; petiolules 2-3 mm long, glabrous. *Inflorescence* a thyrse compound, axillary near end of twigs, 20-40 cm long, erected; pedicels ca. 5 mm long, pubescent. *Calyx* 5, free, greenish, imbricated, ca. 1 mm long, pubescent outer part. *Corolla* 5, free, creamy white, scented, lobe oblong 5-6 by 1.5-2 mm, pubescent outer part. *Staminal tube* tubular or salverform, 3.5-4.5 mm long, with 10 longitudinal ridges outside, pubescent inside, margin with 10 lobes, each lobe attached by one anther. *Stamens* 10, sessile, terminating and opposite lobes of the marginal lobe of staminal tube. *Disk* annular, united with base of ovary. *Ovary* ovate, ca. 1.5 by 1 mm, glabrous, 3 loculi, each locule with 2 ovules; style tubular ca. 3.5 mm, glabrous; stigma swollen, same level of staminal tube. *Drupe* ellipsoid or ovoid, 2.5-3.2 by 2-2.4 cm, glabrous, green then turning yellow at maturity. *Seeds* 1, ca. 2.5 by 1.5-1.8 cm, enclosed with soft pulp.

T h a i l a n d.—SOUTH-WESTERN: Kanchanaburi; SOUTH-EASTERN: Chon Buri; PENINSULAR: Ranong, Surat Thani, Krabi, Trang, Songkhla.

D i s t r i b u t i o n.—Malaysia (Type), Indonesia, Brunei, Philippines.

E c o l o g y.—In evergreen forest; altitude (5-)20-100(-250) m.

V e r n a c u l a r.—Sadao thiam (สะเดาเทียม), Sadao chang (สะเดาช้าง), Thiam (เทียม) (Peninsular).

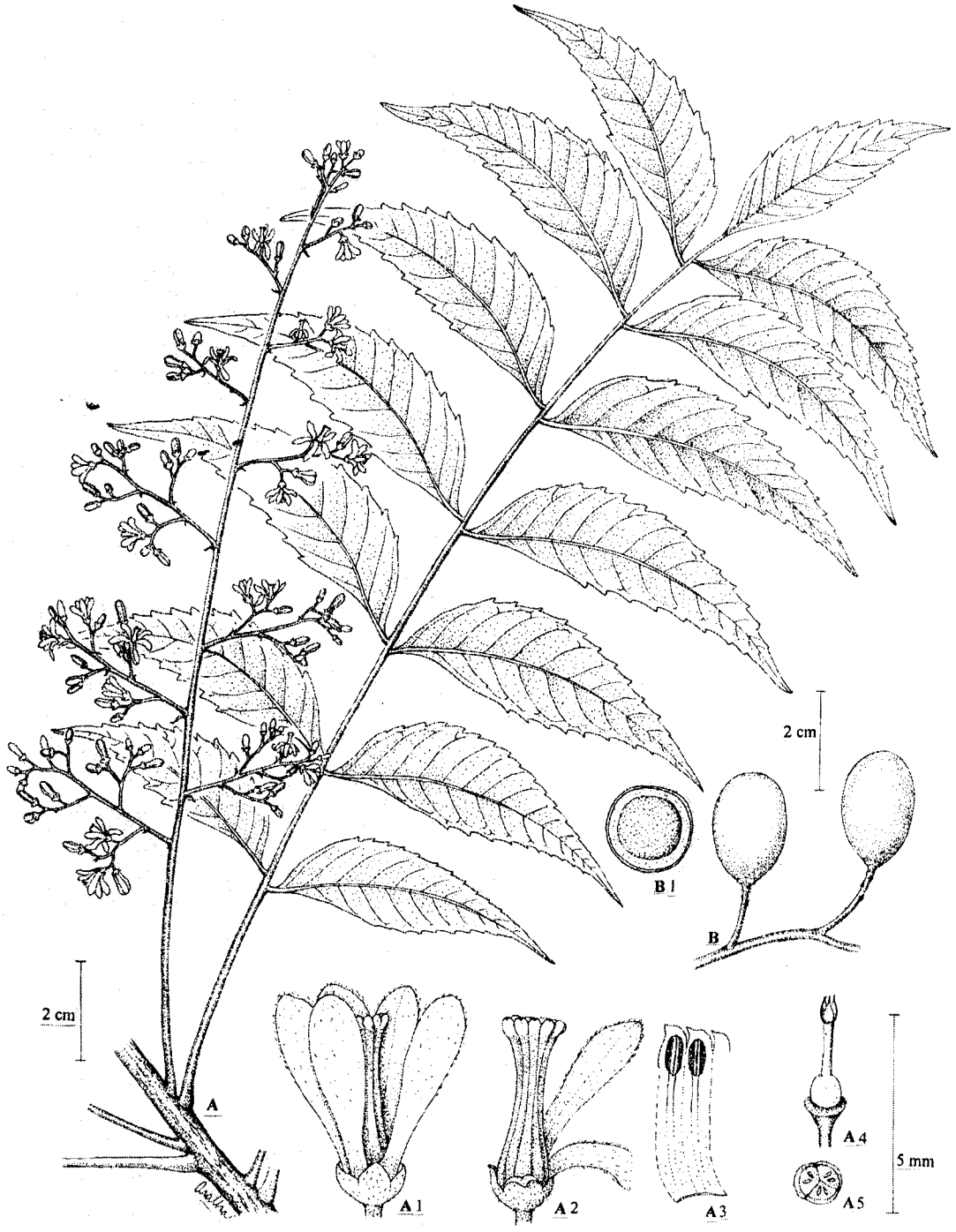

Fig. 41. *Azadirachta indica* A. Juss var. *indica*: A. twig with inflorescences, A.1 flower, A.2 staminal tube, A.3 stamen habit, A.4 pistil, A.5 cross section of ovary (A.F.G. Kerr 5637); B. part of infructescence, B.1 cross section of drupe (C.F. van Beusekom et al 440).

2. Azadirachta indica A. Juss var. **indica** Mém. Mus. Nat. 19: 221. 1832; C. DC. in DC., Monogr. Phan. 1: 459. 1878; Backer & Bakh.f., Fl. Java 2: 120. 1965; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 341. 1995 (not incl. var. *siamensis* Valeton).—*Melia azadirachta* L., Sp. Pl.: 385. 1753; Hiern in Hook.f., Fl. Brit. India 1: 544. 1875; Ridl., Fl. Malay Penin. 1: 384. 1922.—*Melia indica* (A. Juss.) Brandis, For. Fl. NW & C India: 67. 1874; Corner, Wayside Trees Mal. 1: 466. 1940.

Trees, 5-15 m high, 60-120 cm girth, terminal buds oblong, densely glandular hairs and more or less oily. Stipules triangular with indumentum hairs, then caducous; young twigs oily and much oblong lenticels, then glabrous. Outer bark pale green to dark grey, longitudinal furrowed; inner bark creamy to reddish. Sapwood whitish, heartwood reddish brown. *Leaves* imparipinnate, 20-35 cm long, near end of twigs, spirally arrangement, puberulous pubescent then glabrous. Leaflets sword-shaped, or strongly curved to one side, 2-7 by 1.5-4 cm, 4-12 pairs, nearly opposite, the apical one not reduced, mid-green upside, pale beneath, young leaves reddish; apex strongly caudate; base strongly unequal side; margin serrate. Midrib prominent on both sides; secondary nerves 8-15 pairs, faintly on both sides, arched but not anastomosing, reticulate veins hardly distinct. *Petiole* 6-10 cm, not wrinkle at base when dry, spacially with grey hairs then glabrous, petiolules 3-5(-7) mm long. *Inflorescence* a thyrse compound, axillary near end of twigs, 20-30 cm long; pedicels ca. 2 mm long, spacially pubescent, bracts and bracteoles lanceolate, 0.5-1 mm long, pubescent. *Calyx* 5, free or partly united near base, broadly ovate, ca. 1 by 1 mm, pubescent outer part, ciliate. *Corolla* 5, free, spathulate or obovate, 3-5 by 1.5 mm white or yellowish, pubescent on both sides and much more along dorsal line. *Staminal tube* salverform, 3-5 mm long, creamy, glabrous, with 10 longitudinal ridges outside, slightly 10 truncate lobed at margin, each lobe attach by one anther. *Stamens* 10, sessile, terminating and opposite lobes of the marginal lobe of staminal tube. *Disk* annular, united with base of ovary. *Ovary* ovate, ca. 1 by 1 mm, glabrous, 3 loculi, each locule with 2 ovules; style tubular, ca. 2.0 mm, glabrous; stigma 3 lobed, each with erected point upward. *Infructescence* 25-50 cm long, fruit stalk 1-1.5 cm long. *Drupes* ellipsoid or slightly obovoid, 1-2 by 0.8-1.5 cm, dark yellow when ripe. *Seed* 1(-2), enclosed with soft pulp.

T h a i l a n d.—(All cultivated) NORTHERN: Chiang Mai, Phrae; SOUTH-WESTERN: Kanchanaburi, Ratchaburi, Prachuap Khiri Khan; EASTERN: Buri Ram; SOUTH-EASTERN: Chon Buri, Rayong; PENINSULAR: Satun, Songkhla.

D i s t r i b u t i o n.— Saudi Arabia, Pakistan, India (Type) Sri Lanka, Burma, Malaysia, Singapore, Philippines, Australia.

E c o l o g y.—Cultivated along roadside and forest plantation, altitude 50-300(-800) m.

V e r n a c u l a r.—Sadao india (สะเดาอินเดีย), Khwinin (ควินิน) (General).

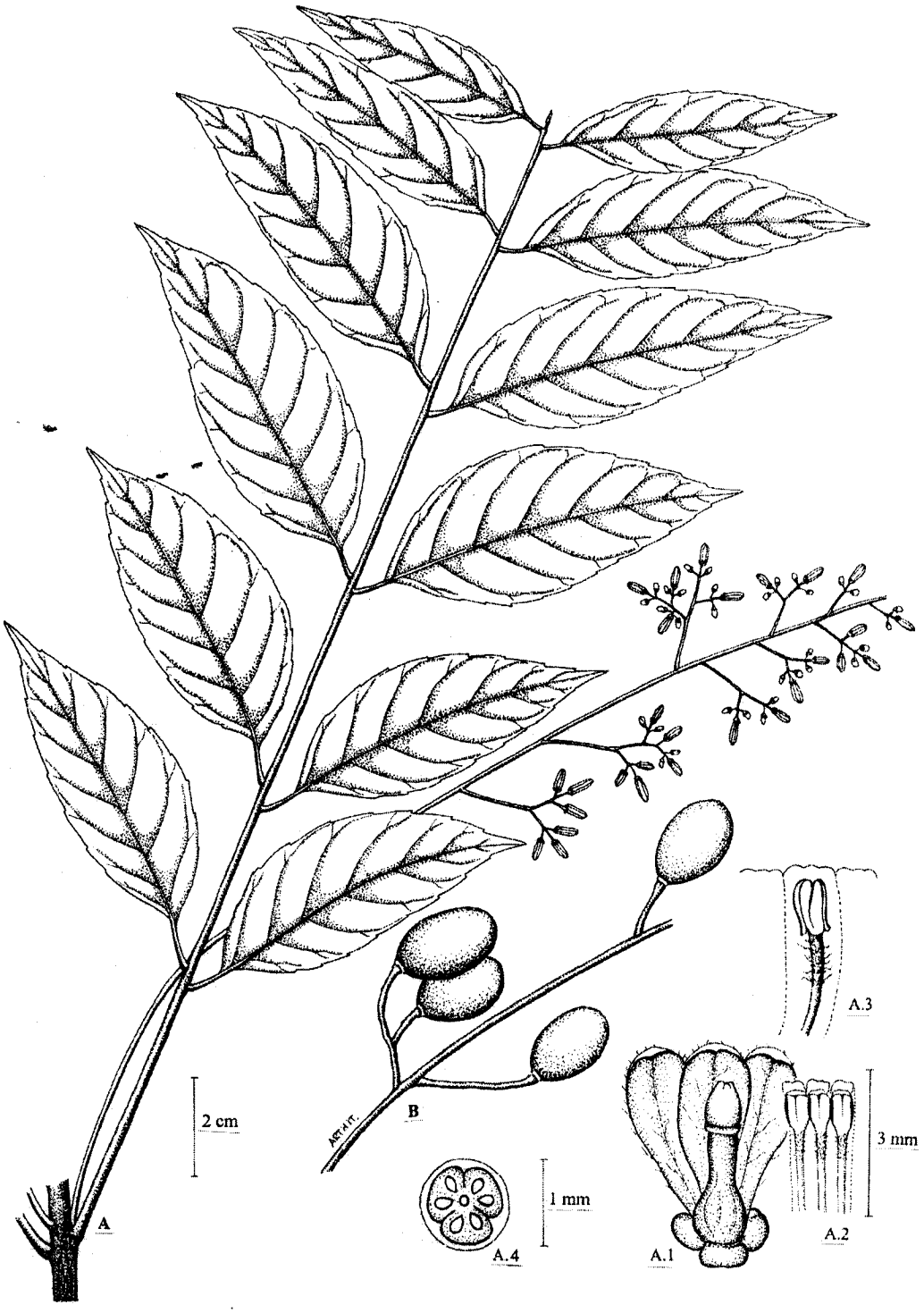

Fig. 42. *Azadirachta indica* A. Juss. var. *siamensis* Valeton: A. twig with inflorescences, A.1 flower shown pistil, A.2 & A.3 stamens, A.4 cross section of ovary; B. part of infructescence.

3. Azadirachta indica A. Juss. var. **siamensis** Valeton in Hochr., Pl. Bogor. Exs.: 66. 1904, et Cat. Bogor. Nov.: 21. 1905.

Trees 5-20 m high, 80-200 cm girth, terminal buds oblong, densely glandular hairs and more or less oily. Stipules triangular with indumentum hairs, then caducous; young twigs oily and much oblong lenticels, then glabrous. Outer bark pale green to dark grey, longitudinal furrowed; inner bark creamy to reddish. Sapwood white to yellowish, heartwood reddish brown. *Leaves* imparipinnate 11-30 cm long, spirally arrangement, near end of twigs, rachis glabrous. Leaflets ovate or ovate-oblong, 6-9(-12) by 2.5-4.5 cm, slightly curved to one side; 6-17 pairs, nearly opposite, the apical one usually reduced, glabrous except spacially indumentum hairs along midrib, glossy green upside, pale with densely white dots beneath; apex acuminate to slightly caudate; base obtuse, slightly unequal side; margin serrate or irregular serrate. Midrib and secondary nerves prominent beneath and faintly on upside; secondary nerves 7-12 pairs, usually spreading; reticulate veins conspicuous beneath. *Petiole* glabrous 3.5-10 cm long, usually wrinkle at base when dry; petiolules 3-10 mm long, glabrous. *Inflorescence* a thryse compound, axillary near end of twigs; 8-25(-30) cm long, pedicels ca. 1 mm long, all glabrous or spacially indumentum, bracts and bracteoles, lanceolate ca. 1 mm long. *Calyx* 5, free, lobes ovate, ca. 1.5 by 1 mm. *Corolla* 5, lobes obovate-oblong, ca. 3 by 1 mm, ciliate, greenish, white or yellowish. *Staminal tube* salverform, 3-5 mm long creamy, glandular hair on upper half., with 10 longitudinal ridges outside, slightly 10 emarginate lobed at margin, each lobe attach by one anther. *Stamens* 10, conspicuous filament which attach the tube, glandular hairs on the upper half and glabrous or lower half inside. *Disk* annular, united with base of ovary. *Ovary* ovate, ca. 1 by 0.5 mm, glabrous, 3 loculi, each locule with 2 ovules; style tubular ca. 1.5 mm long, glabrous; stigma ovate, slightly lobed at apical. *Infructescence* 25-40 cm long, fruit stalk 1-3 cm long. *Drupes* ellipsoid, ca. 2 by 1 cm, yellow when ripe. *Seed* 1, enclosed with soft pulp.

T h a i l a n d.—NORTHERN: Chiang Mai, Phrae; NORTH-EASTERN: Kalasin, Khon Kaen; EASTERN: Buri Ram, Ubon Ratchathani; SOUTH-WESTERN: Kanchanaburi, Ratchaburi, Prachuap Khiri Khan; CENTRAL: Chai Nat, Lop Buri; SOUTH-EASTERN: Prachin Buri, Chon Buri, Rayong, Chanthaburi.

D i s t r i b u t i o n.—Indonesia (Type) (cultivated in Bogor Botanical Gardens).

E c o l o g y.—In deciduous and dry dipterocarp forest; altitude 50-300(-800) m.

V e r n a c u l a r.—Sadao (สะเดา) (General); Saliam (สะเลียม) (Northern).

4. CHISOCHETON

Chisocheton Blume, Bijdr.: 168. 1825; Mabb., Bull. Brit. Mus. (Nat. Hist.) Bot. 6: 301. 1979; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 136. 1995.

Evergreen tree, dioecious (some polygamous), with glandular hairs. *Leaves* imparipinnate rarely paripinnate, leaflets usually opposite. *Inflorescence* paniculate, to thyrsoid or with long peduncle and congested racemose, axillary to supraaxillary, ramiflorous. *Flowers* unisexual, rarely hermaphrodite. *Calyx* cupuliform, 3-6-lobed. *Petals* (3-)4-6(-14) valvate, in one whorl, free; tube cylindrical, expanded with entire to crenate margin. *Staminal tube* cylindrical, sometimes expanded or contracted at the mouth, margin entire. *Stamens* (3-)4-10(-30), usually attached within the tube alternating with the lobes. *Disk* usually absent. *Ovary* (female) 2-8 loculi, each locule with 1(-2) ovule, style slender, stigma capitate. *Drupe* 2-5 valved loculicidal capsule, the valves 1(-2) seeded; pericarp usually leathery or almost completely lignified. *Seeds* arillate or sarcotestal; aril reddish orange.

KEY TO THE SPECIES
(based on flowering and leaf specimens)

1. Pistil with distinct gynophore
 2. Inflorescence rope-liked, strongly pendulous
  3. Inflorescence more than 4 m long. Leaves paripinnate — **8. C. penduliflorus**
  3. Inflorescence up to 1 m long. Leaves imparipinnate — **4. C. dysoxylifolius**
 2. Inflorescence stick-liked, erect or suberect
  4. Base of leaflets cordate, or truncate — **2. C. ceramicus**
  4. Base of leaflets cuneate oblique or obtuse
   5. Stamens 5
    6. Ovary 2 locular. Corolla-lobes with spacially hairs inside — **9.1 C. pentandrus** subsp. **pentandrus**
    6. Ovary 3(-4) locular. Corolla-lobes glabrous inside — **3. C. cumingianus** subsp. **balansae**
   5. Stamens 10 — **1. C. amabilis**
1. Pistil with indistinct gynophore
 7. Ovary 3-(4) or 5 locular
  8. Ovary 3-(4) locular; stamens 5
   9. Leaflets opposite — **6. C. macrophylla** subsp. **fulvescens**
   9. Leaflets alternate — **5. C. grandiflorus**
  8. Ovary 5 locular; stamens 6 — **10. C. tomentosa**
 7. Ovary 2 locular
  10. Stamens 5, leaves paripinnate; inflorescence axillary, not less than 50 cm long — **7. C. patens**
  10. Stamens 6, leaves imparipinnate; inflorescence on twigs, up to 5 cm long — **9.2 C. pentandrus** subsp. **paucijugus**

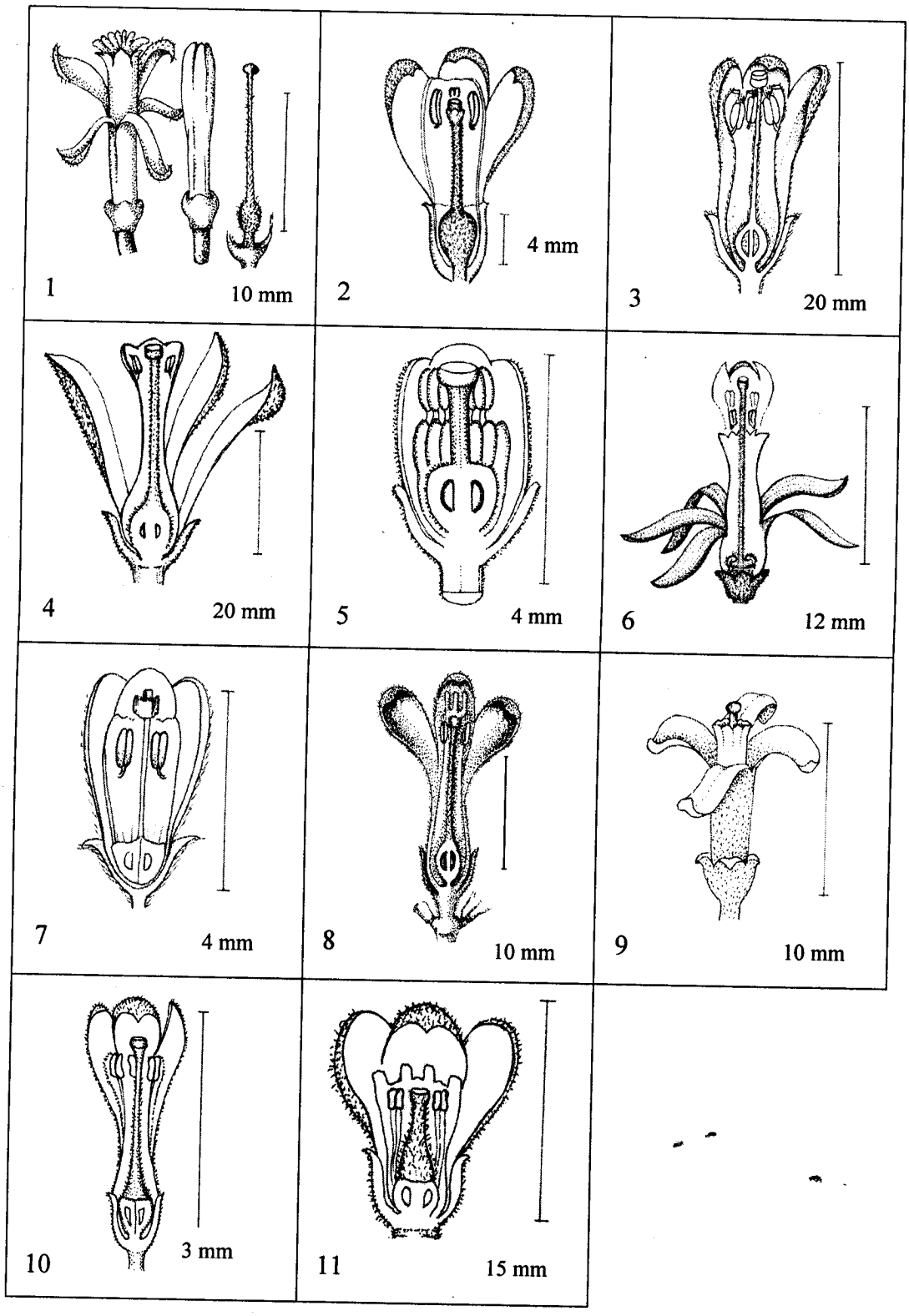

Fig. 43. Longitudinal section of flower in Genus *Chisocheton*: 1) *Chisocheton amabilis*; 2) *C. ceramicus*; 3) *C. cumingianus*; 4) *C. dysoxylifolius*; 5) *C. grandiflorus*; 6) *C. macrophyllus*; 7) *C. patens*; 8) *C. penduliflorus*; 9) *C. pentandrus* subsp. *paucijugus*; 10) *C. pentandrus* subsp. *pentandrus*; 11) *C. tomentosus*.

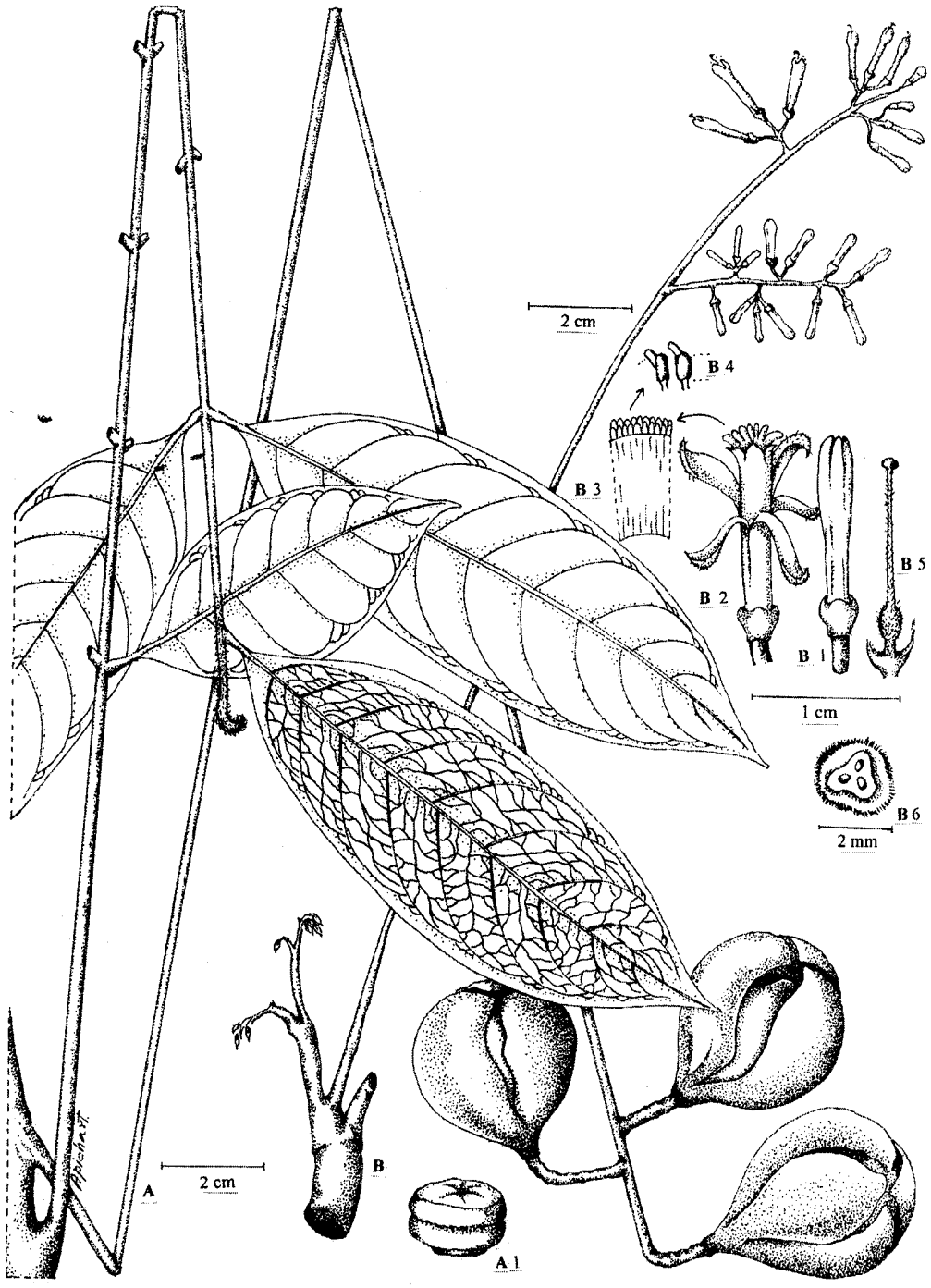

Fig. 44. *Chisocheton amabilis* (Miq.) C.DC.: A. twig with infructescence, A.1 seed (C. Niyomdham 5286); B. inflorescences, B.1 immature flower, B.2 mature flower, B.3 stamen arrangement, B.4 stamens, B.5 pistil (Th. Wongprasert 013-03).

1. Chisocheton amabilis (Miq.) C. DC. in A. DC., Monogr. Phan. 1: 537. 1878; Merr., J. Straits Branch Roy. Asiat. Soc., spec. no.: 319. 1921; Corner, Gard. Bull. Singapore, Suppl. 1: 198. 1978; Mabb., Bull. Brit. Mus. (Nat. Hist.) Bot. 6.4: 344. 1979, et in Tree Fl. Malaya 4: 234. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 163. 1995.—*Schizochiton amabile* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 26, 27. 1968.—*Chisocheton illustris* Ridl., Bull. Misc. Inform. Kew: 366. 1930.—*Chisocheton hackenbergii* Harms, Notizbl. Bot. Gart. Berlin Dahlem 15: 476. 1941.—*Chisocheton brachyanthus* (non Merr.) Anderson, Gard. Bull. Singapore 20: 115. 1963.

Trees 8-20 m high, 40-80 cm girth; outer bark smooth or finely fissure, greenish grey; inner bark creamy to pinkish; sapwood whitish; heartwood reddish brown; terminal buds pinkish pubescent. *Leaves* paripinnate, 30-40 cm long, the apical one always with young and curled new leaflets; leaflets 5-7 pairs, opposite to slightly subopposite; oblong or elliptic-oblong, usually curved to one side, 6-15 by 3.5-5.5 cm, subcoriaceous, glabrous on both sides, glossy green upside, spacially pellucid-liked dots beneath; apex shortly caudate or aristate; base slightly oblique or unequal sides; margin entire; midrib prominent beneath, depressed upside; secondary nerves 7-11 pairs, with sharp ridge beneath, slightly depressed upside. *Petiole* 10-15 cm long, grooved upside, swollen near base; petiolules ca. 0.5 cm, all pubescent then glabrescent. *Inflorescence* a thyrse compound, stick-liked upper axillary near end of twigs, 15-30 cm long, erected or suberected; peduncles 5-10 cm, pedicels ca. 2 mm long, all pubescent then glabrescent; bracts and bracteoles, narrowly triangular ca. 2 by 1 mm, caduous. *Flowers* polygamous. *Calyx* 5, cup-shaped, ca. 2 by 3 mm, pubescent outside, slightly 5-lobed, ciliate. *Corolla* 5, free, linear 5-12(-15) by 2-2.5 mm, pubescent then glabrous outside. *Staminal tube* cylindrical 10-12 mm long, margin with 10 lobes. *Stamens* 10, opposite the lobes, filaments adnate with the tube inside. *Ovary* ovate on gynophore, ca. 2.5 by 2 mm, hirsute; (3-)4 loculi, each locule with 1(-2) ovule; style linear, 7-9 mm, hirsute; stigma rounded and flat top, glabrous. *Infructescence* slightly pendulous, 20-70 cm long. *Capsules* slightly obovoid, 3-5 cm diam., slightly (3)-4 grooved, dark red, thick pericarp, dehiscent longitudinally in (3)-4 parts. *Seeds* 3-4 seeds, ca. 2 cm long, enclosed a half with orange aril.

T h a i l a n d.—SOUTH-EASTERN: Chachoengsao, Trat; PENINSULAR: Chumphon, Songkhla, Narathiwat.

D i s t r i b u t i o n.—Malaysia, Indonesia (Type), Brunei.

E c o l o g y.—Evergreen forest, nearby stream, peat swamp forest; altitude 0-100(-300) m.

V e r n a c u l a r.—Ta suea daeng (ตาเสือแดง) (Southeastern).

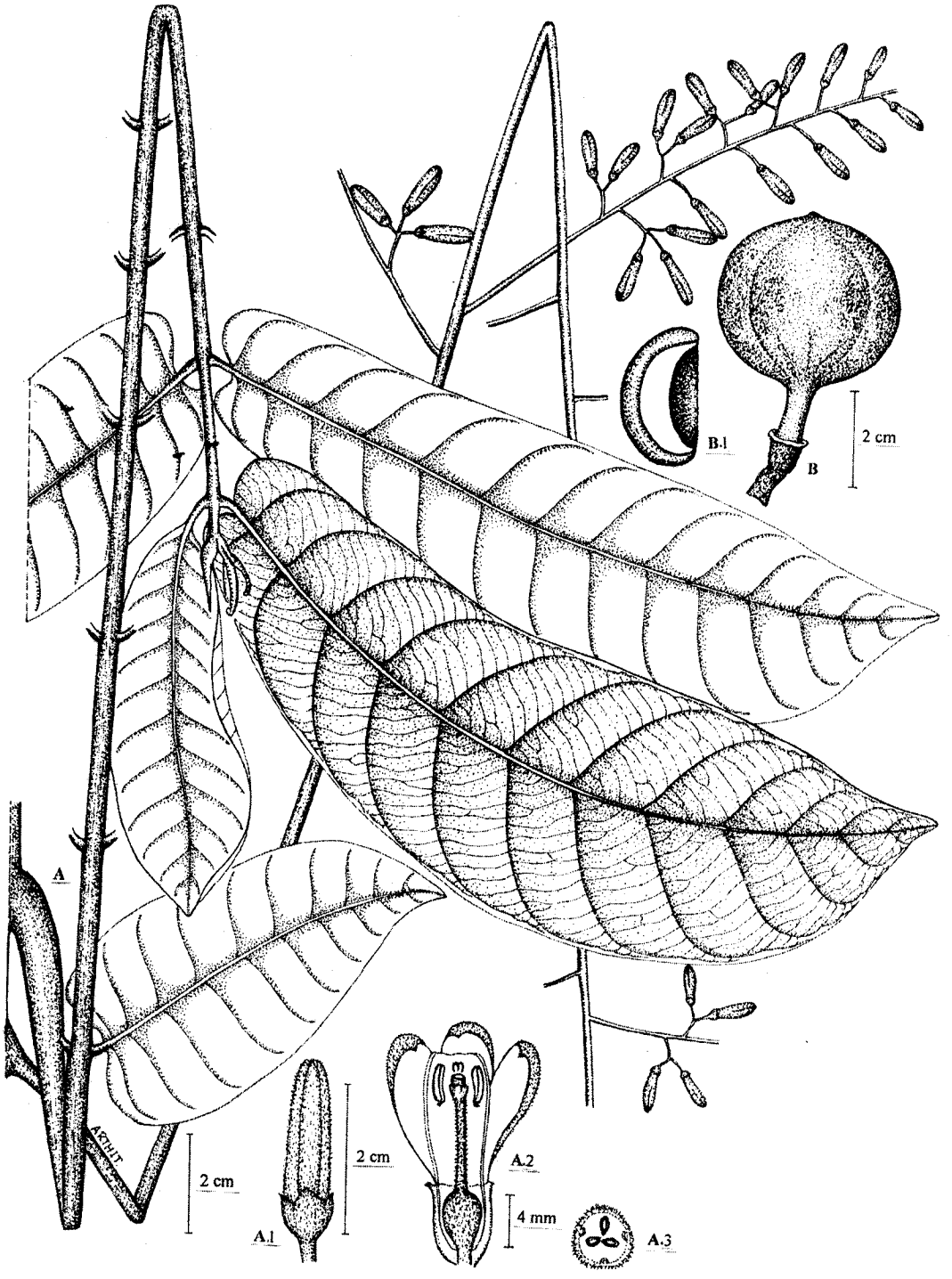

Fig. 45. *Chisocheton ceramicus* (Miq.) C.DC.: A. twig with inflorescences, A.1 flower bud,A.2 longitudinal section of flower, A.3 cross section of ovary (B. Sangkachand 1190); B. fruit, B.1 seed (P. Puudjaa 325).

2. Chisocheton ceramicus (Miq.) C. DC. in A. DC., Monogr. Phan. 1: 553. 1878; Mabb., Bull. Brit. Mus. (Nat. Hist.) Bot. 6: 361. 1979, et in Tree Fl. Malaya 4: 234. 1989; P.H. Hô, 3., Fl. Vietnam 2.1: 493. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 179. 1995.—*Schizochiton ceramicum* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 27, 29. 1868.—*Schizochiton spectabile* Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 27, 29. 1868.—*Chisocheton spectabilis* (Miq.) C. DC. in DC., Monogr. Phan. 1: 539. 1878.—*Chisocheton macrothyrsus* King, J. Asiat. Soc. Bengal 64.2: 33. 1895; Ridl., Fl. Malay Penins. 1: 389. 1922.—*Chisocheton sandoricocarpus* Koord. & Valeton, Bijdr. Boomsoort. Java 3: 111. 1896; Backer & Bakh.f. Fl. Java 2: 124. 1965.—*Chisocheton globosus* Pierre, Fl. Forest Cochinch. Fasc. 5: t. 347A. 1897; Pellegr. in Lecomte, Fl. Indo-Chine 1: 740. 1911.

Trees 10-25 m high, (65-)90-200 cm girth; outer bark pale brown to greyish brown, flaking; inner bark yellowish to red, fibrous; sapwood yellow. *Leaves* paripinnate, 20-30 cm long, the apical one always with young and curled new leaflets. Leaflets 3-12 pairs, opposite to slightly subopposite; oblong, ovate to elliptic or curved to one side, 6-20 by 3.5-7 cm, coriaceous to subcoriaceous, glabrous, puberulous then glabrescent along nerves on both surfaces, dull dark green upside; apex acute, rare obtuse; base cordate, truncate to auriculate, unequal sides; margin entire; midrib prominent beneath, depressed upside; secondary nerves 6-14 pairs, arched and ± anastomosing, sharp ridge beneath, slightly depressed upside; scalariform veins conspicuous beneath. *Petiole* 3-10 cm long, grooved upside, swollen near base; petiolules 1-2 cm long, spacially pubescent then glabrescent. *Inflorescence* a thyrse compound, upper axillary near end of twigs, 10-50 cm long, stick-liked, erected or suberected; peduncles 6-20 cm, pedicels 2-5 mm long, densely tomentose then glabrescent; bracts and bracteoles narrowly triangular ca. 2 by 1 mm, caduous. *Flowers* polygamous. *Calyx* 5, cup-shaped, ca. 2 by 3 mm, tomentose outside, slightly 5-lobed. *Corolla* 5, free, linear, 2-2.2 by 0.2 cm, thick, tomentose outside. *Staminal tube* tubular, ca. 2 cm long, even margin. *Stamens* 5, insert below the marginal tube, filaments adnate with the tube inside. *Ovary* subobovate or ovate on gynophore, ca. 3 by 1.5 mm, hirsute, (2-)3 loculi, each locule with 1(-2) ovule; style linear, ca. 10 mm long, hirsute; stigma dilate and flat top, glabrous *Infructescence* pendulous, 6-20 cm long. *Capsules* globose, 4-5 by 4-5 cm, slightly 4-grooved, yellow to orange red, thick pericarp, dehiscent longitudinally in (3)-4 parts. *Seeds* 1-2 seeds, ca. 1.5 cm long, enclosed a half with orange aril.

T h a i l a n d.—PENINSULAR: Phatthalung, Yala, Narathiwat.

D i s t r i b u t i o n.—Malaysia, Indonesia (Type).

E c o l o g y.—Evergreen forest; altitude 50-500(-645) m.

V e r n a c u l a r.—Yom yai (ยมใหญ่), Kra thon rok (กระท้อนรอก) (Peninsular).

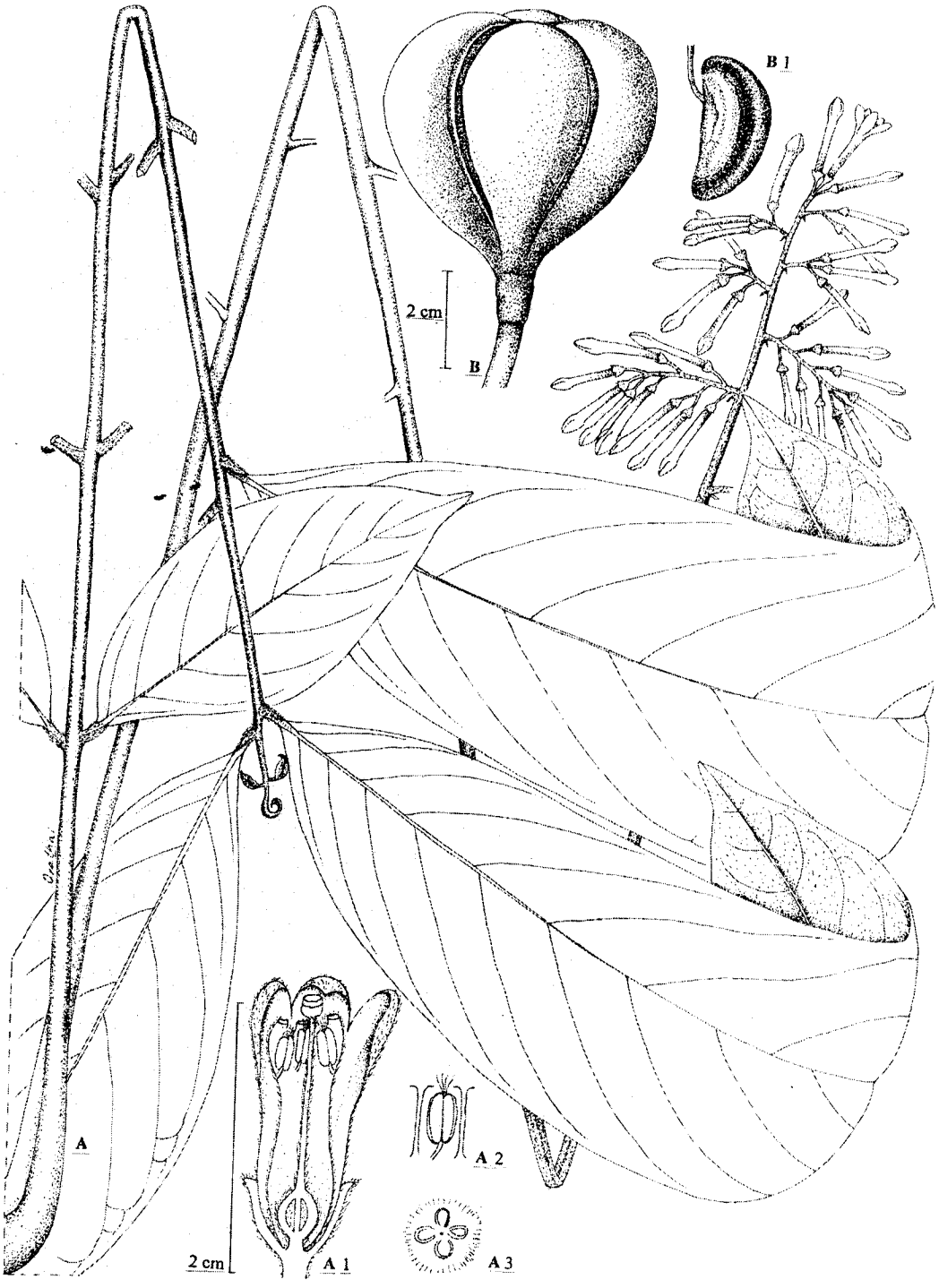

Fig. 46. *Chisocheton cumingianus* (C. DC.) Harms. subsp. *balansae* (C. DC.) Mabb.: A. twig with infructescence, A.1 longitudinal section of flower, A.2 stamen, A.3 cross section of ovary (Winit 1136); B. drupe, B.1 seed (R. Geesink et al. 5724).

3. Chisocheton cumingianus (C. DC.) Harms subsp. **balansae** (C. DC.) Mabb. Taxon 26: 528. 1977, & Bull. Brit. Mus. (Nat. Hist.) Bot. 6. 4.: 347. 1979; P.H. Hô, 3. Fl. Vietnam 2, 1: 492. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 166. 1995.—*Chisocheton balansae* C. DC., Bull. Herb. Boissier 2: 578. 1894; Pellegr. in Lecomte, Fl. Indo-Chine. 1: 737. 1911; Lecomte, Atlas Bois Indoch.: 134. 1925.—*Chisocheton paniculatus* Hiern in Hook.f., Fl. Brit. India 1: 552. 1875; Brandis, Indian Trees: 139, 703. 1906; Pellegr. in Lecomte Fl. Indo-Chine 1: 736. 1911.—*Schizochiton paniculatum* (Hiern) Kurz, J. Asiat. Soc. Bengal 44.2: 145. 1875, & For. Fl. Burma: 216. 1877.—*Chisocheton coriaceus* Pierre, Fl. Forest Cochinch. Fasc. 5: t. 346 A. 1897.—*Chisocheton thorelii* Pierre, Fl. Forest Cochinch. Fasc. 5: sub t. 347. 1897.—*Chisocheton cochinchinensis* Pierre, Fl. Forest Cochinch. Fasc. 5: t. 356 B. 1897.—*Chisocheton harmandianus* Pierre, Fl. Forest Cochinch. Fasc. 5: t. 347 1897.—*Chisocheton chinensis* Merr., Philipp. J. Sci. c. 21: 497. 1922.—*Chisocheton siamensis* Craib, Bull. Misc. Inform. Kew: 342. 1926, et Fl. Siam Enum. 1: 253. 1926; Pellegr. in Lecomte, Fl. Indo-Chine, Suppl: 692. 1946.

Trees (4-)10-30 m high, 60-200 girth; terminal buds oblong, curved, densely tomentose; twigs densely tomentose, lenticellate. Outer bark greyish, smooth or scaly; inner bark brownish; sapwood brownish; heartwood reddish brown. *Leaves* paripinnate, 40-60 cm long, the apical one always with young and curled new leaflets; leaflets (3-)7-2(-15) pairs, opposite or slightly subopposite; oblong, lanceolate, usually curved to one side, 8-25 by 3-7 cm, subcoriaceous to chartaceous, pubescent beneath then glabrescent, glossy green upside and pale beneath; apex acute, acuminate; base oblique, cuneate; margin entire; midrib prominent and hairy beneath, depressed and with spacially hairs upside; secondary nerves 5-15 pairs, sharp ridge on lower and faintly depressed on upper surface; scalariform veins distinct on lower surface. *Petiole* 10-30 cm long, swollen near base, spacially pubescent; petiolules 0.5-1 cm long, pubescent. *Inflorescence* a thyrse compound 50-130 cm long, stick-liked, axillary, peduncles up to 20 cm long, pedicels 2-4 mm, all pubescent then glabrescent; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, cup-shaped, ca. 2 by 2 mm, slightly 5 lobed, pubescent outside. *Corolla* 5, free or united 1/2 of length, linear or oblanceolate, ca. 20 by 0.5 mm, white or yellowish, pubescent outside. *Staminal tube* cylindrical, 1.5-1.8 cm long, pubescent outside, margin with 10-lobes. *Stamens* 5, opposite with one and interval with another free one lobes; filaments adnate with the tube inside. *Ovary* ovate, ca. 2 by 1 mm, hirsute, on gynophore, 3(-4) loculi, each locule with 1(-2) ovule; style linear, up to 2 cm long, pubescent; stigma dilate, globular, glabrous. *Infructescence* slightly pendulous, up to 30 cm long. *Capsules* slightly obovoid, up to 5 by 5 cm, slightly 3-4 grooved, reddish brown, yellowish red and shining, dehiscing longitudinally in 3-4 parts. *Seeds* blackish, 3-4 seeds, enclosed with thin aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Nan, Tak; SOUTH-WESTERN: Phetchaburi; SOUTH-EASTERN: Chanthaburi.

D i s t r i b u t i o n.—India, Burma, China (Type), Indochina, Philippines.

E c o l o g y.—In evergreen and dry dipterocarp forest, along stream, and limestone bedrock.

V e r n a c u l a r.—Yom makok (ยมมะกอก).

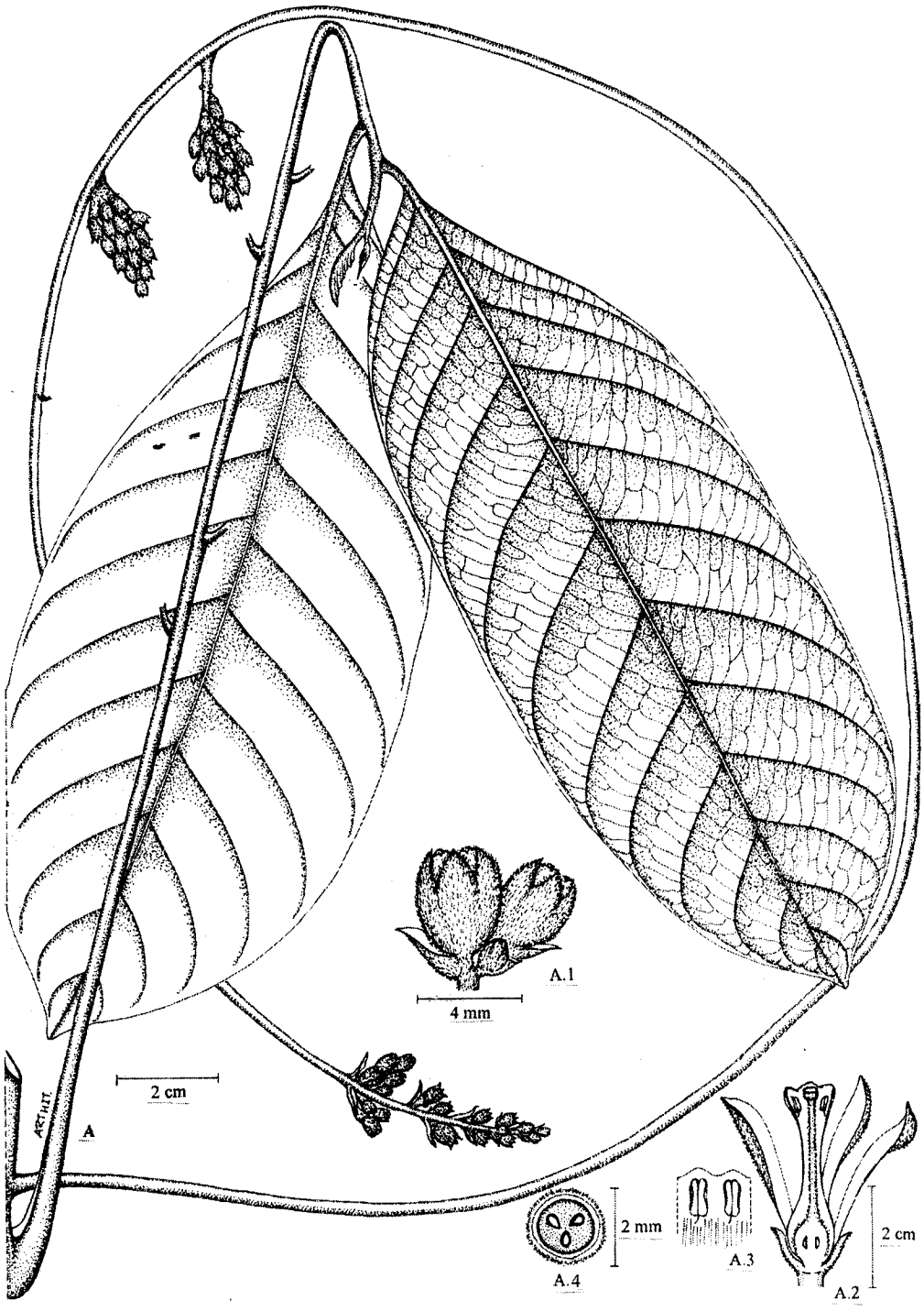

Fig. 47. *Chisocheton dysoxylifolius* (Kurz) Hiern: A. twig with inflorescences, A.1 flower bud, A.2 longitudinal section of flower, A.3 stamens, A.4 cross section of ovary (C.F. van Beusekom & C. Phengklai 277).

4. Chisocheton dysoxylifolius (Kurz) Hiern in Hook.f., Fl. Brit. India 1: 551. 1875; C. DC. in A. DC., Monogr. Phan. 1: 537. 1878; Prain, Bengal Pl. 1: 315. 1903; Brandis, Indian Trees: 139, 703. 1906; Mabb., Bull. Brit. Mus. (Nat. Hist.), Bot. 6. 4: 346. 1979.—*Schizochiton dysoxylifolius* Kurz, J. Asiat. Soc. Bengal 41(1): 49. 1871, et in Forest Fl. Brit. Burma 1: 215. 1877.

Trees (4-)10-25 m high, 50-100 cm girth; outer bark smooth, grey, ca. 1.5 cm thick; sapwood yellowish brown. *Leaves* imparipinnate, 30-100 cm long, the apical one always with young and curled of new leaflets; leaflets 3-10 pairs, alternate, subopposite, rarely opposite; oblong, ovate-oblong or oblanceolate, 12-30 by 5-9 cm, subcoriaceous to coriaceous, pubescent then glabrescent; apex acute to shortly acuminate; base slightly oblique to unequal sides; margin entire; midrib prominent beneath, depressed upside, pubescent then glabrescent; secondary nerves 7-12 pairs, arched and more or less anastomosing near margin, sharp ridge beneath, slightly depressed upside; scalariform veins conspicuous beneath. *Petiole* 10-15 cm, grooved upside and swollen near base, pubescent then glabrescent; petiolules 1-1.5 cm long, pubescent. *Inflorescence* a thyrse compound, rope-liked, strongly pendulous, 20-100 cm long, peduncles 10-40 cm long; pedicels 1-2 mm long, all pubescent; bracts and bracteoles ca. 2 by 1 mm, hairy, caduous. *Flower* polygamous. *Calyx* (4-)5, campanulate, all ca. 4 mm long, lobes ca. 1/3 of all length, densely tomentose outside, glabrous inside. *Corolla* 5, free, oblong or slightly obovate oblong, ± 20 by 1.5 mm, tomentose outside and glabrous inside, yellow, scented. *Staminal tube* salverform, 1.5-2 cm long, pubescent outside, margin slightly lobed or undulate. *Stamens* 5, near marginal tube, filaments adnate with the tube inside. *Ovary* ovate on short gynophore, ca. 2.5 by 2 mm, hirsute; 3 loculi, each locule with 1(-2) ovule; style linear ca. 2 cm long, pubescent; dilate, depressed upside, glabrous. *Infructescence* (not seen).

T h a i l a n d.—NORTHERN: Chiang Mai; EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Kanchanaburi.

D i s t r i b u t i o n. —Burma (Type).

E c o l o g y. —Evergreen and mixed deciduous forest, nearby stream.

V e r n a c u l a r. —Ta suea (ตาเสือ) (Northern).

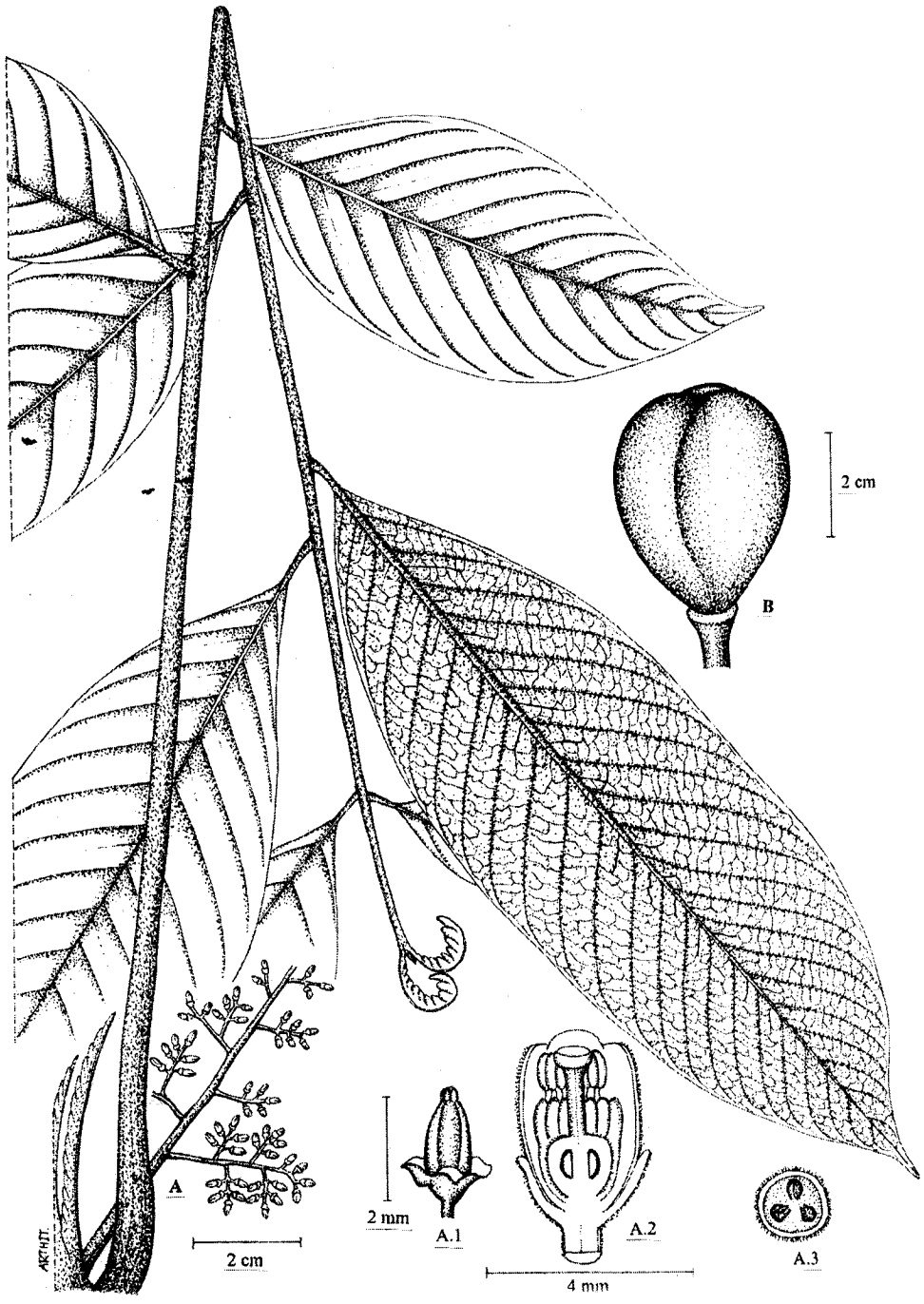

Fig. 48. *Chisocheton grandiflorus* (Kurz) Hiern: A. twig with inflorescence, A.1 flower, A.2 longitudinal section of flower, A.3 cross section of ovary (J.F. Maxwell 02-176); B. Drupe

5. Chisocheton grandiflorus (Kurz) Hiern in Hook.f., Fl. Brit. India 1: 552. 1875; C. DC. in A. DC. Monogr. Plan. 1: 534. 1878; Brandis, Indian Trees: 139. 1906; Mabb., Bull. Brit. Mus. (Nat. Hist.) Bot. 6.4: 358. 1979.—*Schizochiton grandiflorum* Kurz, J. Asiat. Soc. Bengal 41: 296. 1873, et in Forest Fl. Brit. Burma 1: 216. 1877.

Trees 10-20 high, 100-200 cm girth; terminal buds slightly sword-shaped, 2-4 cm long, hirsute then glabrescent; outer bark flaking and rough, brownish, ca. 5 mm thick; inner bark reddish brown; sapwood white or yellowish. *Leaves* paripinnate, 30-50 cm long, spirally arranged, greenish, pubescent, the apical one always with young and curled of new leaflets; leaflets 4-7 pairs, alternate especially the lower ones; oblong, oblong-lanceolate; 10-18 by 3.5-5.5 cm, chartaceous or subcoriaceous, pubescent beneath, pubescent then glabrescent except along nerves on upper side; apex caudate, acuminate; base oblique, or acute; margin entire; midrib prominent beneath, depressed upside; secondary nerves, arched and more or less anastomosing near margin, slightly prominent hairy beneath, subdepressed upside; other nerves conspicuous beneath, hardly distinct upside. *Petiole* 15-20 cm long, swollen near base, spacially pubescent. *Inflorescence* a thyrse compound, 5-20 cm long, peduncles 3-5 cm long, pedicels 1-3 mm long, all pubescent; bracts and bracteoles narrowly triangular ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, campanulate, all 2-3 mm long. lobed ca. 1/2 of all length, tomentose outside, glabrous inside. *Corolla* 5, tubular, 3-4 mm long, lobes linear, free or divided ca. 3/4 of all length, greenish to yellowish, tomentose outside, glabrous inside. *Staminal tube* tubular, ca. 2 mm long, glabrous both sides, margin with 10 lobes. *Stamens* 5, protracted over the marginal tube. *Ovary* obovate, or collar of disk, ca. 0.5 by 1.5 mm; 3 loculi, each locule with 1-(2) ovule; style tubular, ca. 1 mm long or as long as the ovary, pubescent; stigma dilate, flat top, glabrous. *Infructescence* 10-25 cm long. *Capsules* obovoid, woody or leathery, 3 longitudinal lobed, dehiscent longitudinally in 3 parts. *Seeds* 3, ca. 2.5 by 1.5 cm and 0.5 cm thick, enclosed a part with aril.

T h a i l a n d.—NORTHERN: Chiang Rai; CENTRAL: Nakhon Nayok.

D i s t r i b u t i o n.—Burma (Type)

E c o l o g y.—Evergreen forest, on limestone bedrock; altitude 500-800 m.

V e r n a c u l a r.—Ta suea khon (ตาเสือคอน) (Northern).

Fig. 49. *Chisocheton macrophyllus* King subsp. *fulvescens* Mabb.: A. twig with inflorescences, A.1 flower, A.2 longitudinal section of flower, A.3 cross section of flower (S. Phusomsaeng 35); B. capsule

6. Chisocheton macrophyllus King subsp. **fulvescens** Mabb., Bull. Brit. Mus. (Nat. Hist.) Bot. 6: 346. 1979; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 178. 1995.

Trees 10-25 m high, 100-200 cm girth; twigs spacially pubescent then glabrescent, lenticellate; outer bark greyish brown, smooth or slightly narrow vertically cracked; inner bark yellow or white, fibrous; sapwood brownish white. *Leaves* paripinnate, up to 1.7 m long, spirally arranged, the apical one always with young and curled of new leaflets; leaflets 14-28 pairs, opposite, rarely subopposite; oblong, elliptic-oblong to sword-shaped; 10-30 by 6-11 cm, subcoriaceous or chartaceous; pubescent especially along nerves beneath, glabrous or puberulous upside; apex broadly acute or minutely caudate; base obtuse, slightly cuneate, oblique; margin entire; midrib prominent beneath, depressed upside; secondary nerves 14-20 pairs, rather straight then curved near margin; scalariform veins conspicuous with narrowly ridges beneath. *Petiole* 13-30 cm long, pubescent then glabresecnt, swollen near base, petiolules 0.5-1 cm long, densely pubescent. *Inflorescence* a thyrse compound, 50-100 cm long, densely grey pubescent; peduncles up to 50 cm long, pedicels ca. 1 mm long, all with densely grey hairs; bracts and bracteoles narrow triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4-5, campanulate, all ca. 2 mm long, lobed ca. 1/4 of all length, tomentose outside, glabrous inside. *Corolla* 5, free, lobe linear ca. 1.5 cm long, pubescent outside, glabrous inside, yellowish white, scented. *Staminal tube*, salverform, up to 1 cm long, margin with 10 triangular lobes. *Stamens* 5, below the marginal tube. *Ovary* ovate, hairy on collar of disk, ca. 05 by 0.5 mm; 3(-4) loculi, each locule with 1 ovule; style narrow tubular, pubescent, stigma dilate, flat top, glabrous. *Infructescence* (not seen). *Capsules* obovoid, woody up to 8 by 5.0 cm orange brown, slightly 4 longitudinal lobes. *Seeds* 3-(4), ca. 4 cm long.

T h a i l a n d.—SOUTH-WESTERN: Phetchaburi, Prachuap Khiri Khan; PENINSULAR: Nakhon Si Thammarat, Trang, Yala, Narathiwat.

D i s t r i b u t i o n.—Malaysia (Type).

E c o l o g y.—Evergreen forest; altitude 80-100 m.

V e r n a c u l a r.—Ta suea (ตาเสือ), Sai (สาย), Ma-a (มะอ้า) (Peninsular).

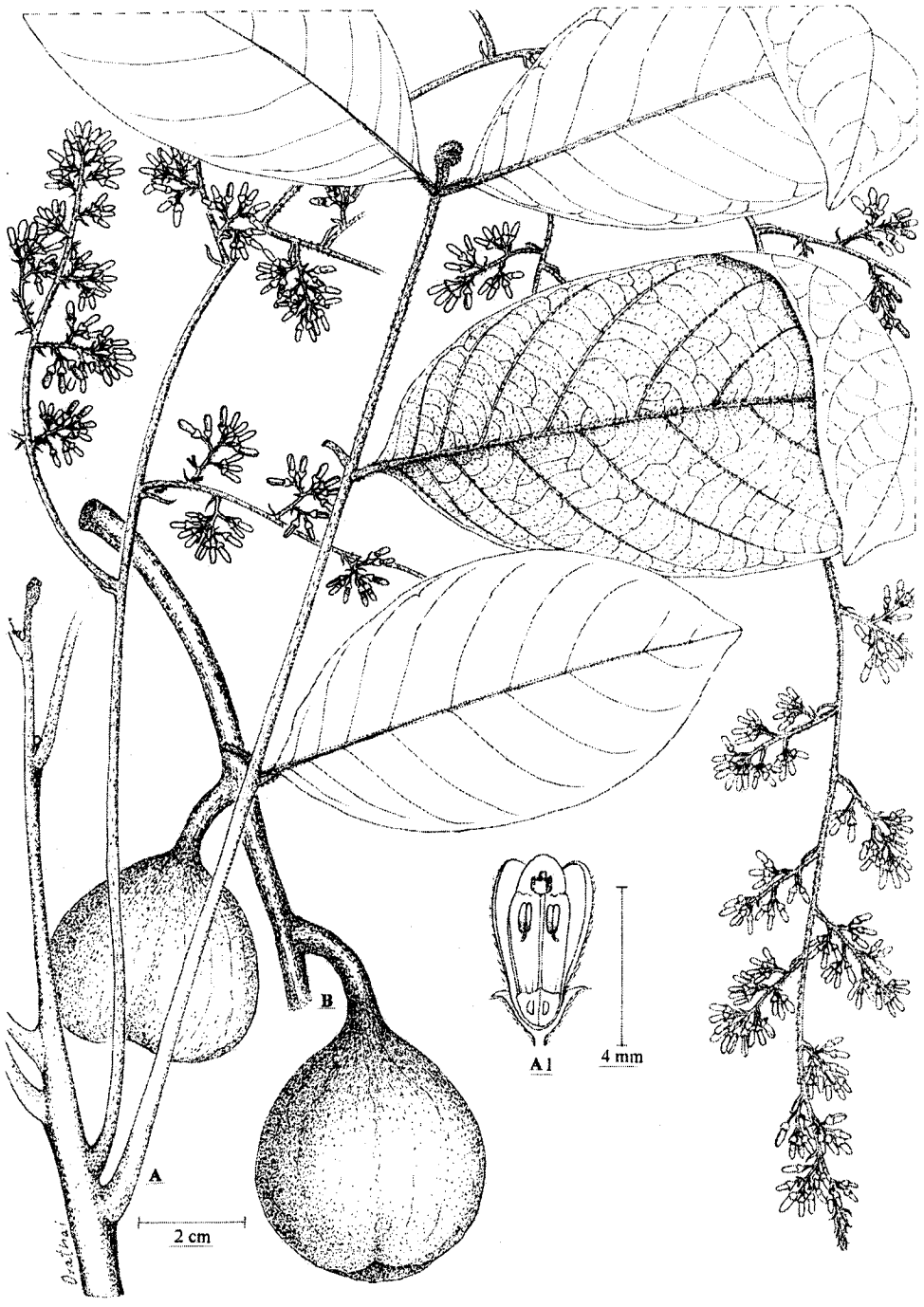

Fig. 50. *Chisocheton patens* Blume: A. twig with inflorescences, A.1 longitudinal section of flower (R. Geesink & T. Santisuk 5283); B. part of infructescence (C. Niyomdham 788).

7. Chisocheton patens Blume, Bijdr.: 169. 1825; C. DC. in A. DC. Monogr. Phan. 1: 529. 1878; King, J. Asiat. Soc. Bengal 64.2: 34. 1895; Mabb., Bull. Brit. Mus. (Nat. Hist.), Bot. 6.: 350. 1979, et in Tree Fl. Malaya 4: 235. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 167. 1995.—*Chisocheton divergens* Blume, Bijdr.: 169. 1825; King, J. Asiat. Soc. Bengal 64.2: 35. 1895; Brandis, Indian Trees: 139. 1906; Ridl., Fl. Malay Penins. 1: 390. 1922; Backer & Bakh. f., Fl. Java 2: 124. 1965; T. D. Penn., Blumea 22: 496. 1975.—*Chisocheton fragrans* Hiern in Hook.f., Fl. Brit. India 1: 551. 1875.—*Chisocheton glomeratus* Hiern in Hook.f., Fl. Brit. India 1: 551. 1875; Ridl., Fl. Malay Penins. 1: 389. 1922.—*Chisocheton holocalyx* Hiern in Hook.f., Fl. Brit. India 1: 551. 1875.

Trees 8-25 m high, 80-200 cm girth; terminal bud elliptical, 1-2 cm long, hairy; twigs few branches and usually drooping; outer bark flaking, dark brown or grey to brownish, scaly in patches; buttress ca. 1.5 m high, steep and thin; inner bark white, yellowish red to orange, fibrous; sapwood yellowish white or white. *Leaves* paripinnate, 15-30(-150) cm long, densely pubescent, then glabrescent, spirally arranged, the apical always with young and curled of new leaflets; leaflets 2-7(-10) pairs, opposite or slightly alternate, oblong or ovate-oblong; 9-20 by 3-6 cm, chartaceous, glossy green upside, densely pubescent beneath; apex acute to obtuse; base obtuse, slightly oblique; margin entire; midrib prominent beneath and densely pubescent, slightly depressed upside; secondary nerves 6-15 pairs, arched and more or less anastomosing; scalariform veins distinct on lower surface. *Petiole* 10-15 cm long, pubescent, then glabrescent; petiolules ca. 0.5 cm long, densely pubescent. *Inflorescence* a thyrse compound, ramiflorus and axillary, 50-80 cm long, peduncles 10-20 cm long, pedicels 1-2 mm long, all pubescent; bracts and bracteoles, narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, campanulate, 1-1.5 mm long, lobe ca. 1/3 of all length, hairy outside. *Corolla* 5, linear, free, 4-5 mm long, pubescent outerpart; white, yellowish or greenish, scented. *Staminal tube* tubular, 1-2 mm long, glabrous both sides, margin smooth or slightly undulate. *Stamens* 5, not protracted the marginal tube, filaments attach the tube inside. *Ovary* broadly ovoid pubescent, flat top on collar of disk, ca. 1 mm diam.; 2 loculi, each locule with 1-(2) ovule; style cylindrically, ca. 2.5 mm long, glabrous dilate, flat top, glabrous. *Infructescence* pendulous, 50-100 cm long. *Capsules* globose or obovoid, woody, ca. 45 cm diam., orange to orange red, slightly 2-3 longitudinal lobed, dehiscent in 2(-3) longitudinal parts; fruit stalk 1.5-2 cm. *Seeds* 2, black, enclosed half with aril.

T h a i l a n d.—NORTHERN: Chiang Mai; SOUTH-WESTERN: Phetchaburi, Prachuap Khiri Khan; SOUTH-EASTERN: Chachoengsao, Chanthaburi, Trat; PENINSULAR: Surat Thani, Phangnga, Phuket, Krabi, Nakhon Si Thammarat, Trang, Songkhla, Narathiwat.

D i s t r i b u t i o n.—Burma, Malaysia, Singapore, Brunei, Indonesia (Type), Philippines.

E c o l o g y.—Evergreen forest, peat swamp forest; altitude 0-350(-530) m.

V e r n a c u l a r.—Sang kried (สังเครียด), Khamin (ขมิ้น), Ku bi (กูบิ), Sang kried langsat (สังเครียดลางสาด), Ta suea (ตาเสือ) (Southeastern) (Peninsular).

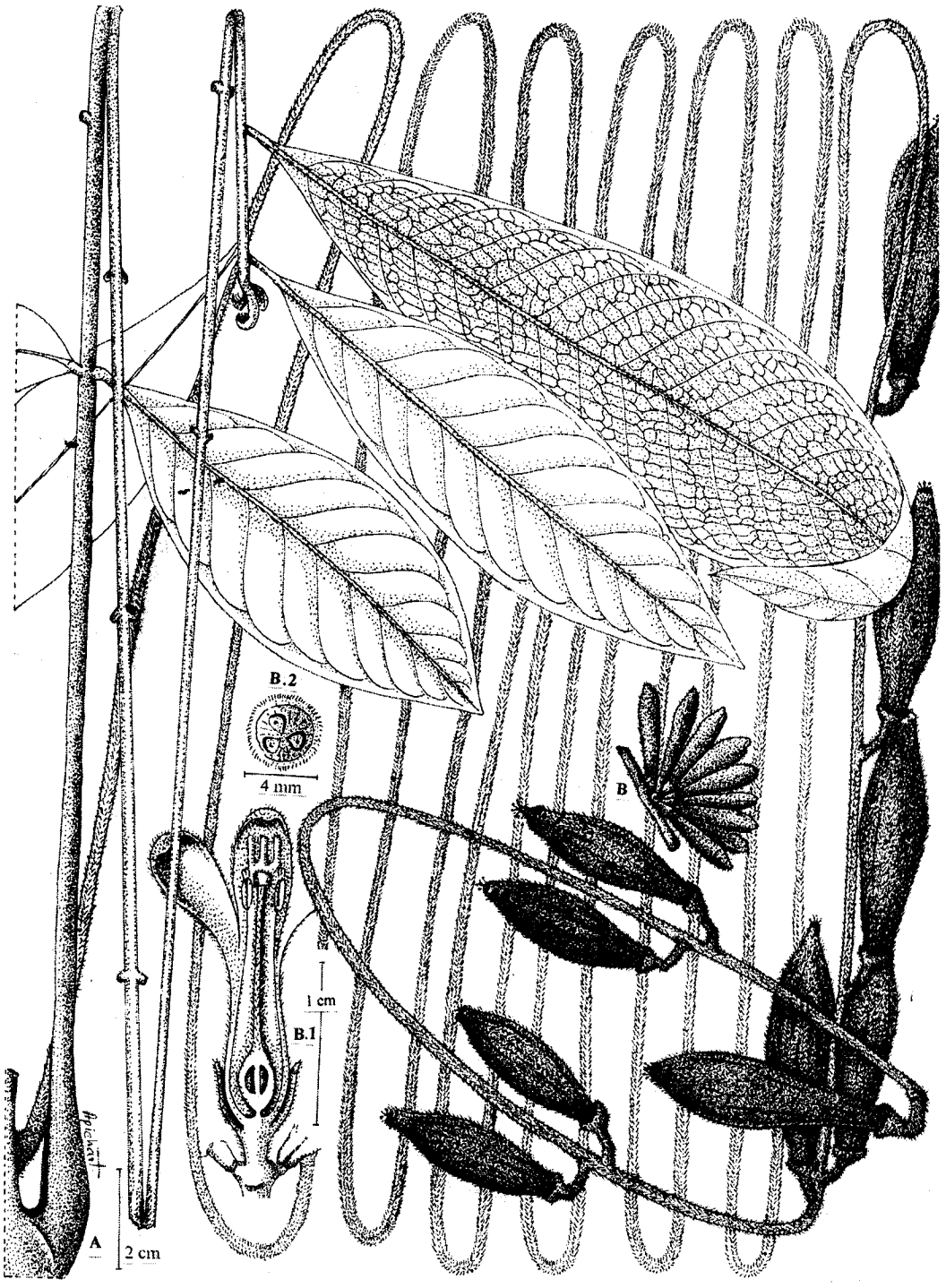

Fig. 51. *Chisocheton penduliflorus* Planch. ex Hiern: A. twig with infructescence (S. Phusomsaeng 348); B. cluster of flowers, B.1 longitudinal section of flower, B.2 cross section of ovary (S. Phusomsaeng 324).

8. Chisocheton penduliflorus Planch. ex Hiern in Hook.f., Fl. Brit. India 1: 550. 1875; C. DC. in DC., Monogr. Phan. 1: 536. 1878; Curtis, J. Straits Branch Roy. Asiat. Soc. 25: 22. 1894; King, J. Asiat. Soc. Bengal 64.2: 38. 1895; Ridl., Fl. Malay Penins. 1: 388. 1922; Mabb., Bull. Brit. Mus. (Nat. Hist.), Bot. 6: 326. 1979, et in Tree Fl. Malaya 4: 237. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 145. 1995.—*Chisocheton kunstleri* King, J. Asiat. Soc. Bengal 64.2: 27. 1895.

Trees 5-12 m high, 40-60 cm girth; twigs densely glandular hairy. soft pitch; outer bark greyish or blackish; inner bark orange or brownish; sapwood brownish. *Leaves* paripinnate, rarely imparipinnate, 30-100 cm long, the apical always with young and curled of new leaflets; leaflets 8-14 pairs, opposite to slightly subopposite; oblong, oblanceolate, 10-30 by 4-7.5 cm, chartaceous, glabrescent upside, densely especially along nerved beneath; apex acute, acuminate to caudate; base cauneate, obtuse to slightly oblique; margin entire; midrib prominent and hairy beneath, depressed upside; secondary nerves 9-21 pairs, arched and anastomosing near margin, prominent and hairy beneath; scalariform veins distinct on both sides and hairy beneath. *Petiole* 15-20 cm long, swollen at base, densely glandular hairs. *Inflorescence* a thyrse compound, rope-liked, axillary, near end of twigs, up to 5 m long, strongly pendulous, densely dark greyish brown, irritant hairs, pedicels ca. 1 mm long, hairs as inflorescences; bracts and bracteoles, narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, campanulate, 3-4 by 2.5-3 mm, tomentose outside, glabrous inside; lobe ca. 1/4 of all length. *Corolla* 5, united at lower half, tubular or salverform 1.8-2 cm long, lobes slightly oblanceolate, hairy outside, glabrous inside, orange or white. *Staminal tube*, cylindrical ca. 1.5 cm long, margin with 5 linear lobes, all orange. *Stamens* 5, lower the lobe of tube, filaments adnate with the tube inside. *Disk* cupular, globose. *Ovary* ovate, ca. 3 by 2-3 mm, densely hairs; 3 loculi, each locule with 1(-2) ovule; style linear, ca. 10 mm, hirsute; stigma dilate, round and flat top, glabrous. *Infructescence* strongly pendulous, 10-12 m long, densely glandular with irritant hairs. *Capsules* long elliptical, leathery, ca. 3.5 by 1-2 cm, apex upward or recurved, densely brown or pinkish red irritant hairs; dehiscent into 3 parts when mature. *Seeds* 3, black, enclosed a part with reddish orange aril.

T h a i l a n d.—PENINSULAR: Phatthalung, Trang, Narathiwat.

D i s t r i b u t i o n.—Malaysia (Type).

E c o l o g y.—Evergreen forest, nearby stream; altitude 50-100(-300) m.

V e r n a c u l a r.—Ma mui chang (หมามุ่ยช้าง), Yom man (ยมมัน) (Peninsular).

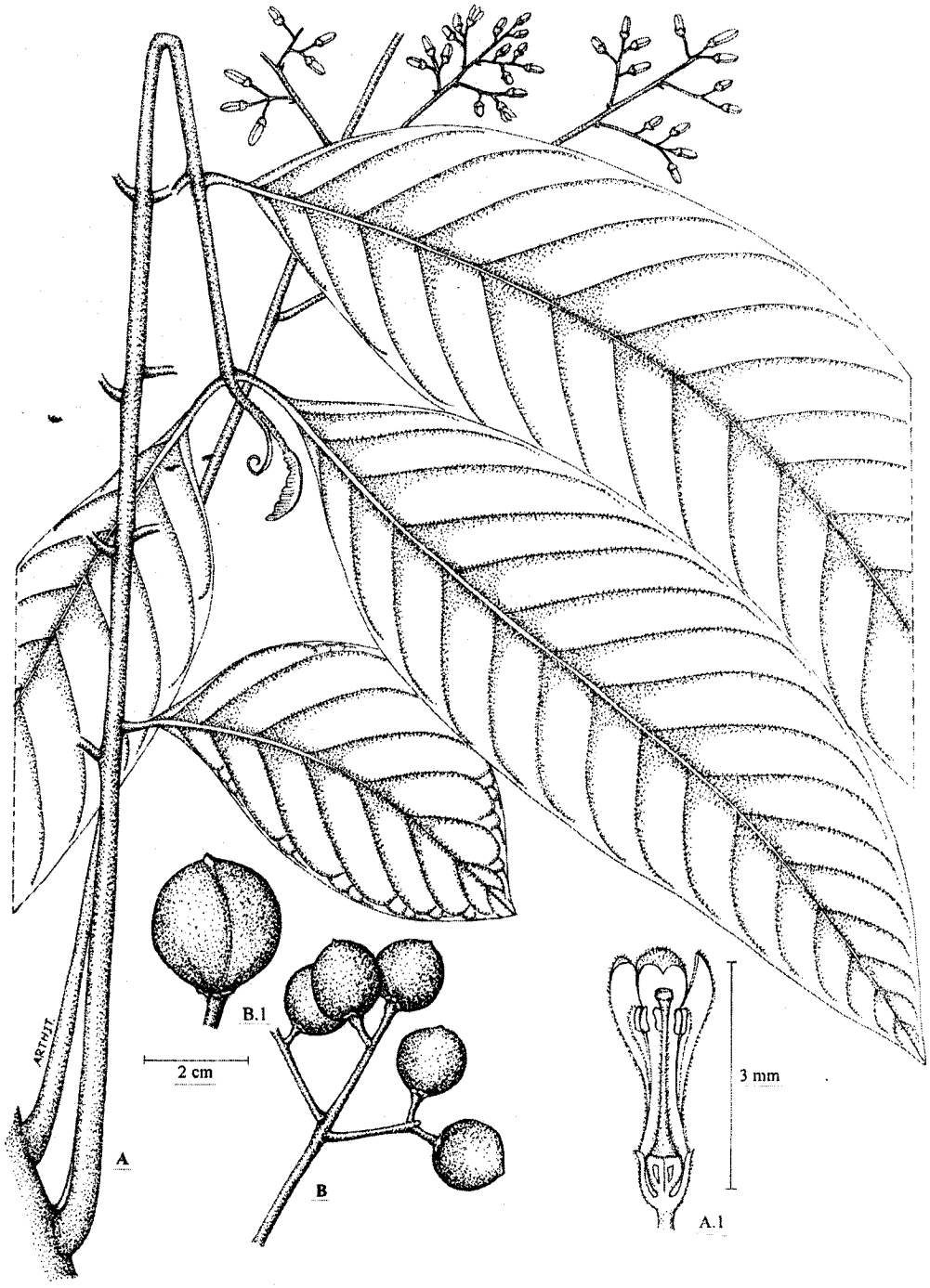

Fig. 52. *Chisocheton pentandrus* (Blanco) Merr. subsp. *pentandrus*: A. twig with inflorescences, A.1 longitudinal section of flower; B. part of infructescence, B.1 another form of drupe (P. Puudja 466).

9.1 Chisocheton pentandrus (Blanco) Merr. subsp. ***pentandrus*** in Philipp. Govt. Lab. Bur. Bull. 27: 210. 1905; Mabb. Bull. Brit. Mus. (Nat. Hist.), Bot. 6: 363. 1979, et in Tree Fl. Malaya 4: 237. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 180. 1995.—*Trichilia pentandra* Blanco, Fl. Filip.: 355. 1837.—*Chisocheton microcarpus* Koord. & Valeton, Bijdr. Boomsoort. Java 3: 115. 1896; Backer et Bakh. f., Fl. Java 2: 125. 1965.—*Dasycoleum philippinum* Turcz., Bull. Soc. Imp. Naturalistes Moscou 31: 415. 1858.—*Chisocheton philippinus* (Trucz.) Harms, in Engl. & Prantl., Nat. Pflanzenfam. 3(4): 296. 1896.—*Chisocheton parvifoliolus* Merr., Philipp. J. Sci., Bot. 13: 297. 1918.

Trees 7-20 m high, 40-80 cm girth; terminal bud dark brown; outer bark greyish brown to dark brown, finely cracked with raised lenticels lines interval; inner bark yellowish or red and white interval stripes. *Leaves* paripinnate, 20-50 cm long, spirally arranged, the apical always with young and curled of new leaflets; leaflets 3-9 pairs, opposite to slightly subopposite; elliptic, elliptic-oblong, 5-20 by 3.5-6 cm; chartaceous to subcoriaceous, dull dark green upside, pale and pubescent beneath; apex acute or acuminate; base slightly cuneate or oblique; margin entire; midrib prominent beneath, subdepressed upside; secondary nerves 7-20 pairs, arched and anastomosing near margin, prominent beneath, conspicuous upside; other nerves hardly distinct. *Petiole* 6-10 cm long, pubescent; petiolules 0.5-1.5 cm long, pubescent. *Inflorescence* a thyrse compound, stick-liked, erected or suberected, axillary or supraaxillary, near end of twigs, 20-30(-50) cm long; peduncles 8-15 cm, pedicels 2-5 mm long, all pubescent, then glabrescent; bracts and bracteoles narrow triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, campanulate, 1-1.5 mm long; lobed ca. 1/3 of all longth; pubescent outside, glabrous inside. *Corolla* 5, salverform, 2.5-3 mm long, lobe oblong, ca. 1/2 of all length, pubescent on both sides, much on outer part. *Staminal tube* salverform, ca. 2 mm long, pubescent outside, margin rather even. *Stamens* 5, at same level with margin, filaments adnate with the tube inside. *Ovary* on gynophore, ellipsoid or ovoid, 0.5-1 mm diam.; 2 loculi, each locule with 1-(2) ovule, hispid; style cylindrical, 2-2.5 m long, hispid on lower half; stigma dilate, flat top, glabrous. *Infructescence* up to 30 cm long. *Capsules* globose, 1.5-2.5 cm diam., usually with one longitudinal ridge with minutely beak at apical; dull red and minutely rusty tomentose. *Seeds* 2, flattened, enclosed minutely with aril or sarcotesta.

T h a i l a n d.—PENINSULAR: Phatthalung, Songkhla.

D i s t r i b u t i o n.—Malaysia, Indonesia, Philippines (Type).

E c o l o g y.—Fresh water swamp forest; altitude 0-100 m.

V e r n a c u l a r.—Yom yot (ยมยอด) (Peninsular).

Fig. 53. *Chisocheton pentandrus* (Blanco) Merr. subsp. *paucijugus* (Miq.) Mabb.: A. twig, A.1 inflorescences, A.2 flower, A.3 pistil, A.4 opened staminal tube. (J.F. Maxwell 87-576).

9.2 Chisocheton pentandrus (Blanco) Merr. subsp. **paucijugus** (Miq.) Mabb., Bull. Brit. Mus. (Nat. Hist.), Bot. 6: 366. 1979; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 182. 1995.—*Schizochiton paucijugum* Miq., Ann. Muss. Bot. Lugduno-Batavi 4: 27, 30. 1868.—*Dasycoleum beccarianum* Baill., Adansonia 2: 263. 1874.—*Chisocheton spicatus* Hiern in Hook.f. Fl. Brit. India 1: 550. 1875; King. J. Asiat. Soc. Bengal 64.2: 26. 1895; Ridl., Fl. Malay Penins. 1: 387. 1922.—*Chisocheton paucijugus* (Miq.) B.D. Jackson, Ind. Kew. 1: 517. 1893.

Trees 8-12 m high, 40-80 cm girth; terminal buds, caducous, narrow lanceolate, tawny, pubescent to glabrous; outer bark brownish, flaking; inner bark brownish or pinkish; sapwood creamy. *Leaves* imparipinnate, 40-70 cm long, the apical more or less curled of young leaflets; leaflets 5-9 pairs, opposite or slightly subopposite; oblong, lanceolate, usually curved to one side; 5-17 by 2-4 cm, chartaceous to subcoriaceous, glossy green upside, pale beneath; apex acuminate to slightly caudate; base oblique to obtuse in outline; margin entire; midrib prominent beneath, depressed upside; secondary nerves 7-16 pairs, arched and more or less anastomosing, prominent beneath, slightly distinct upside; other nerves hardly distinct on both sides. *Petiole* 3-10 cm long, swollen near base, spacially indumentum, pubescent; petiolules 0.5-1.5 cm, pubescent then glabrescent. *Inflorescence* a thyrse or racemose-liked, 3-5-(20) cm long, peduncles 3-7 cm long, pedicels ca. 1 mm long, pubescent then glabrescent; bracts and bracteoles narrow triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, campanulate 1.5-2 mm long, lobes ca. 1/4 of all length, stellate indumentum outside, glabrous inside. *Corolla* 4, tubular, 8-10 mm long, lobes oblong ca. 1/2 of all length, tomentose outside, glabrous inside. *Staminal tube*, tubular, up to 10 mm long, glabrous outside, pubescent inside, slightly 10 lobes at margin. *Stamens* 10, along margin, filaments adnate with the tube inside. *Ovary* ovate on collar of disk, ca. 2 by 1.5 mm; 2 loculi, each locule with 1-(2) ovules; style linear, ca. 8 mm long, hairy; stigma round and depressed upside, glabrous. *Infructescence* (not seen), globose ca. 1.5 cm diam. (as said), orange yellow, dehiscent in mature stage. *Seeds* 2, round and flattened, ca. 1.5 cm diam.

T h a i l a n d.—PENINSULAR. Trang, Satun.

D i s t r i b u t i o n.—Indonesia (Type), Philippines

E c o l o g y.—Evergreen forest, on granite bedrock and in swamp area; altitude 0-250 m.

V e r m a c u l a r.—Yom yot (ยมยอด) (Peninsular)

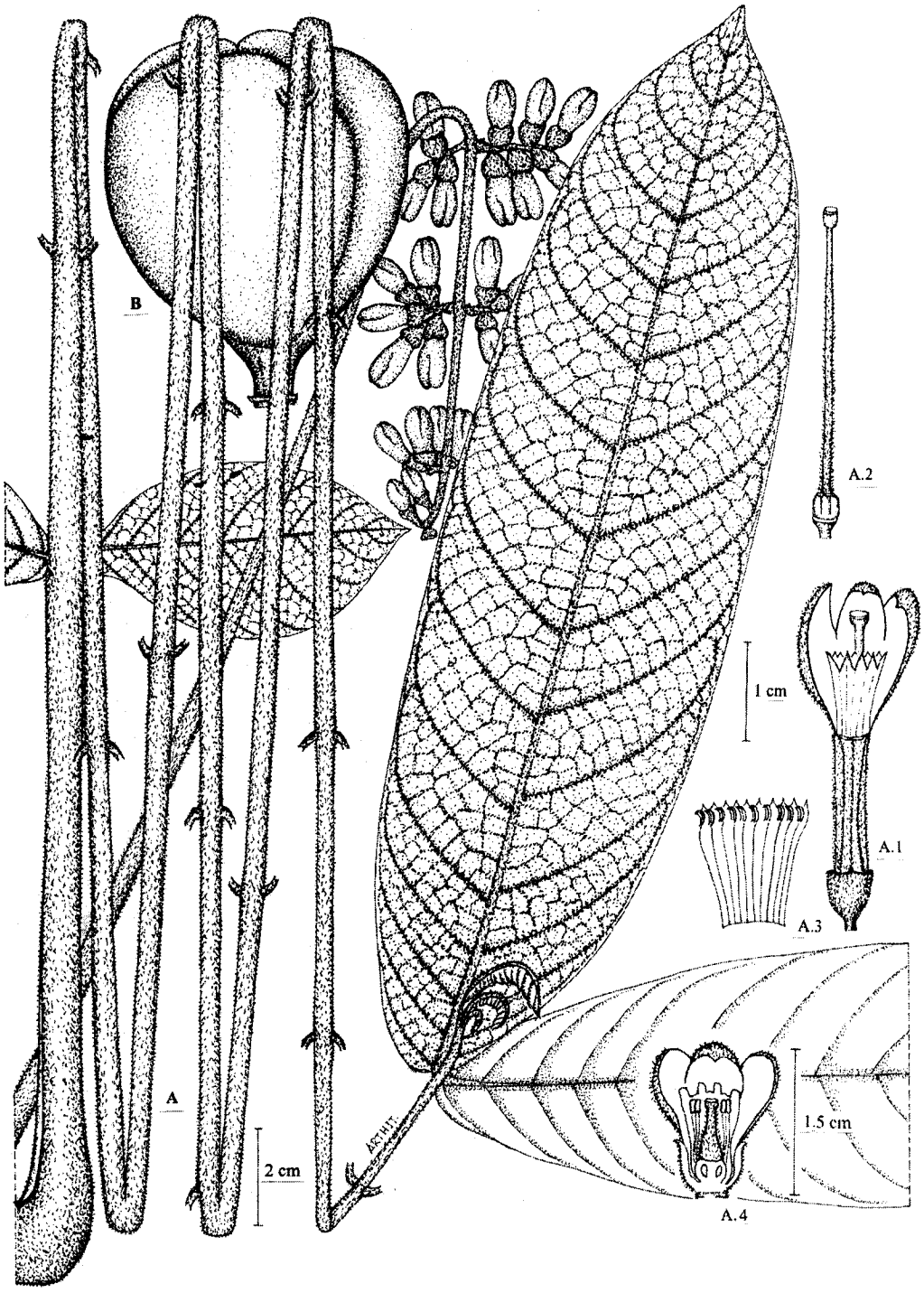

Fig. 54. *Chisocheton tomentosus* (Roxb.) Mabb.: A. twig with inflorescences, A.1 flower, A.2 pistil, A.3 stamens, A.4 longitudinal section of flower (C. Niyomdham 5670); B. drupe (Curtis 1519).

10. Chisocheton tomentosus (Roxb.) Mabb., Bull. Brit. Mus. (Nat. Hist.), Bot. 6: 323. 1979, et in Tree Fl. Malaya 4: 238. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 143. 1995.—*Melia tomentosa* Roxb.,Fl. Ind. (Carey & Wallich. ed) 1: 394. 1832; Hiern in Hook.f., Fl. Brit. India 1: 543. 1875; C. DC. in DC., Monogr. Phan. 1: 458. 1878; Curtis, J. Straits. Branch Roy. Asiat. Soc. 25: 21. 1894.—*Azedarach tomentosa* (Roxb.) Kuntze, Revis. Gen. Fl. 1: 110. 1891.—*Chisocheton princeps* Hemsl. in Hook.f., Fl. Brit. India 1: t. 1884. 1889; Ridl., Fl. Malay Penins. 1: 388. 1922; Whitmore, Trop. Rain For. Far East: t. 2. 7. 1975.—*Chisocheton rubiginosus* King, J. Asiat. Soc. Bengal 64.2: 29. 1895; Ridl., Fl. Malay Penins. 1: 389. 1922.—*Chisocheton rugosus* Pierre, Fl. Forest Cochinch. Fasc. 5: t. 347. 1897

Trees 5-12 m high 30-40 cm long, rather slender; terminal buds lanceolate, ca. 2 by 0.5 cm, tomentose; twigs rather stout, soft to hollow at center; outer bark blackish brown, smooth or finely fissured; inner bark orange yellow to brownish; sapwood whitish. *Leaves* paripinnate (rarely imparipinnate), 50-80 cm long, tomentose all parts, spirally arranged, the apical always with young and curled of new leaflets; leaflets 10-15 pairs, opposite or slightly opposite, oblong or elliptical; 13-30 by 3.5-12 cm, coriaceous to subcoriaceous, sparsely tomentose upside then glabrescent, except along nerves; densely tomentose beneath; apex acute, acuminate; base obtuse to slightly caudate; margin entire; midrib promiment and densely tomentose beneath, depressed and hairy upside, secondary nerves 7-16 pairs, arched and anastomosing near margin; scalariform and reticulate veins subprominent and dense hairs beneath. *Petiole* 10-20 cm long, swollen near base, densely hairs; petiolules 2-3 mm long, swollen and hairy. *Inflorescence* a thyrse compound, 18-75 cm long, axillary or supraaxillary, near end of branches, pendulous, densely tomentose, peduncles 20-30 cm long, pedicels ± 1 mm long, all hairy; bracts and bracteoles narrowly trianglar, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 5, campanulate, all ca. 3 mm long, lobes ca. 1/4 of all length, tomentose outside, glabrous inside. *Corolla* 5, devided ca. 1/3 of all length, obovate or oblanceolate, 1-1.3 by 0.3-0.5 mm, creamy, usually 3 lobes larger, the other 2 smaller, all tomentose outside and glabrous inside. *Staminal tube* broadly tubular, 7-10 mm long, margin with irregular lobes, serrate or dentate 7-8-10-lobed. *Stamens* 6, not protracted over the marginal tube; filaments adnate with tube inside. *Ovary* ovate or oval, on collar of disk, ca. 2 by 2 mm; (4-)5(-6) loculi, each locule with 1-(2) ovule; style cylindrical or rather stout, ca. 1 cm long, hirsute; stigma dilate, flat top, glabrous. *Infructescence* 10-30 cm long, pendulous. *Capsules* obovoid 6-7.5 by 5-6 cm, shining, 3-4-5 longitudinal grooved, woody, dehiscent. *Seeds* 3-5, up to 4 cm long, enclosed a part with white aril.

T h a i l a n d.—PENINSULAR: Nakhon Si Thammarat, Narathiwat.

D i s t r i b u t i o n.—Malaysia (Type).

E c o l o g y.—Evergreen forest; altitude 500-700 m.

V e r n a c u l a r.—Klong (กล้อง) (Peninsular).

5. CHUKRASIA

Chukrasia A. Juss., Bull. Sci. Nat. Géol. 23: 239. 1830; et. Mém. Mus. Natl. Hist. Nat. 19: 251. t. 29. 1832; Harms. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 19 b 1: 65. 1940; T. D. Penn. et Styles, Blumea 22: 519. 1975; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 354. 1995.

Trees with indumentum of simple hairs. *Leaves* paripinnate. *Inflorescence* panicle with many units of thyrses, axillary near end of branches. *Calyx* (4-)5 lobed. *Petal* (4-)5, free, tubular in outline in budding, contorted. *Staminal tube* cylindrical, margin crenulate rarely entire; anthers attached to margin. *Disk* obscure to narrowly cushion-shaped. *Ovary* flask-shaped (3)-5 loculi, each locule with numerous ovules; style capitate with 3-5 stigmatic ridges. *Capsule* ellipsoid, woody, opening by 3-5 valves from the apex, the valves splitting into an outer and inner bifid layer; columella with 3-5 sharply angled ridges, extending to apex of capsule; seed scars conspicuous. *Seeds* many, winged.

KEY TO THE VARIETIES
(based on flowering and leaf specimens)

1. Leaflets glabrous on both sides **1. C. tabularis** var. **tabularis**
1. Leaflets glabrous on the upper side and hairy on the lower side **2. C. tabularis** var. **velutina**

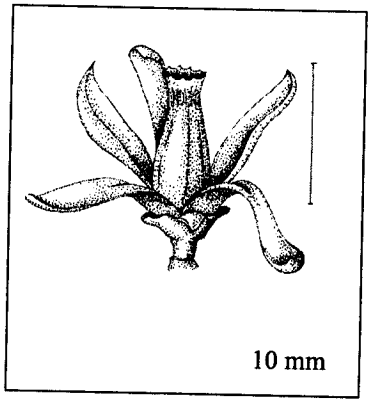

Fig. 55. Flower of *Chukrasia tabularis* A. Juss. var. *tabularis*

Fig. 56. *Chukrasia tabularis* A. Juss. var. *tabularis*: A. twig with inflorescences, A.1 flower, A.2 ovary, A.3 part of ovary, A.4 stamens (K. Suvanasudhi 538); B. capsules, B.1 seed (R. Pooma 1475).

1. Chukrasia tabularis A. Juss. var. **tabularis**, Bull. Sci. Nat. Géol. 23: 241. 1830; Pierre, Fl. Forest Cochinch. Fasc. 5: t. 357 C. 1897; Brandis, Indian Trees: 144. 1906; Pellegr. in Lecomte Fl. Indo-Chine 1: 780. 1911; T.D. Penn., Blumea 22: 522. 1875; C. Y. Wu, Fl. Yunnan 1: 211. 1977; Mabb. in Tree Fl. Malaya 4: 256. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 354. 1995.—*Chickrasia tabularis* (A. Juss.) Wight & Arn., Prodr.: 123. 1834; Hiern in Hook.f., Fl. Brit. India 1: 568. 1875; Kurz, Forest Fl. Brit. Burma 1: 227. 1877; Ridl., Fl. Malay Penins. 1: 415. 1922.

Trees 10-30 m high, 300-400 cm girth; buttress up to 150 cm high. Outer bark orange brown, flaking upward, curved; inner bark pinkish orange, fibrous; heartwood brown. *Leaves* imparipinnate, up to 60 cm long, spirally arranged, densely pubescent all parts; leaflets 10-15 opposite or slightly oblique, except the terminal one; elliptic, obovate, ovate-oblong or oblong, 4-15 by 2.5-5 cm, pubescent then glabrescent to glabrous both sides; apex acuminate to shortly caudate; base oblique to obtuse; margin entire. midrib prominent beneath, adpressed upside; secondary nerves arched and more or less anastomosing with conspicuous beneath; reticulate veins slightly conspicuous beneath. *Petiole* 4-10 cm long, petiolules ca. 1 cm long, pubescent then glabrescent. *Inflorescence* a thyrse compound, 15-18 cm long, suberect or reflex, pedicels linear 4-5 mm long, pubescent. *Calyx* 5, free or minutely united near base, lobes ovate 2-3 by 1-1.5 mm, pubescent on both sides. *Corolla* 5, free, linear-oblong, 6-10 by 2 mm, yellow, yellowish white or yellowish green, sparsely pubescent outer part and pubescent near the margin on the upper part at inner side. *Staminal tube* tubular, 5-6 by 2-3 mm, glabrous, yellow, margin with truncate or serrate lobed and opposite with the anthers. *Stamens* 5, filaments adnate the tube, anther as the same level of staminal margin. *Ovary* urceolate, 8-10 by 2-3 mm, 5 loculi, each locule with 1 ovule; style tubular, stigma slightly 5–lobed. *Infructescence* pendulous. *Capsule* ellipsoid, woody, 4-4.5 by 2.5-3 cm, pubescent, always dehiscing in 3-(5) longitudinal parts; each part minutely divided in 2-pointed apex. *Seeds* winged at the terminal, up to 1 cm long.

T h a i l a n d.—NORTHERN: Chang Mai, Chiang Rai, Nan, Phrae, Tak; NORTH-EASTERN: Loei; SOUTH-WESTERN: Kanchanaburi; CENTRAL: Lop Buri; SOUTH-EASTERN: Chanthaburi; PENINSULAR: Surat Thani, Nakhhon Si Thammarat, Trang, Songkhla.

D i s t r i b u t i o n.—India, Sri Langka, Bangladesh, Indochina, Malaysia.

E c o l o g y.—Limestone bedrock in evergreen, deciduous or mixed deciduous forest; altitude 60-1,680 m (most commonly 200-700 m).

V e r n a c u l a r.—Yom hin (ยมหิน), Sadao chang (สะเดาช้าง), Sadao hin (สะเดาหิน) (Northern, Central); Fak dap (ฝักกดาบ) (Southeastern).

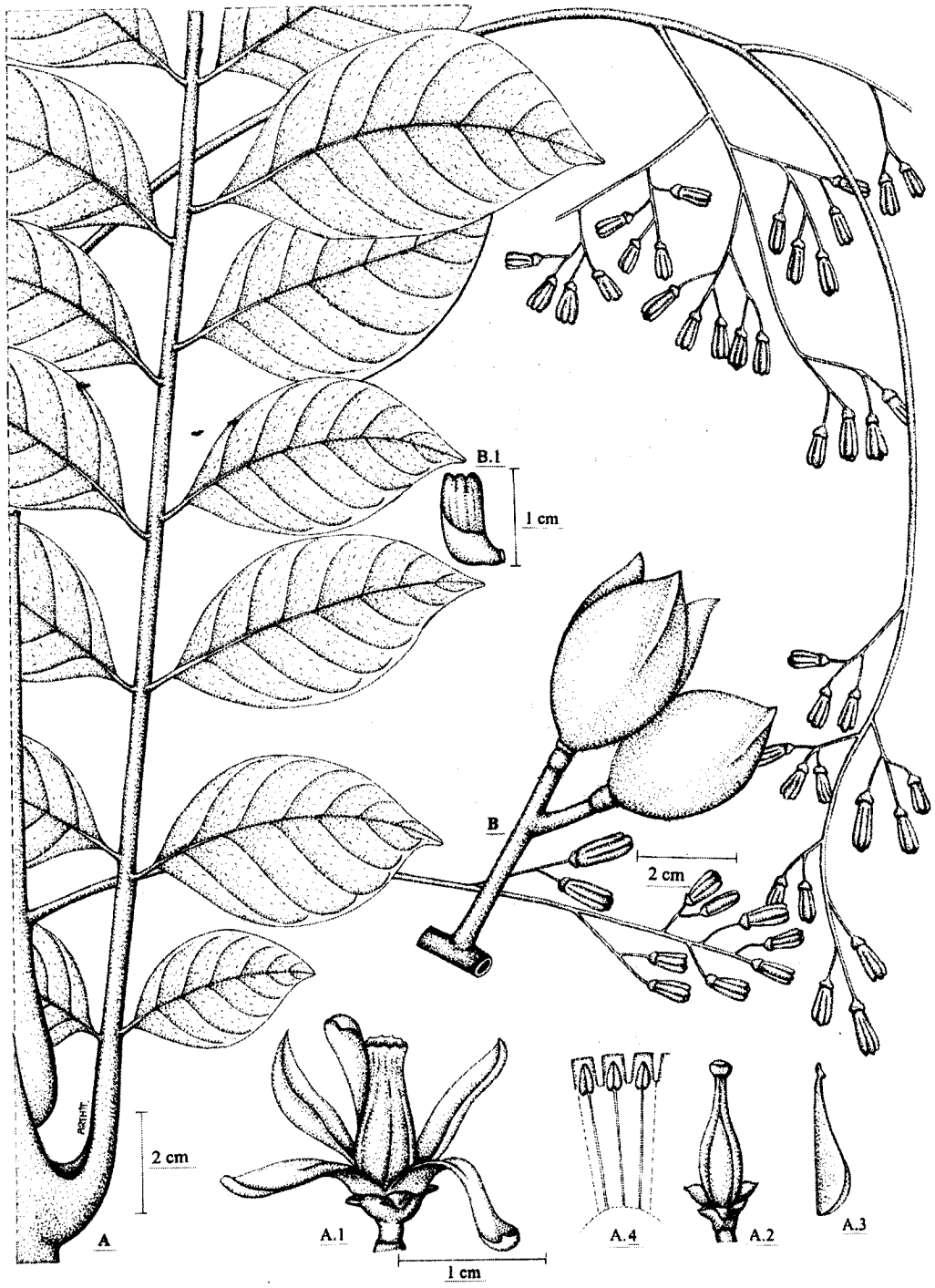

Fig. 57. *Chukrasia tabularis* A. Juss. var. *velutina* (M. Roem.) Phengklai.: A. twig with inflorescences, A.1 flower, A.2 ovary, A.3 part of ovary, A.4 stamens; B. capsules, B.1 seed

2. Chukrasia tabularis A. Juss. var. **velutina** (M. Roem.) Phengklai.—*Chickrassia velutina* M. Roem. Fam. Nat. Synops. Monogr. 1: 135. 1846; Kurz, Forest Fl. Brit. Burma 1: 227. 1877.—*Chukrasia velutina* (M. Roem.) C. DC. in DC., Monogr. Phan. 1: 727. 1878, incl. var. *macrocarpa* C. DC.; Pierre, Fl. Forest Cochinch. Fasc. 5, t. 357: 1897, incl. var. *dongnaiensis* Pierre & var. *microcarpa* Pierre; Brandis, Indian Trees: 145. 1906; Alston in Trim., Handb. Fl. Ceylon 6: 46. 1931; Worth., Ceylon Trees: t. 125. 1959.

Trees, 10-30 m high, 300-400 cm girth; buttress up to 150 cm high. Outer bark orange brown, flaking upward, curved; inner bark pinkish orange, fibrous; heartwood brown. *Leaves* imparipinnate, up to 60 cm long, spirally arranged, densely pubescent all parts; leaflets 10-15 opposite or slightly oblique, except the terminal one; elliptic, obovate, obovate-oblong or oblong, 4-15 by 2.5-5 cm, pubescent upside, velutinous beneath; apex acuminate to shortly caudate; base oblique, to obtuse;margin entire. Midrib prominent beneath, adpressed upside; secondary nerves arched and more or less anastomosing with conspicuous beneath; reticulate veins slightly conspicuous beneath. *Petiole* 4-10 cm long, petiolules ca. 1 cm long, pubescent. *Inflorescence* a thyrse compound, 5-18 cm long, suberect or reflex, pedicels linear 4-5 mm long, velutinous. *Calyx* 5, free or minutely united near base, lobes ovate 2-3 by 1-1.5 mm, velutinous both sides. *Corolla* 5, free, linear-oblong, 6-10 by 2 mm, yellow or yellowish white, pubescent outer part and pubescent near the margin on the upper part at inner side. *Staminal tube* tubular, 5-6 by 2-3 mm, pubescent outer part, yellow, margin with truncate or serrate lobes and opposite with the anthers. *Stamens* 5, filaments adnate the tube, anther as the same level of staminal margin. *Ovary* urcolate, 8-10 by 2-3 mm, 5 loculi, each locule with 1 ovule; style tubular, stigma slightly 5-lobed. *Infructescence* pendulous. *Capsule* ellipsoid, woody, 4-4.5 by 2.5-3 cm, pubescent, always dehiscing in 3-(5) longitudinal parts; each part minutely divided in 2-pointed apex. *Seeds* winged at the terminal, up to 1 cm long.

T h a i l a n d.—NORTHERN: Lampang; NORTH-EASTERN: Loei; EASTERN: Chaiyaphum, Nakhon Ratchasima; CENTRAL: Saraburi; PENINSULAR: Surat Thani.

D i s t r i b u t i o n.—India, Sri Lanka, Laos, Vietnam.

E c o l o g y.—Limestone bedrock, in evergreen or mixed deciduous forest.

V e r n a c u l a r.—Sadao chang (สะเดาช้าง), Kadao chang (กะเดาช้าง), Yom hin (ยมหิน) (Northeastern).

6. CIPADESSA

Cipadessa Blume, Bijdr.: 162. 1825; Harms in Engl. & Prantl, Nat. Pflanzenfam., ed 2, 19 b 1: 93. 1940; T.D. Penn., Blumea 22: 479. 1975; Mabb. in Tree Fl. Malaya 4: 239. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 57. 1995.—*Mallea* A. Juss., Bull. Soc. Sci Nat. Gëol. 23: 236. 1830.

Shrubs to small trees, young parts pubescent. *Leaves* imparipinnate, leaflets opposite. *Inflorescence* polygamous, axillary, near end of twigs, panicle with thyrse units. *Calyx* 5, in apical half. *Corolla* 5(-6), free, valvate. *Stamens* 10, acute, pubescent. *Disk* patelliform. *Ovary* obovoid, 5(-6) lobes. *Capsule* globular or obovoid, with 5(-6) pyrenes or lobes, each with 1(2) seed. *Seeds* obovoid, without aril; testa thin; embryo embedded in endosperm.

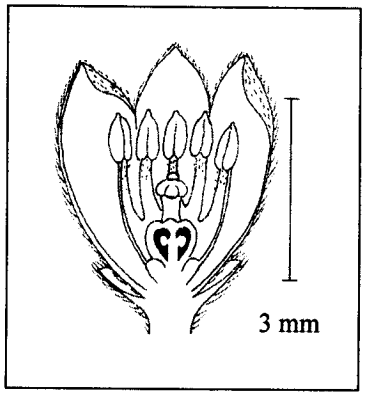

Fig. 58. *Cipadessa baccifera*: longitudinal section of flower.

Fig. 59. *Cipadessa baccifera* (Roth) Miq.: A. twig with infructescences, A.1 capsule, A.2 part of capsule (R. Pooma 1175); B. twig with inflorescences, B.1 longitudinal section of flower.

Cipadessa baccifera (Roth) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 6. 1868; C. DC. in DC. Monogr. Phan. 1: 426. 1878; Craib, Fl. Siam Enum. 1: 251. 1926; Elmer in Leafl. Philipp. Bot. 9: 3348. 1937; Pellegr. in Lecomte Fl. Indo-Chine, Suppl.: 722. 1946; How & Chen, Acta Phytotax. Sin. 4: 34. 1955; Backer & Bakh. f., Fl. Java 2: 118. 1965; T. D. Penn., Blumea 22: 479. 1975; Mabb. in Tree Fl. Malaya 4: 239. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 59. 1995; Hô, 3. Fl. Vietnam 2.1: 484. 1992.—*Melia baccifera* Roth, Nov. Sp. Pl. Ind. Or.: 215. 1821.—*Cipadessa fruticosa* Blume, Bijdr.: 162. 1825; Hiern in Hook.f., Fl. Brit. India 1: 545. 1875; Brandis, Indian Tree: 137. 1906; Pellegr. in Lecomte Fl. Indo-Chine 1: 782. 1911.—*Cipadessa sinensis* (Rehd. et Wils.) Hand.-Mazz., Vegetationsbilder 20(7): 9. 1930.—*Cipadessa cinerascens* (Pellegr.) Hand.-Mazz., Symb. Sin. 7: 632. 1933.

Shrubs to small trees 2-6(-20) m high, 20-40 cm girth. *Twigs* densely pubescent; outer bark thin, finely fissured, sparsely with greenish-tan lenticels. Inner wood hard, white to slightly pink. *Leaves* imparipinnate, sprirally arranged, 15-25 cm long, pubescent all parts; leaflets elliptic to elliptic-oblong, with unequal sides, 5-13 leaflets, opposite except the terminal one, 3-8 by 1.5-4 cm, glossy green upside, greenish beneath, dull red before falling off, densely pubescent both surfaces; apex acuminate; base oblique or broadly cuneate with oblique; entire margin; midrib prominent beneath and subdepressed upside, densely pubescent both surfaces, secondary nerves 7-10 pairs, arched but not anastomosing, other nerves hardly distinct. *Petiole* 2.5-10 cm long, petiolules 0.2-0.5(2.5) cm, densely pubescent all. *Inflorescence* a thyrse compound, axillary near end of twigs, 5-15 cm long, densely pubescent; bracts subulate, 1.5 mm long, sericeous; bracteoles ca. 1 mm long, sericeous. *Calyx* 5, broadly campanulate, ca. 0.5 mm high, lobes triangular, ca. 1/2 of all the length, pubescent outer parts and glabrous inner parts. *Corolla* 5, free, lobes ovate or lanceolate 3-3.5 by 1 mm, alternate with calyx lobes, yellow, creamy, creamy-white, greenish white or white, pubescent outer part, glabrous inner part. *Staminal tube* slighty urceolate, 2-2.5 by 1.5-2 mm, divided 3/4 of all length; anthers 10, on the end of each lobe; filaments white, hairy on the upper half. *Ovary* obconical shape, ca. 0.5 by 0.5 mm, glabrous; 5 loculi, each locule with 1(-2) ovules; style tubular, ca. 0.5 mm high, glabrous, stigmata expand with 6-lobed. *Infructescence* nearly the same size of inflorescence, usually below the remain leaves. *Drupes* globose with 5 longitudinal grooved, 3-5 mm diam., woody, reddish brown to dark red in maturity.

T h a i l a n d.—NORTHERN: Mae Hong Son, Chiang-Mâi, Chiang Rai, Nan, Lampang, Tak; NORTH-EASTERN: Loei, Nakhon Phanom; SOUTH-EASTERN: Chanthaburi.

D i s t r i b u t i o n.—India, Sri Lanka, China, Indonesia, Philippines (Type).

E c o l o g y.—On granite bedrock or limestone ridge in hill evergreen or mixed deciduous scrub, swampy and nearby stream; altitude (220-)700-1,500(-2,250) m.

7. DYSOXYLUM

Dysoxylum Blume, Bijdr.: 172. 1825; Harms in Engl. & Prantl, Nat. Pflanzenfam., ed. 2: 19b1: 160. 1940; T.D. Penn., Blumea 22: 504. 1975; Mabb. in Fl. Nouv.-Caléd. et Dép. 15: 23. 1988; Mabb. in Tree Fl. Malaya 4, f. 6: 239. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 61. 1995.

Trees or shrubs, polygamo-dioecious, pubescent to glabrous. *Leaves* spirally arranged, *paripinnate* or *imparipinnate*; leaflets alternate, subopposite or opposite, except the top one. *Inflorescence* a thyrse compound, racemose or spicate; axillary near terminal, ramiflorous or cauliflorous. *Calyx* 4, free or united near base, spirally. *Petals* 4(-6), free or adnate to base of staminal tube, valvate. *Staminal tube* cylindrical or slightly long urceolate, margin dentate or emarginate. *Stamens* 8(-10), within throat of tube. *Disk* free, cotyliform or cyathiform. *Ovary* 4 loculi, each locule with 2 ovules. *Drupe* ovoid or obovoid, 1-4-lobes, dehiscent (almost). *Seeds* with fleshy aril or sarcotesta.

KEY TO THE SPECIES

1. Leaves imparipinnate
 2. Leaflets distinct alternately
  3. Inflorescence erected, spikeliform or non-branched
   4. Spike erect, up to 10 cm long **9. D. flavescens**
   4. Spike or thyrse, usually 20-30 cm long **6. D. cyrtobotryum**
  3. Inflorescence pendulous, branched or paniculate
   5. Ovary with 8 locular. Disk cupuliform as long as ovary **2. D. alliaceum**
   5. Ovary with 4 locular. Disk broadly campanulate, a half of ovary **12. D. macrocarpum**
 2. Leaflets opposite or slightly opposite (except the terminal one)
  6. Leaflets opposite
   7. Leaflets glabrous all. Staminal tube with glandular within **4. D. arborescens**
   7. Leaflets pubescent along midrib and secondary nerves. Staminal tube glabrous within **11. D. lenticellatum**
  6. Leaflets slightly opposite
   8. Petiolule of apical one not less than 2 cm long. Leaflets obovate to obovate oblong. Inflorescence axillary **15. D. rubrocostatum**
   8. Petiolule of apical one ca. 0.5 cm long. Leaflets oblanceolate to ovate. Inflorescence cauliflorus or ramiflorus **7. D. densiflorum**
1. Leaves paripinnate
 9. Leaflets densely hairy or sparsely pubescent on beneath
  10. Leaflets serrate or serrulate margin, sparsely pubescent beneath **13. D. mollissimum**
  10. Leaflets entire margin, densely hairs on beneath
   11. Leaflets 4-10 pairs, densely tomentose and soft hairs beneath, scalariforms veins prominent beneath **10. D. grande**
   11. Leaflets strictly 2(-3) pairs only, many gland dots beneath, scalariform veins hardly distinct **14. D. papillosum**
 9. Leaflets completely glabrous both sides
  12. Petals or corolla, glabrous on the inner side

13. Inflorescence cauliflorous or ramiflorous. Petals glabrous on both sides **5. D. cauliflorum**
13. Inflorescence axillary. Petals glabrous only on the inner side. **8. D. excelsum**
12. Petals or corolla pubescent on both sides
    14. Petals up to 1 cm long; yellowish. Staminal tube pubescent outer part, renulate on margin **1. D. acutangulum**
    14. Petals not less than 1.5 cm long; white. Staminal tube glabrous on both sides, 8-dentate on margin **3. D. angustifolium**

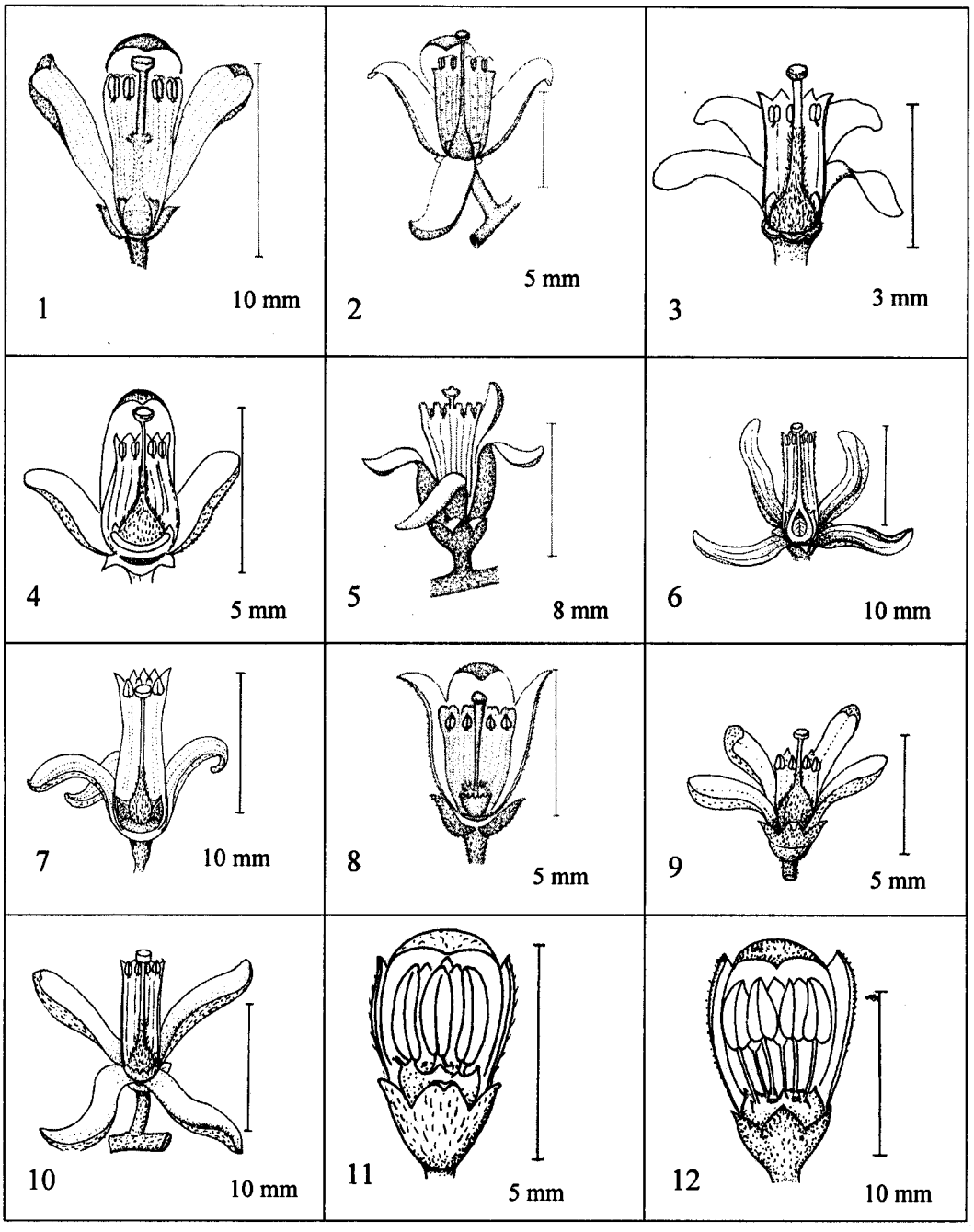

Fig. 60. Longitudinal section of flower in Genus *Dysoxylum*: 1) *Dysoxylum alliaceum*; 2) *D. arborescens*; 3) *D. cauliflorum*; 4) *D. cyrtobotryum*; 5) *D. densiflorum*; 6) *D. excelsum*; 7) *D. flavescens*; 8) *D. grande*; 9) *D. lenticellatum*; 10) *D. macrocarpum*; 11) *D. mollissimum*; 24) *D. rubrocostatum*.

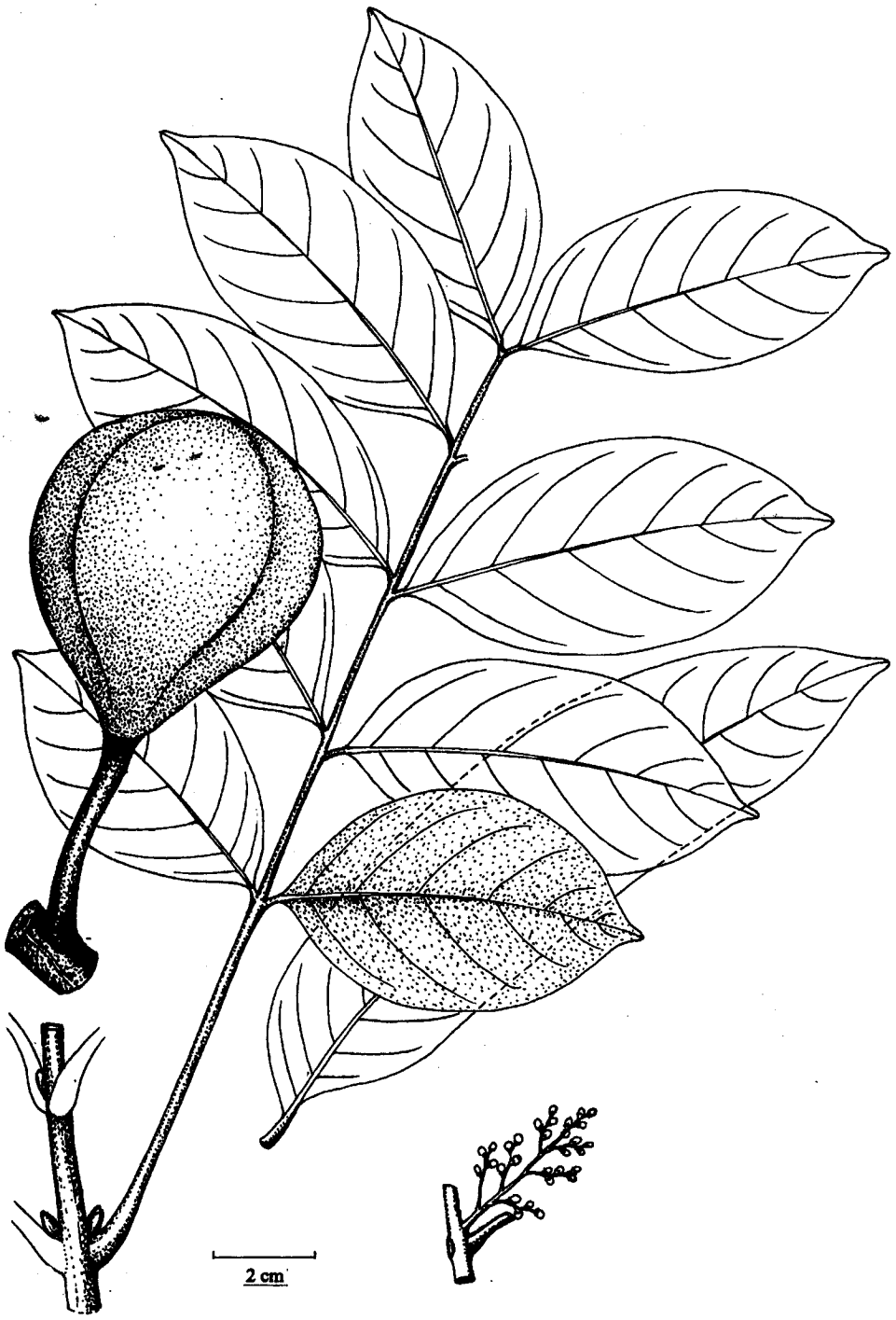

Fig. 61. *Dysoxylum acutangulum* Miq.: A. twig; B. inflorescences (A.F.G. Kerr 19434); C. drupe (M. Shah 400).

1. Dysoxylum acutangulum Miq., Fl. Ind. Bat. Suppl. 1: 196, 503. 1861; King, J. Asiat. Soc. Bengal 64,2: 41. 1895; Ridl., Fl. Malay Penins. 1: 393. 1922; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 129. 1995.—*Alliaria acutangula* (Miq.) Kuntze, Revis. Gen. Pl. 1: 109. 1891.—*Dysoxylum schultzii* C. DC. in DC., Monogr. Phan. 1: 502. 1878.—*Dysoxylum foveolatum* Radlk., Sitzungsber. Math.-Phys. Kl. Konigl. Bayer. Akad. Wiss. Munchen: 598. 1879.

Trees 20-25 m high, 100-150 cm girth, apical buds with fist-shaped young leaves, 1-2 cm long with minute fulvous tomentose; young twigs slightly 4 angular and sparsely lenticels. Outer bark smooth or with long scaly bark, brownish grey and lenticellate; inner bark dark yellow and fibrous; sapwood yellowish brown. *Leaves* paripinnate 15-30 cm long, decussate arranged; leaflets 1-5 pairs, opposite or subopposite; elliptic or elliptic-oblong; 9-15 by 2-5(-6) cm, coriaceous, leathery, glabrous, rugulose when dry, green upside pale beneath; apex acute to acuminate; base obtuse to slighty cuneate; margin slightly undulate to entire; midrib prominent beneath, ± glabrous, depressed upside; secondary nerves more or less conspicuous beneath, hardly distinct upside; other veins indistinct. *Petiole* 5-10 cm long, grooved upside, petiolules 0.5-1 cm long, all glabrous. *Inflorescence* axillary, a short thyrse compound, 3-10 cm long, erected, spacially pubescent, peduncles 1-3 cm long, pedicels 0-1 mm long; bracts and bracteoles narrowly triangular, ca. 0.5 mm long, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, all 2-3 mm long, lobes ca. 1/2 of all length, pubescent outside, glabrous inside. *Corolla* 4, free, linear-oblong, valvate, ca. 1 cm long, pubescent or both sides, yellowish. *Staminal tube* tubular, ca. 5 mm long, sparsely pubescent outside, glabrous inside, margin crenulate. *Stamens* 8(-10), lower than the marginal tube, filaments adnate the tube inside. *Disk* cupuliform, ca. 1.5 mm high, red. *Ovary* ovoid, ca. 0.5 by 0.5 mm, pilose, (3-)4 loculi, each locule with 2 ovules; style cylindrical, ca. 0.2 mm long, pilose on lower half; stigma dilate, round, glabrous. *Infructescence* erected, 5-10 cm long. *Capsule* obovate, 5-8 cm diam., orange when mature, always dehiscing in 3-(4) longitudinal parts, pericarp up to 1 cm thick, inner side orange yellow; glabrous. *Seeds* (3)-4, ellipsoid, ca. 2 cm long, enclosed a part with orange aril.

T h a i l a n d.—PENINSULAR: Chumphon, Satun.

D i s t r i b u t i o n.—Malaysia, Indonesia (Type), Philippines, Australia.

E c o l o g y.—Evergreen forest; altitude 100-700 m.

V e r n a c u l a r.—Ta suea (ตาเสือ).

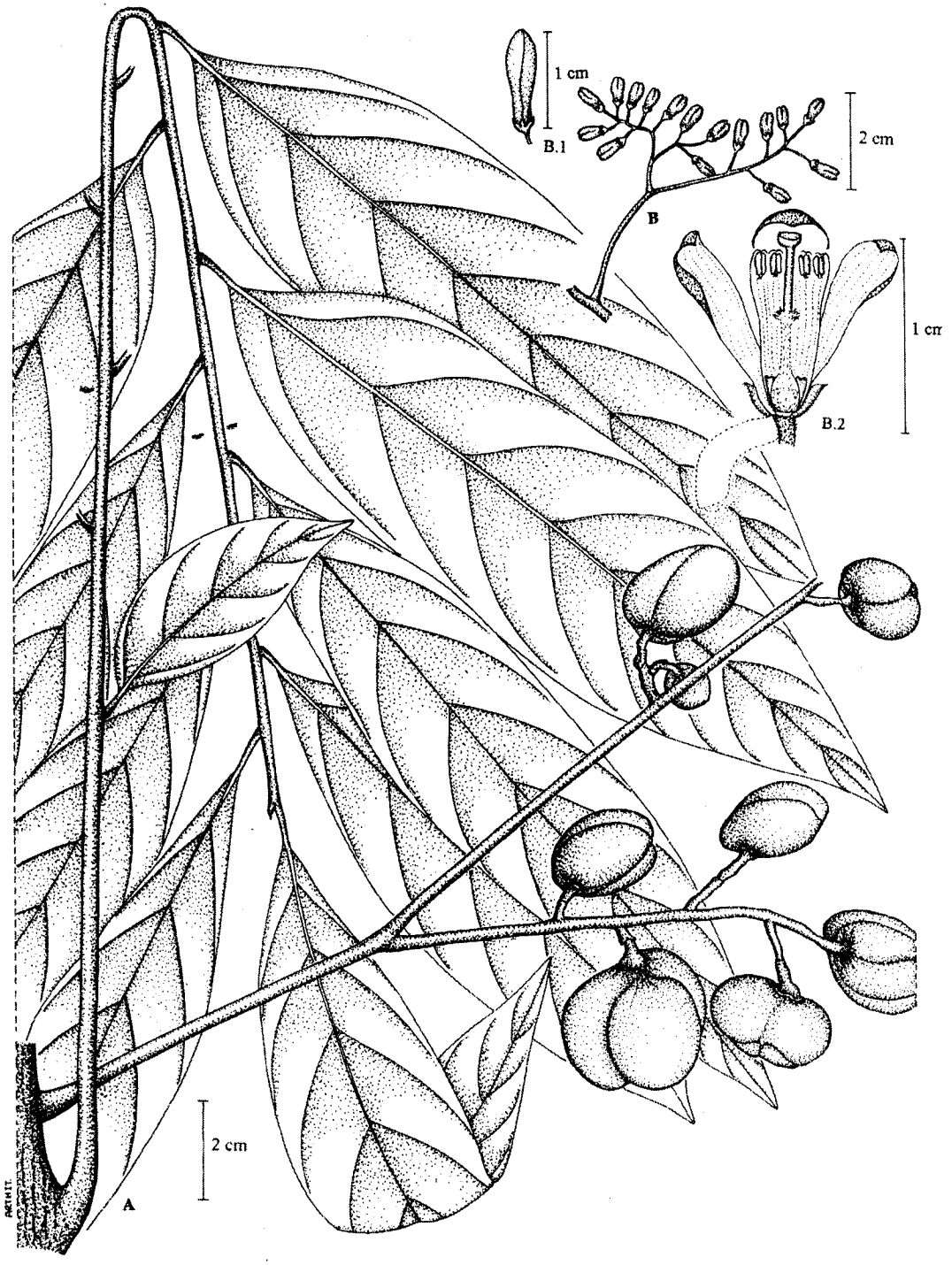

Fig. 62. *Dysoxylum alliaceum* (Blume) Blume: A. twig with infructescences (S. Phusomsaeng 234); B. part of inflorescence, B.1 flower bud, B.2 longitudinal section of flower (Elmer 10736).

2. Dysoxylum alliaceum (Blume) Blume, Bijdr.: 172. 1825; Miq., Fl. Ind. Bat., Suppl. 1,2: 536. 1859; Backer & Bakh. f., Fl. Java 2: 123. 1965; Mabb. in Tree Fl. Malaya 4: 240. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 106. 1995.—*Dysoxylum costulatum* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 21. 1868; Ridl., Fl. Malay Penins. 1: 394. 1922.—*Dysoxylum brevipes* Hiern in Hook.f., Fl. Brit. India 1: 546. 1875.—*Amoora oligosperma* Pierre, Fl. Forest Cochinch.: t. 345 A. 1897.—*Dysoxylum pulchrum* Rid., J. As. Soc. Str. Br. 75: 17. 1917, et Ridl., Fl. Malay Penins. 1: 395. 1922.

Shrubs to trees (3)20-30(-38) m high, (25)100-200 cm girth; apical buds obtuse or round. Outer bark brownish, finely fissured, creamy lenticellate; inner bark reddish brown, yellow to dark orange or brown; heartwood reddish brown. *Leaves* imparipinnate (pari pinnate occasionally) 20-60 cm long, spirally arranged; leaflets 7-11 pairs, strongly alternate apical one always present, elliptic-oblong, oblong-lanceolate to lanceolate, 10-25 by 3-7.5 cm, chartaceous to subcoriaceous, glabrous, glossy green upside, pale beneath; apex acuminate; base oblique, broadly cuneate; margin entire; midrib prominent beneath, depressed upside; secondary nerves 8-12(-14) pairs, arched but not anastomosing, sharply raised beneath and depressed upside; scalariform veins slightly distinct on lower surface. *Petiole* 5-13(-15) cm long, swollen at base, sparsely pubescent then glabrous, petiolules 0.5-1 cm, glabrous. *Inflorescence* a thyrse compound, 10-20(-40) cm long, pendulous or erected, axillary or supraaxillary near end of twigs; peduncles 5-15 cm long, pedicels 2-5 mm long, sparsely pubescent; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, all 1-1.5 mm long, lobes ca. 2/3 of all length, densely pubescent outside, glabrous inside. *Corolla* 4, free, oblanceolate, 8-12 by 2-3 mm, adpressed pubescent outside, glabrous inside, pinkish or white, sweet scented. *Staminal tube* tubular ca. 6 mm long, sparsely pubescent outside, margin smooth or slightly with 8 emarginate lobes. *Stamens* 8, opposite at same level of lobes, filaments adnate the tube inside. *Disk* cupulariform, as long as ovary. *Ovary* ovate, glabrous or pilose, ca. 1.5 by 1 mm; (3-)4 loculi, each locule with (1-)2 ovules; style cylindrical, ca. 6 mm long, hairy on lower half; stigma dilate, round, flat top, glabrous. *Infructescence* erected or slightly pendulous, 15-20 cm long. *Capsule* globose in outline, with clearly 2-3-4 longitudinal lobed; 3-3.5 by 2.5-5 cm; reddish or yellowish brown. *Seeds* 1-4, oblong-globose, white aril.

T h a i l a n d.—SOUTH-WESTERN: Kanchanaburi; SOUTH-EASTERN: Chon Buri, Chanthaburi; PENINSULAR: Ranong, Surat Thani, Trang, Narathiwat.

D i s t r i b u t i o n.—Burma, Vietnam, Malaysia, Indonesia, Philippines, Australia.

E c o l o g y.—Tropical evergeen to dry or hill evergreen forest, preferred nearby stream; altitude (200-)700-1,100(-1,700) m.

V e r n a c u l a r.—Ta suea khao (ตาเสือขาว) (Peninsular).

Fig. 63. *Dysoxylum angustifolium* King: A. twig with infructescences (M. F. Newman et al. 1068).

3. Dysoxylum angustifolium King, J. Asiat. Soc. Bengal 64,2: 39. 1895; Ridl., Fl. Malay Penins. 1: 392. 1922; Corner, Wayside Trees Mal. 1: 461. t. 153. 1940; Mabb. in Tree Fl. Malaya 4: 242. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 112. 1995.

Trees (6-)10-20 m high, 40-100 cm girth, apical buds with fist-shaped young leaves, 2-3 cm long, hairy or indumentum; young twigs sparsely with leaf-scars. Outer bark smooth, olive-brown with grey patches, lenticellate; inner bark red or dark brown; heartwood brown. *Leaves* paripinnate (imparipinnate occasionally) 20-40 cm long, spirally arranged; leaflets 4-8 pairs, the lower pairs slightly subopposite; lanceolate, oblanceolate or oblong, 8-21 by 1.5-2.5(-6) cm, chartaceous to subcoriaceous, glabrous, glossy green upside, pale beneath; apex acuminate to acute; base cuneate to broadly cuneate; margin entire; midrib prominent beneath, depressed upside, sparsely pubescent, then glabrescent; secondary nerves 6-17 pairs, arched but not anastomosing, others veins hardly distinct. *Petiole* 6-12 cm long, sparsely then glabrous, petiolules 0.5-1 cm long, glabrous. *Inflorescence* axillary or supraaxillary, a thyrse compound, up to 1 m long, pendulous or suberected, glabrous or glabrescent, peduncles 5-20 cm long, pedicels 1-3 mm long; bracts and bracteoles narrowly triangular, ca. 1 by 0.5 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, all ca. 3 mm long, lobes ca. 1/3 of all length, pubescent outside, glabrous inside. *Corolla* 4, free, linear-oblong, valvate, 1.5-2 cm long, sparsely pubescent both sides, white or pinkish. *Staminal tube* tubular, ca. 8 mm long, glabrous on both sides, margin with 8 dentate-lobed. *Stamens* 8, alternate and lower the lobes, filaments adnate the tube inside. *Disk* annular with slightly lobed at base of ovary. *Ovary* ovate or ovoid, ca. 0.5 by 0.5 mm, pilose, 4 loculi, each locule with 2 ovules; style cylindrical, ca. 2 mm long slightly 4-angled, pilose on lower half; stigma dilate, round, flat top, glabrous. *Infructescence* erected or slightly pendulous, 10-25 cm long. *Capsule* globose, 2.5-3 by 2-3 cm, pink, yellow or orange, slightly 3-4 longitudinal lobes, leathery. *Seeds* 1-4, ellipsoid with depressed the attached sides, enclosed a part with bright red aril.

T h a i l a n d.—NORTHERN: Chiang Mai; PENINSULAR: Trang.

D i s t r i b u t i o n.—Vietnam, Malaysia (Type), Singapore.

E c o l o g y.—On limestone or granite bedrock in evergreen forest; altitude 350-650 m.

V e r n a c u l a r.—Ta suea daeng (ตาเสือแดง) (Peninsular).

Fig. 64. *Dysoxylum arborescens* (Blume) Miq.: A. twig with inflorescences, A.1 another form of leaf (S. Phusomsaeng 81); B. part of infructescence (A.D.E. Elmer 18180).

4. Dysoxylum arborescens (Blume) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 24. 1868; King, J. Asiat. Soc. Bengal 64,2: 38. 1895; Brandis, Indian Trees: 138. 1906; Ridl., Fl. Malay Penins. 1: 391. 1922; Backer & Bakh. f., Fl. Java 2: 123. 1965; Mabb. in Tree Fl. Malaya 4: 242. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 103. 1995.—*Dysoxylum maingayi* Hiern in Hook.f., Fl. Brit. India 1: 547. 1875.

Trees (4-)8-20 m high, 30-100 cm girth, apical buds linear, ca. 1 cm long, densely hairs indumentum. *Twigs* drooping, lenticellate in horizontal lines. Outer bark greyish brown, rough, raised brown lenticels in horizontal lines, each ca. 1.5 cm long; inner bark creamy yellow, turn dark when exposed; sapwood pale brown. *Leaves* imparipinnate (paripinnate occasionally) 8-20(-25) cm long, spirally arranged; leaflets 3-7 pairs, opposite; ovate-oblong to oblanceolate, 4-28 by 2.5-6.5 cm, chartaceous, glabrous, grassy green upside, green beneath; apex acuminate to caudate; base cuneate and oblique; margin entire; midrib prominent beneath, flat to subdepressed upside; secondary nerves 5-10 pairs, arched and more or less anastomosing; scalariform veins hardly conspicuous on both sides. *Petiole* 3-5(-7) cm long, densely or sparsely pubescent, swollen at base; petiolules ca. 6 mm long, pubescent. *Inflorescence* a thyrse compound, axillary at or near end of twigs, 10-15 cm long, pedicels yellowish green 3-7 mm long, pubescent; bracts and bracteoles narrowly triangular, ca. 1.5 by 0.5 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, all 1-1.5 mm, long, lobes ca. 1/3 of all length, pubescent outside, glabrous inside. *Corolla* 4, free, linear-oblong, imbricate, 6-8 mm long, white or yellowish, pubescent outside, glabrous inside. *Staminal tube* tubular, 5-6 mm long, glandular inside, glabrous outside, margin slightly serrate 8-(10); lobed. *Stamens* 8-(-10), alternate with the marginal lobe; filaments adnate the tube inside. *Disk* cupuliform, glabrous, ca. 1 mm high. *Ovary* ovate, ca. 2 by 1 mm, densely simple hairs; (3-)4(-5) loculi, each locule with 2 ovules; style narrowly cylindrical, 6-7 mm long, hairy on lower half; stigma dilate, round, flat top, glabrous. *Infructescence* solitary or a small cluster, up to 10 cm long. *Capsule* ovoid, 2-2.5 by 3-4 cm, with 3-(4) longitudinal lobes; bright pinkish red, glabrous. *Seeds* ca. 2 by 1.5 cm, plano-convex, minutely aril.

T h a i l a n d.—NORTHERN: Chiang Mai; CENTRAL: Nakhon Nayok; PENINSULAR: Nakhon Si Thammarat, Phatthalung, Trang.

D i s t r i b u t i o n.—Malaysia (Type), Indonesia, Philippines, Taiwan, New Guinea, Australia.

E c o l o g y.—On granite or limestone bedrock, nearby stream in evergreen forest.

V e r n a c u l a r.—Ta suea khon (ตาเสือขน).

Fig. 65. *Dysoxylum cauliflorum* Hiern: A. twig, A.1 infructescence (C. Phengklai 12657); B. inflorescences, B.1 flower, B.2 longitudinal section of flower (C. Niyomdham 4703).

5. Dysoxylum cauliflorum Hiern in Hook.f., Fl. Brit. India 1: 549. 1875; Ridl., Fl. Malay Penins. 1: 396, t. 40. 1922; Corner, Wayside Trees Mal. 1: 462, t. 153. 1940: Mabb. in Tree Fl. Malaya 4: 242. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 86. 1995.—*Dysoxylum cuneatum* Hiern in Hook.f., Fl. Brit. India 1: 549. 1875.

Trees 10-25(-30) m high, 80-120 cm girth, apical buds with fist-shaped young leaves, more or less pubescent; twigs lenticellate. Outer bark dark brown, flaking in vertical pattern, or grey and smooth with lenticels; sapwood yellowish brown. *Leaves* paripinnate (imparipinnate occasionally) 30-60 cm long, spirally arranged; leaflets 6-7 pairs, the lower pairs slightly subopposite, elliptic-oblong, oblong or oblanceolate, 9-20 by 4-8 cm, chartaceous to subcoriaceous, glabrous, glossy green upside, pale beneath; apex caudate; base oblique, obtuse in outline or cuneate; margin entire; midrib prominent beneath depressed upside; secondary nerves 6-17 pairs, arched but not anastomosing, sharp ridge beneath, conspicuous upside; scalariform veins conspicuous beneath. *Petiole* 5-13 cm long, glabrous; petiolules 0.5-1 cm long, glabrous. *Inflorescence* on trunk, a thyrse compound or spike-liked, 5-10 cm long, pendulous or suberected, pubescent all parts; peduncles 1-2 cm long, pedicels ca. 1 mm long; bracts and bracteoles, narrowly triangular, ca. 1 by 0.5 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, all ca. 1.5 mm long, lobes ca. 3/4 of all length, hairy outside, glabrous inside. *Corolla* (3-)4, free, linear, imbricate, 7-10 mm long, glabrous, white or pinkish. *Staminal tube* tubular, ca. 3 mm long, glabrous both sides, margin with (6-)8 dentate lobes. *Stamens* (6-)8, alternate, lower than the lobes, filaments adnate the tube inside. *Disk* annular with slightly lobed, at base of ovary. *Ovary* ovate or ovoid, ca. 0.5 by 0.5 mm, pilose, 4-(5) loculi, each locule with 2 ovules; style cylindrical, ca. 2 mm long, pilose on lower half; stigma dilate, round, flat top, glabrous. *Infructescence* erected or slightly pendulous 4-8 cm long. *Capsule* ellipsoid or ovoid, 2-3 by 1.2-2 cm, in 4 longitudinal angular, leathery, bright red, dehiscent into 3-4 longitudinal lobes, each with 1 naked seed. *Seeds* 1-4, black, ca. 2 by 0.8 cm enclosed by bright orange aril at seed base.

T h a i l a n d.—SOUTH-EASTERN: Chon Buri, Chanthaburi; PENINSULAR: Phangnga, Krabi, Narathiwat.

D i s t r i b u t i o n.—Cambodia, Vietnam, Malaysia (Type), Indonesia, Philippines.

E c o l o g y.—Evergreen forest, nearby stream.

V e r n a c u l a r.—Ta suea tubtim (ตาเสือทับทิม) (Southeastern).

Fig. 66. *Dysoxylum cyrtobotryum* Miq.: A. twig with infructescences, A.1 seed (Th. Wongprasert 985 s.n.); B. inflorescence, B.1 flower, B.2 longitudinal section of flower (K. Larsen 9392).

6. Dysoxylum cyrtobotryum Miq., Fl. Ind. Bat., Suppl. 1: 196, 504. 1861; Mabb. in Tree Fl. Malaya 4: 243. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 123. 1995.—*Dysoxylum venulosum* King, J. Asiat. Soc. Bengal 64, 2: 42. 1895; Ridl., Fl. Malay Penins. 1: 397. 1922.—*Dysoxylum alternatum* Ridl., Fl. Malay Penins. 1: 397. 1922.

Trees 10-20 m high, 60-120 cm girth; apical buds stiletto-liked; twigs densely indumentum and pubescent, pitch brownish. Outer bark smooth, grey to mid greyish brown; inner bark dark orange or pale yellow with dark orange stripes; heartwood yellowish brown to red brown. *Leaves* imparipinnate (rarely paripinnate) 20-50 cm long, spirally arranged; leaflets 3-5 pairs, alternate, the apical one always reduced; elliptic, elliptic-oblong, 10-15 by 4-5 cm chartaceous glossy green upside, green beneath, glabrous; apex acuminate, acute or caudate; base oblique to obtuse in outline; margin entire; midrib prominent beneath, depressed upside; secondary nerves 7-12 pairs, raised in narrow ridge beneath, slightly or hardly distinct on upside; other veins hardly distinct. *Petiole* 7-10 cm, sparsely pubescent then glabrescent; petiolules 0.5-1 cm long, swollen near base, pubescent. *Inflorescence* a thyrse compound, erected, axillary, near end of twigs, (5-)20-30 cm long; peduncles 3-8 cm long, pedicels 1-2 mm long, all pubescent; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly companulate, all ca. 2 mm long, lobes ca. 1/2 of all length, pubescent outside, ciliate. *Corolla* 4, free, oblong, 5-7 by 1.5-2 mm, densely pubescent outside, glabrous inside, yellowish or white, scented. *Staminal tube* slightly urceolate, 4-5 mm long, sparsely pubescent outside, glabrous inside, margin with 8 serrate lobed. *Stamens* 8, alternate with the lobes, filaments adnate the tube inside. *Disk* annular, support or enclosed base of ovary, glabrous. *Ovary* slightly ovate, ca. 2 by 1 mm, pilose, 4 loculi, each locule with 1 ovule; style slightly obcylindrical, ca. 3 mm long, hairy on lower half; stigma dilate, round, flat top, glabrous. *Infructescence* erected, rarely pendulous, 10-15 cm long. *Capsule* slightly obovate, with distinct 3-4 longitudinal lobes, 3-3.5 by 2-2.5 cm, woody, glabrous; orange yellow or red, dehiscent, each valve with 1 seed. *Seeds* 4-5, ca. 2-3 cm long 1.5-2 cm thick, enclosed some part with thin and red aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai, Kamphaeng Phet; NORTH-EASTERN: Phetchabun, Loei, Nakhon Phanom; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Kanchanaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL: Lop Buri, Saraburi, Nakhon Nayok; SOUTH-EASTERN: Prachin Buri, Chon Buri, Chanthaburi; PENINSULAR: Ranong, Surat Thani, Phangnga, Nakhon Si Thammarat, Trang, Songkhla, Yala, Narathiwat.

D i s t r i b u t i o n.—Laos, Cambodia, Vietnam, Malaysia, Indonesia (Type), Philippines, Nicobars.

E c o l o g y.—On limestone or granite bedrock, in evergreen forest nearby stream; altitude (150-)200-800(-1,320) m.

V e r n a c u l a r.—Khang khao e lit (ค้างคาวอีลิต) (Southeastern); Ma duk, Mak duk (มะดูก หมากดูก) (Northern); Ta suea (ตาเสือ) (Northeastern).

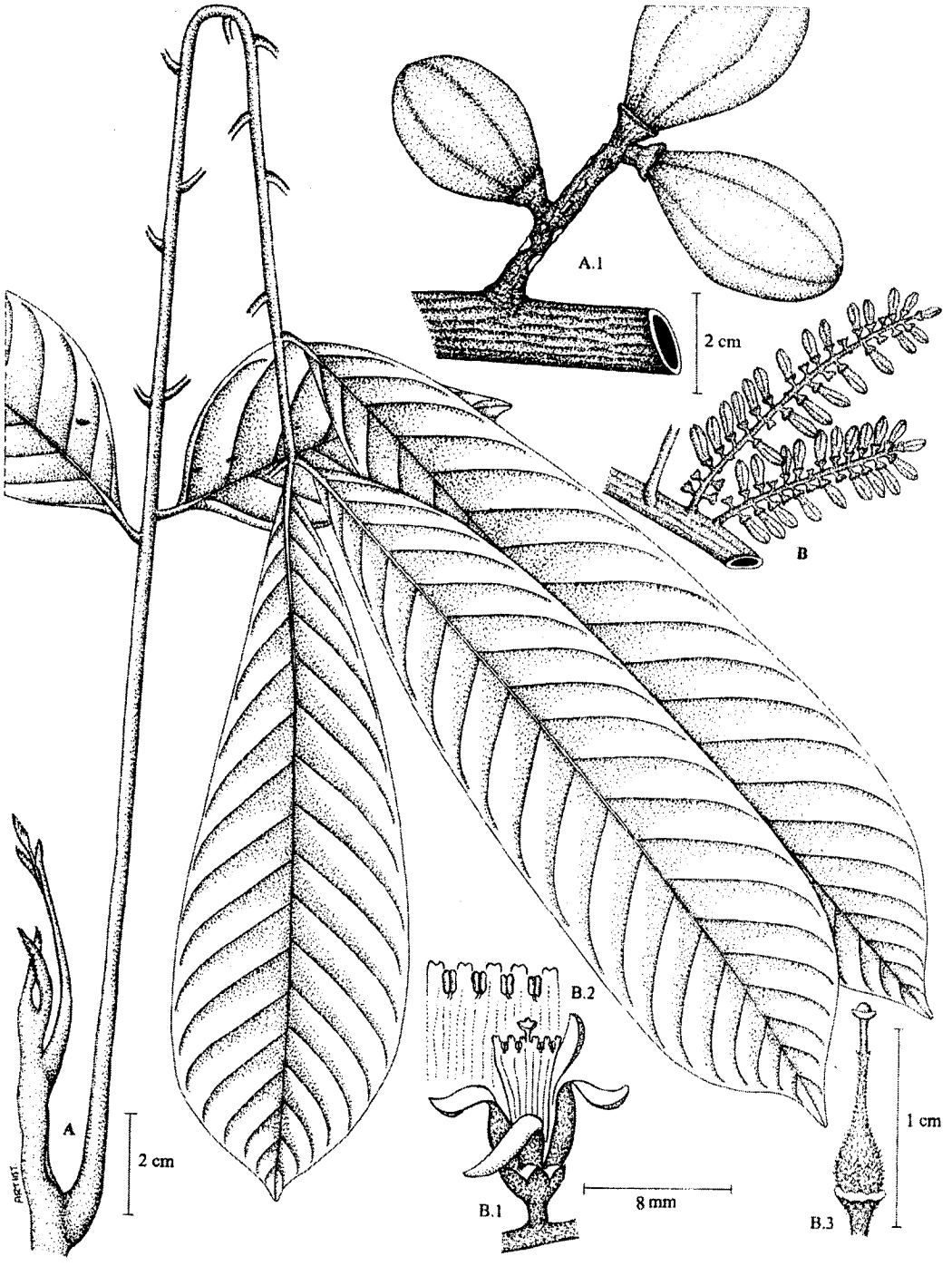

Fig. 67. *Dysoxylum densiflorum* (Blume) Miq.: A. twig, A.1 infructescence (R. Geesink et al. 5070); B. inflorescences, B.1 flower, B.2 stamens, B.3 pistil.

7. Dysoxylum densiflorum (Blume) Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 9. 1868; King, J. Asiat. Soc. Bengal 64, 2: 46. 1895; Ridl., Fl. Malay Penins. 1: 396. 1922; Backer & Bakh. f., Fl. Java 2: 122. 1965; Mabb. in Tree Fl. Malaya 4: 243. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 81. 1995.—*Dysoxylum griffithii* Hiern in Hook.f., Fl. Brit. India 1: 549. 1875.

Trees 7-20 m high, 40-180 cm girth, apical buds with fist-shaped young leaves. Outer bark dark brown, cream to orange with orange-brown lenticels, flaking and roughly cracked; inner bark dull yellow, turning dark orange when exposed; sapwood brownish. *Leaves* imparipinnate (paripinnate occasionally) 16-30(-100) cm long, spirally arranged; leaflets 5-9 pairs, the lower pairs subopposite, oblanceolate or ovate, 7-18 by 3.5-4 cm, chartaceous to subcoriceous, glabrous, glossy green upside, green beneath; apex acute to acuminate; base strongly oblique to cuneate; margin entire; midrib and secondary nerves prominent beneath, slightly depressed upside; secondary nerves 9-20 pairs, arched but not anastomosing; other veins not conspicuous. *Petiole* 10-20 cm long, sparsely pubescent, then glabrescent, swollen near base; petiolules 0.2-0.5 cm long, other as petiole. *Inflorescence* a thyrse compound or spike-liked, 5-10 cm long, slightly pendulous or suberected, pubescent all parts; peduncles 1-2 cm long, pedicels ca. 1 mm long; bracts and bracteoles narrowly triangular, ca. 1 by 0.5 mm caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, ca. 3 mm long, lobes ca. 2/3 of all length, pubescent outside, glabrous inside. *Corolla* 4, free, linear, imbricate, 8-10 mm long, white, yellowish to dull orange. *Staminal tube* slightly tubular ca. 8 mm long, glabrous on both sides, margin with 8 marginal lobes. *Stamens* 8 , alternate and lower than the lobe-margin, filaments adnate the tube inside. *Disk* annular with undulate, at base of ovary. *Ovary* ovate, ca. 4 by 2 mm, pilose, 4 loculi, each locule with 2 ovules; style cylindrical, ca. 2 mm long, pilose on lower half; stigma dilate, round, curved up at apical, glabrous. *Infructescence* erected, 4-10 cm long. *Capsules* ellipsoid, or fusiform, 3.5-4.5 by 2-2.5 cm, with 4 longitudinal grooves, greyish green, hairy. *Seeds* 2-4, black, enclosed some part with aril.

T h a i l a n d.—NORTHERN: Chiang Mai; SOUTH-WESTERN: Kanchanaburi; PENINSULAR: Surat Thani, Phangnga, Nakhon Si Thammarat, Trang, Narathiwat.

D i s t r i b u t i o n.—Burma, China, Malaysia, Indonesia (Type).

E c o l o g y.—Dry or moist evergreen forest, nearby stream or on ridges. altitude (80-)100-700(-1,000) m.

V e r n a c u l a r.—Hang kan (ฮังก่าน) (Northern); Sang kried langsat (สังเครียดลางสาด), Koh oak (กอโอก) (Peninsular).

Fig. 68. *Dysoxylum excelsum* Blume: A. twig with inflorescences, A.1 & A.2 flowers, A.3 longitudinal section of flower (Th. Wongprasert 082-28); B. infructescence (T. Santisuk 286).

8. Dysoxylum excelsum Blume, Bijdr.: 176.1825; Backer & Bakh. f., Fl. Java 2: 124. 1965; Mabb. in Tree Fl. Malaya 4: 244. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 109. 1995.—*Dysoxylum procerum* Hiern in Hook.f., Fl. Brit. India 1: 547. 1875; Brandis, Indian Trees: 138. 1906; Pellegr. in Lecomte, Fl. Indo-Chine 1: 744, t. 81, f. 6-11. 1911; Craib. Fl. Siam Enum. 1: 252. 1926.—*Dysoxylum turbinatum* King, J. Asiat., Soc. Bengal 64, 2: 43. 1895; Ridl., Fl. Malay Penins. 1: 394. 1922.

Trees 10-20 m high, 30-100 cm girth; apical buds with fist-shaped young leaves. *Twigs* lenticellate, pubescent when young. Outer bark smooth, brown, slightly flaking, lenticellate; inner bark reddish brown with resinous smell; sapwood white; heartwood brownish red. *Leaves* paripinnate, 15-30 cm long, spirally arranged; leaflets 3-5 pairs, opposite (rarely subopposite); oblong, elliptic or slightly obovate; 17-18 by 4-8.5 cm; glossy green upside, pale beneath; glabrous on both sides; apex acute or slightly acuminate; base oblique, obtuse to slightly cuneate; margin entire; midrib and secondary nerves strongly prominent beneath, flat to subdepressed upside; secondary nerves 7-15 pairs, arched but not anastomosing. *Petiole* 5-9 cm, swollen near base, pubescent; petiolules 0.3-0.5 cm long, densely pubescent then glabrescent. *Inflorescence* a thyrse compound, slightly pendulous, axillary or supraaxillary near end of twigs, 15-30 cm long, peduncles 5-15 cm long, pubescent, pedicels 1-2 mm long pubescent all; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, pubescent outside, glabrous inside, all ca. 1 mm long, lobes ca. 1/2 of all length. *Corolla* 4, 0.8-1 cm long, free or united near base, linear-oblong, white or yellowish white, scented; pubescent outside, glabrous inside. *Staminal tube*, tubular 5-8 mm long, pubescent outside, glabrous with many longitudinal lines inside, margin with 8 serrate lobes. *Stamens* 8, alternate with the lobes, filaments adnate the tube inside. *Disk* cupuliform, as long as ovary. *Ovary* ovate or ovoid, hairy, ca. 2 by 1 mm, 4 loculi, each locule with 2 ovules; style, linear-cylindrical, hairy on lower half; stigma dilate, round, flat top, glabrous, *Infructescence* erected to pendulous, 10-20 cm long. *Capsule* slightly obovoid, with conspicuous 4-lobed; 3-6 by 3-5.5 cm, woody, glabrous and shining, dehiscing in (3)-4 longitudinal parts. *Seeds* bright-red (2)-4, ca. 2.5 by 1.5 cm, subreniform-shaped.

T h a i l a n d.—NORTHERN: Chiang Mai; EASTERN: Chaiyaphum; CENTRAL: Nakhon Nayok; SOUTH-EASTERN: Chon Buri, Chanthaburi, Trat; PENINSULAR: Ranong, Surat Thani, Phangnga, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Narathiwat.

D i s t r i b u t i o n.—Nepal, India, Sri Lanka, Burma, China, Laos, Cambodia, Vietnam, Malaysia, Indonesia (Type), Philippines.

E c o l o g y.—Evergreen forest, nearby stream; altitude (10-)100-700(-900) m.

V e r n a c u l a r.—Ta suea (ตาเสือ) (Northern); Sang kried (สังเครียด) (Peninsular).

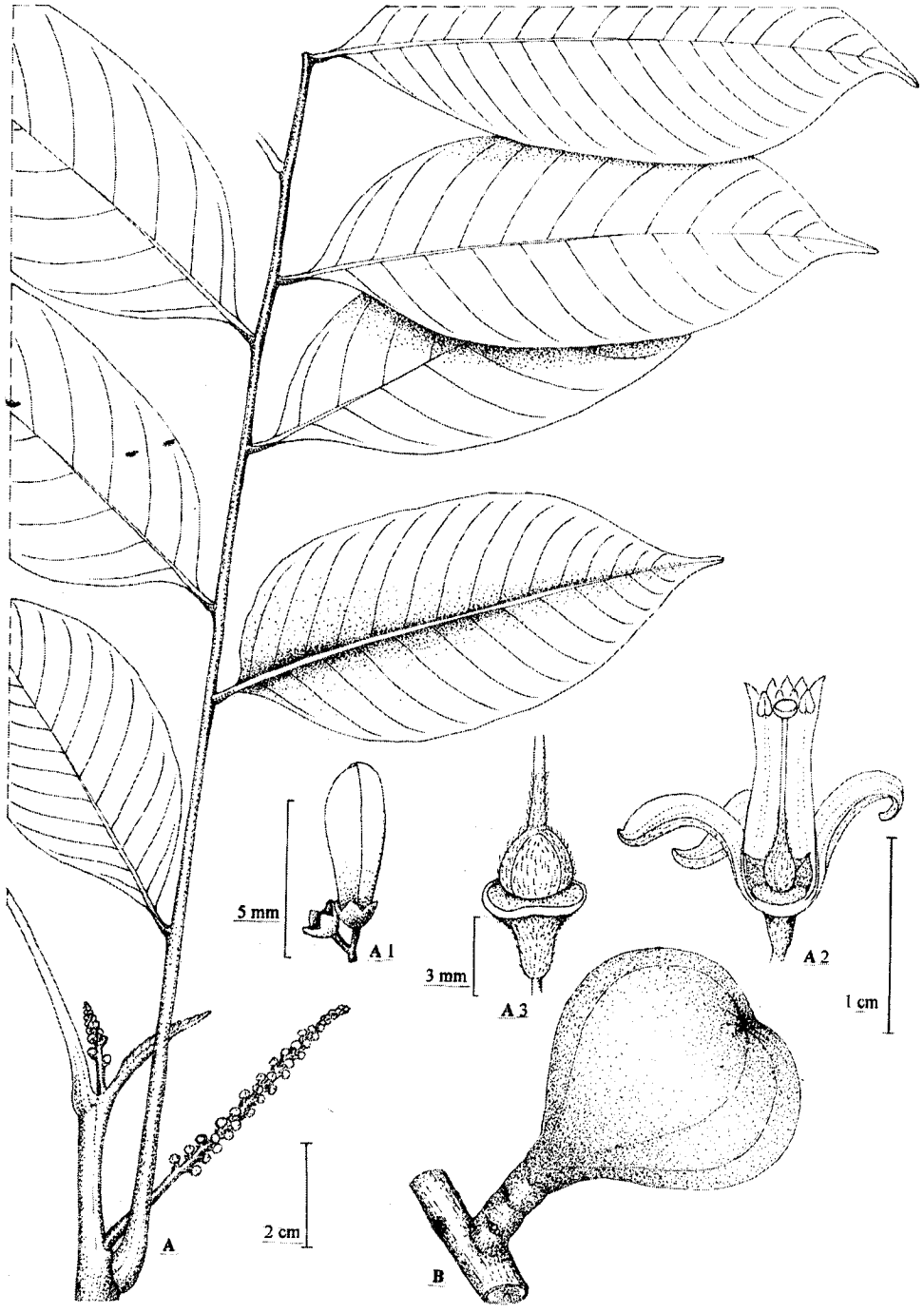

Fig. 69. *Dysoxylum flavescens* Hiern: A. twig with infructescence, A.1 flower bud, A.2 longitudinal section of flower, A.3 ovary, (S. Gardner et al. ST 2335); B. fruit (Chulalongkorn Univ. BKF 96855).

9. Dysoxylum flavescens Hiern in Hook.f., Fl. Brit. India 1: 549. 1875; Ridl., Fl. Malay Penins. 1: 396. 1922; Mabb. in Tree Fl. Malaya 4: 244. 1989; Mabb. & Pannell, Fl. Males. ser. I. 12(1): 128. 1995.—*Dysoxylum griffithii* Hiern in Hook.f., Fl. Brit. India 1: 549. 1875; King, J. Asiat. Soc. Bengal 64, 2: 46. 1895.

Trees 10-25 m hith, 100-150 cm girth; apical buds stiletto-liked young leaves. *Twigs* brown with sparsely grey patches, glabrous or sparsely indumentum and lenticels. Outer bark smooth, creamy, many raised lenticels; inner bark creamy, yellowish to dark orange stripes; sapwood yellowish; heartwood reddish. *Leaves* imparipinnate, 15-35 cm long, spirally arranged; leaflets 5-11(13), alternate to subopposite (rarely opposite), the apical one always reduced; ovate, ovate-oblong 5-14 by 3-5 cm, chartaceous to subcoriaceous, glossy green upside, pale beneath; apex acuminate to shortly caudate; base oblique, obtuse in outline; margin entire or undulate; midrib prominent beneath, flat or slightly depressed upside; secondary nerves first straight then curved near magin, but not anastomosing, conspicuous beneath, hardly distinct upside; other nerves hardly distinct. *Petiole* 5-10 cm long, pubescent then glabrous; petiolule 0.5-1 cm long, glabrous. *Inflorescence* a thyrse or spike, erected, axillary or supraaxillary near end of twigs, 3-10 cm long, densely short grey hairs all parts; peduncles ca. 2 cm long, pedicels 1-2 mm long, all pubescent; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, ca. 2 mm long, lobes ca. 1/2 of all length, glandular hairs outside, glabrous inside. *Corolla* 4, free, linear, 10-12 by 2.3-3 mm, glandular hairs outer part, glabrous inside, white to yellow. *Staminal tube* tubular or slightly urceolate, ca. 8 mm long, sparsely pilose to glabrous, both sides, margin with 8(-10) serrate lobes. *Stamens* 8, alternate with the lobes, filaments adnate the tube. *Disk* cupuliform, as long as ovary, glabrous or spacially hairs on both sides. *Ovary* ovate, pilose, ca. 3 by 3 mm, 4 loculi, locule with 1-2 ovules; style tubular, as long as tube, hairy on lower half; stigma dilate, round, flat top and glabrous. *Infructescence* erected, ca. 10 cm long. *Capsule* slightly obovoid 3.5-4.5 by 3-5 cm with conspicuous 4 longitudinal lobes, woody, reddish, pinkish to orange, dehiscing in (3)-4 parts. *Seeds* brown to black enclosed partly with minute aril.

T h a i l a n d.—EASTERN: Nakhon Ratchasima: PENINSULAR: Nakhon Si Thammarat, Phatthalung, Satun.

D i s t r i b u t i o n.—Malaysia (Type).

E c o l o g y.—Evergreen forest; altitude (20-)100-700 m.

V e r n a c u l a r.—Cha langsat pa (ช้าลางสาดป่า) (Peninsular).

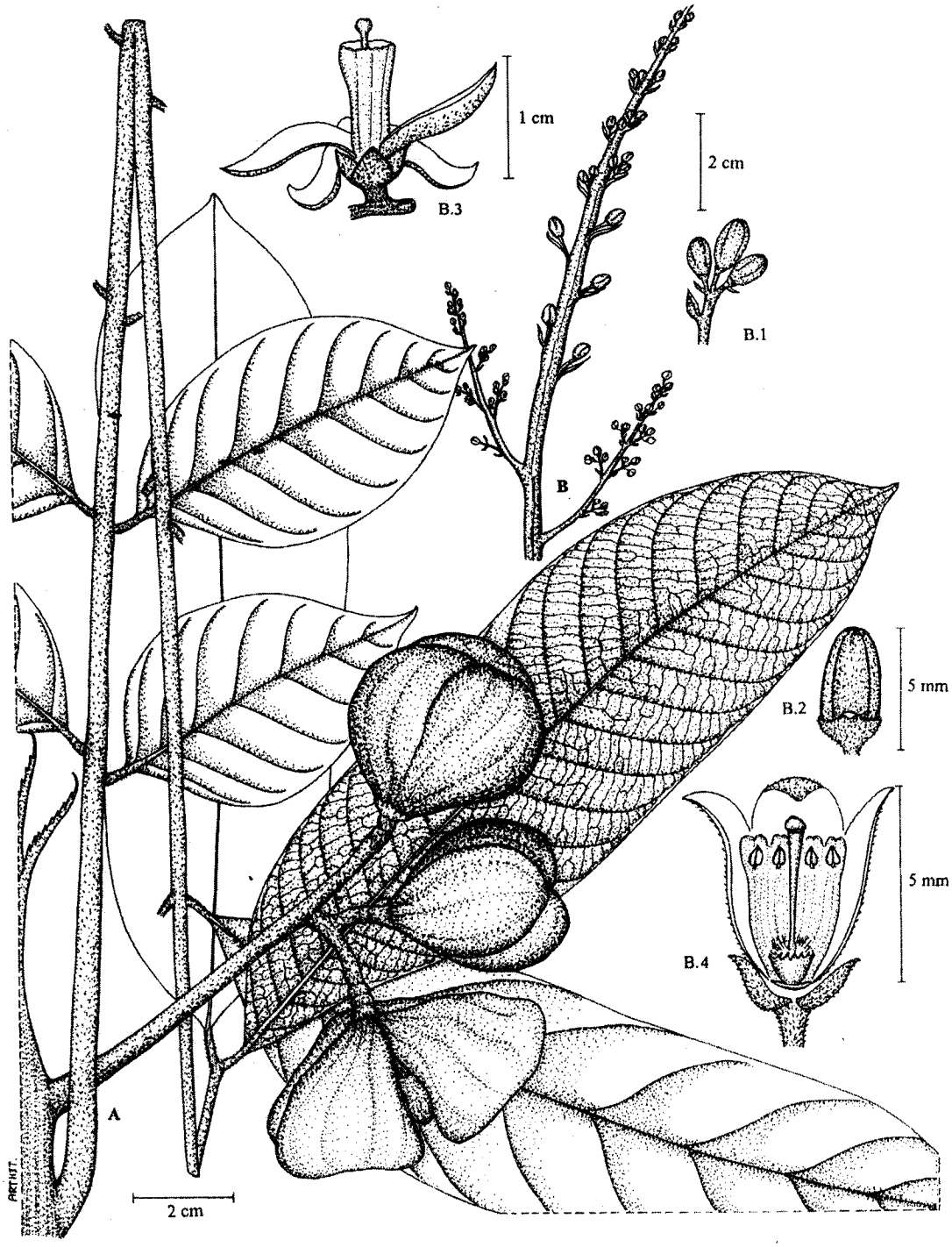

Fig. 70. *Dysoxylum grande* Hiern: A. twig with infructescence (C.F. van Beusekom & C. Phengklai 3065); B. part of inflorescences, B.1, B.2, B.3 flowers, B.4 longitudinal section of flower

10. Dysoxylum grande Hiern in Hook.f., Fl. Brit. India 1: 547. 1875; Brandis, Indian Trees: 138. 1906; Mabb. in Tree Fl. Malaya 4: 244. 1989.—*Chisocheton grandiflorus* (non Kurz) Hiern in Hook.f., Fl. Brit. India 1: 522. 1875; Brandis, Indian Trees: 139. 1906.—*Chisocheton costatus* Hiern in Hook.f., Fl. Brit. India 1: 522. 1875; Brandis, Indian Trees: 139. 1906.—*Dysoxylum interruptum* King, J. Asiat. Soc. Bengal 64, 2: 40. 1895; Ridl., Fl. Malay Penins. 1: 392. 1922.

Trees 8-25 m high, 30-100 cm girth; apical buds with long stiletto-liked young leaves. *Twigs* slightly 4 angulars, covered with grey to white glandular simple hairs and lenticellate. Outer bark smooth, tan or brownish grey; inner bark pink or white, with dark brown lines interval; sapwood white, yellowish to brownish. *Leaves* paripinnate 30-100 cm long, spirally arranged; leaflets 4-10 pairs, opposite or slightly subopposite; oblong, ovate-elliptical; 7-25 by 4-10.5 cm, chartaceous, glossy green upside, densely and soft hairs beneath; apex acuminate or shortly caudate; base strongly oblique, obtuse in outline; margin entire and recurved; midrib, secondary nerves and scalariform nerves strongly prominent beneath, subdepressed upside; sparsely hairs along nerves upside, densely tomentose and soft hairs beneath; secondary nerves 7-25 pairs, arched and more or less anastomosing. *Petiole* 10-25 long, swollen near base, densely hairs, petiolule 0.5-1 cm long with short hairs. *Inflorescence* a thyrse compound, pendulous or erected, axillary or supraaxillary, near end of twigs, 10-50 cm long; peduncles 5-20 cm, long, pedicels ca. 1 mm long, all densely hairs and indumentum; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, all 1.5-2 mm long, lobes ca. 1/2 of all length, hairy outside, glabrous inside. *Corolla* 4, free, linear oblong, 5-6 by 1 mm, densely glandular hairs outside, sparsely inside, creamy or yellowish, scented. *Staminal tube* slightly tubular, ca. 5 mm long, sparsely indumentum to glabrous outside, glabrous inside, margin with 8 emarginate lobed. *Stamens* 8, opposite with the lobes, filaments adnate the tube inside. *Disk* cupuliform, as long as ovary. *Ovary* ovoid, pilose, ca. 1.3 by 1.3 mm; (3-)4(-5) loculi, each locule with 1 ovule; style slightly cylindrical, glabrous, ca. 3 mm long, stigma dilate, round, glabrous. *Infructescence* erected, rarely pendulous, 8-20 cm long. *Capsule* slightly obovoid, with conspicuous 3-4 lobed; 4-4.5 by 4 cm, woody, glabrous, orange red, dehiscing in longitudinal parts. *Seeds* 1-4 seeds, ca. 2.5 cm long, yellowish.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai, Tak; NORTH-EASTERN: Phetchabun, Loei; EASTERN: Chaiyaphum; SOUTH-WESTERN: Uthai Thani; PENINSULAR: Ranong, Phangnga, Phuket, Nakhon Si Thmmarat, Trang.

D i s t r i b u t i o n.—India (Type), Burma, China, Cambodia, Laos, Vietnam, Malaysia, Indonesia.

E c o l o g y.—Lowland to hill evergreen forest, savannah forest, on limestone bedrock; altitude (50-)100-800(-1,000) m.

V e r n a c u l a r.—Tabu (ตาบู่) (Northeastern); Ta suea (ตาเสือ) (Southwestern); Ta khwai (ตาควาย) (Peninsular).

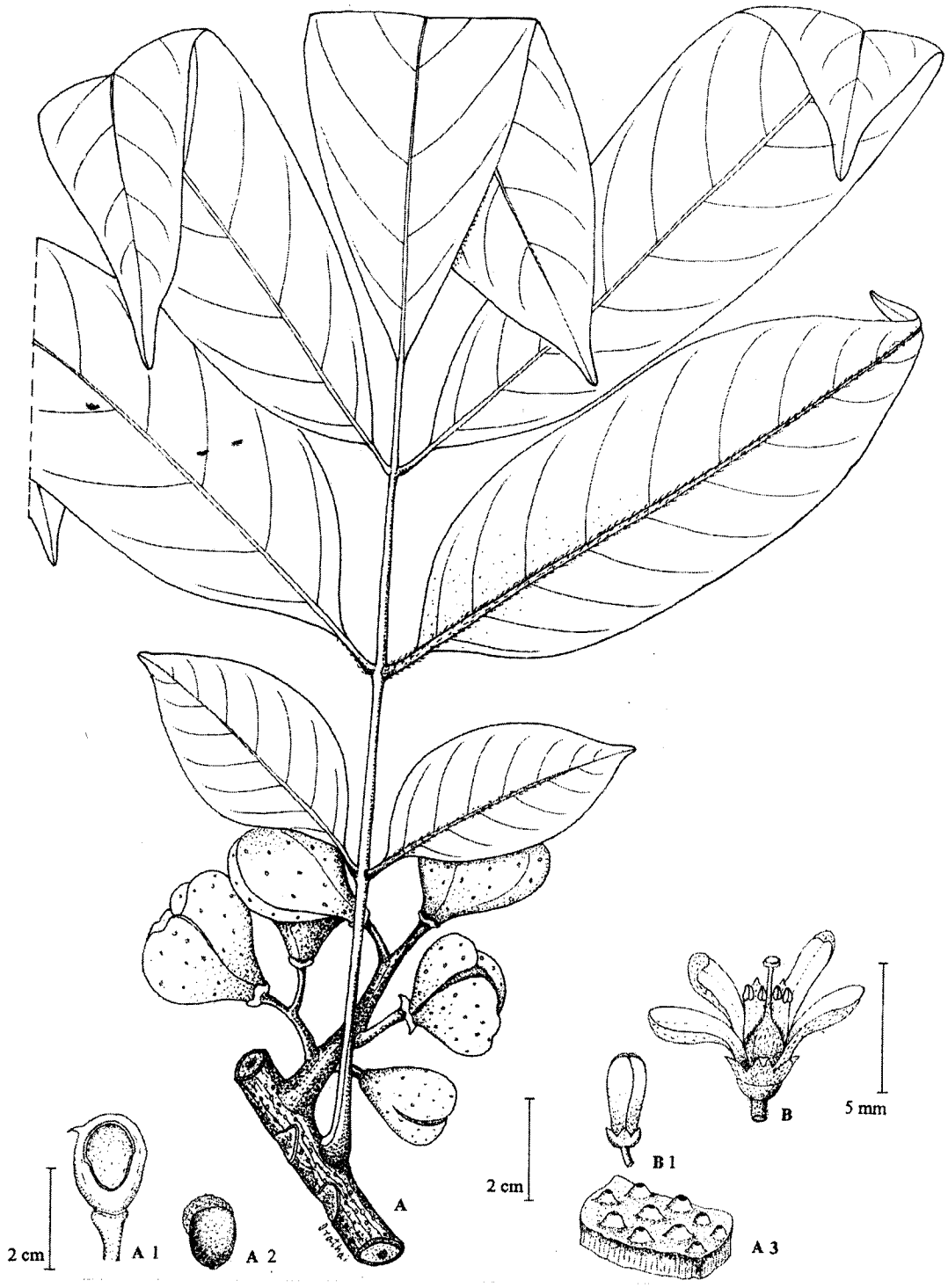

Fig. 71. *Dysoxylum lenticellatum* Wu: A. twig with infructescence, A.1 longitudinal section of young fruit, A.2 seed & aril, A.3 lenticels on bark (R. Geesink et al 5895); B. flower, B.1 flowering bud (R. Geesink et al. 5895).

11. Dysoxylum lenticellatum Wu, in Fl. Yunnan., 1: 251. 1977.

Trees 8-10 m high; 40-60 cm girth; twigs smooth, pale brown, then glabrescent, conspicuously with yellow and curved up lenticels. *Leaves* imparipinnate 17-25 cm long, spirally arranged; leaflets 3-5 pairs, opposite, except the apical one; oblong or oblanceolate; 7-21 by 3-6 cm, chartaceous, glabrous except along the midrib and secondary nerves on upper side with sparsely pubescent then glabrescent, apex acute; base slightly cuneate to oblique; margin entire, minutely recurved; midrib and secondary nerves sharp raise up on beneath, flat to subdepressed upside; secondary nerves 7-12 pairs, arched but not anastomosing; other veins hardly distinct. *Petiole* 6-8 cm long, grooved upside, swollen near base, pubescent then glabrescent; petiolules 0.5-1 cm long, sparsely pubescent then glabrous. *Inflorescence* a thyrse compound, axillary or supraaxillary, 3-5 cm long; peduncles 1-2 cm long; pedicels ca. 1 mm long; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, ca. 2 mm long, lobes ca. 1/2 of all length, hairy outside, sparsely hairy inside. *Corolla* 4, free linear or slightly oblanceolate, 5-8 mm, densely glandular hairs outside, glabrous inside. *Staminal tube* tubular, 3-4 mm long, sparsely pubescent outside, glabrous inside, margin with 8 serrate lobed, more or less at same level of anthers. *Stamens* 8, filaments adnate the tube inside. *Disk* a collar-liked around base of ovary. *Ovary* ovate to ovoid, hairy, ca. 2.5 by 2 mm, slightly with 4 longitudinal lobed; 4 loculi, each locule with 2 ovules; style cylindrical, ca. 2.5 mm, hairy on lower half, stigma dilate, round, flat top, glabrous. *Infructescence* erceted, 5-10 cm long. *Capsule* obovoid with conspicuous 3-4-longitudinal lobes; 2-2.5 by 1.5-2.5 cm, pinkish red; sparsely with yellow and round lenticels. *Seeds* ovate ca. 1.2 by 1 cm, enclosed partly with red aril.

T h a i l a n d.—NORTHERN: Chiang Mai (uncommon).

D i s t r i b u t i o n.—China (Type).

E c o l o g y.—Hill evergreen forest, nearby stream; altitude 1,050 m.

V e r n a c u l a r.—Ta suea pom (ตาเสือปม) (Northern).

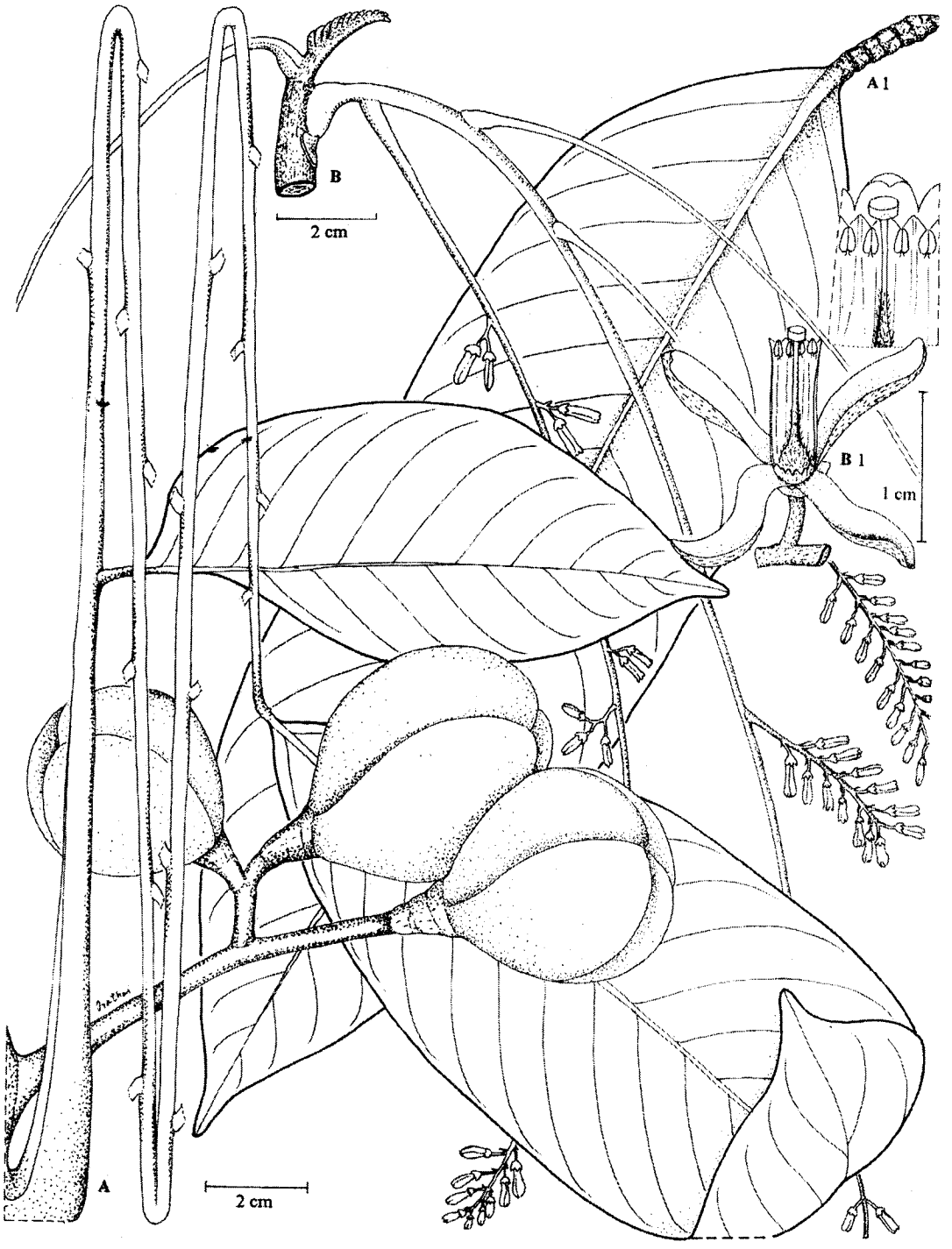

Fig. 72. *Dysoxylum macrocarpum* Blume: A. twig with infructescence, A.1 another form of leaf (M.R. Henderson 23664); B. inflorescences, B.1 flower, B.2 longitudinal section of flower (P. Suvanakoses 167).

12. Dysoxylum macrocarpum Blume, Bijdr., 175. 1825; Backer & Bakh.f., Fl. Java 2: 123. 1965; Mabb. in Tree Fl. Malaya 4: 244. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 116. 1995.

Trees 20-30 m high, 100-200 cm girth, apical buds curved, teretes, 1.5-2(-5) cm, densely pubescent and indumentum; crown narrow with few main branches. *Twigs* wide pith, lenticellate. Outer bark dark brown or greyish brown, smooth or with longitudinal furrows, finely with lenticels; inner bark pale yellow with interval red stripes, fibrous; sapwood pale brown. *Leaves* imparipinnate 30-50(-100) cm long, spirally arranged; leaflets 7-10 pairs, strongly alternate (rarely subopposite); ovate to oblong, 7-28 by 5-9 cm, chartaceous, glabrous, glossy green upside, pale beneath; apex acute to acuminate; base obtube, slightly or strongly oblique; margin entire; midrib strongly prominent beneath, depressed upside; secondary nerves 8-25 pairs, sharp ridge beneath and slightly depressed upside; other veins hardly distinct. *Petiole* 8-15-(30) cm long, swollen near base, petiolules 1-2 cm long, all densely horizontal lenticels. *Inflorescence* a thyrse compound, pendulous, 30-50 cm long, with long branchlets, in axillary or supraaxillary, near end of twigs, all densely pubescent and indumentum; bracts and bracteoles narrowly triangular, 1-2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, all 1-2 mm long, lobes ca. 2/3 of all length, hairy outside, glabrous inside. *Corolla* 4, free, oblong, imbricate, 5-10 mm long, creamy white to orange, pubescent outside, indumentum or glabrous inside. *Staminal tube* tubular, 5-6 mm long, glabrous outside, sparsely pubescent inside, margin with 8 serrate lobes. *Stamens* 8, alternate with the marginal lobe, filaments adnate the tube inside. *Disk* broadly campanulate with serrulate margin, ca. 1 mm high. *Ovary* ovate, ca. 2 by 1 mm densely simple hairs; 8 loculi, each locule with 2 ovules; style narrrowly cylindrical, 5-6 mm long, hairy on lower half; stigma dilate, round, flat top, glabrous. *Infructescence* erected, 5-10 cm long. *Capsule* obovoid, ca. 7.5 by 8-9 cm, with 3-4 longitudinal grooves. *Seeds* 1-4, ca. 4.5 by 2.5 cm.

T h a i l a n d.—SOUTH-WESTERN: Kanchanaburi; PENINSULAR: Ranong, Satun, Songkhla, Narathiwat.

D i s t r i b u t i o n.—Vietnam, Malaysia, Indonesia (Type) Philippines.

E c o l o g y.—Evergreen forest; altitude 500-750 m.

V e r n a c u l a r.—Ta suea khao (ตาเสือขาว) (Peninsular).

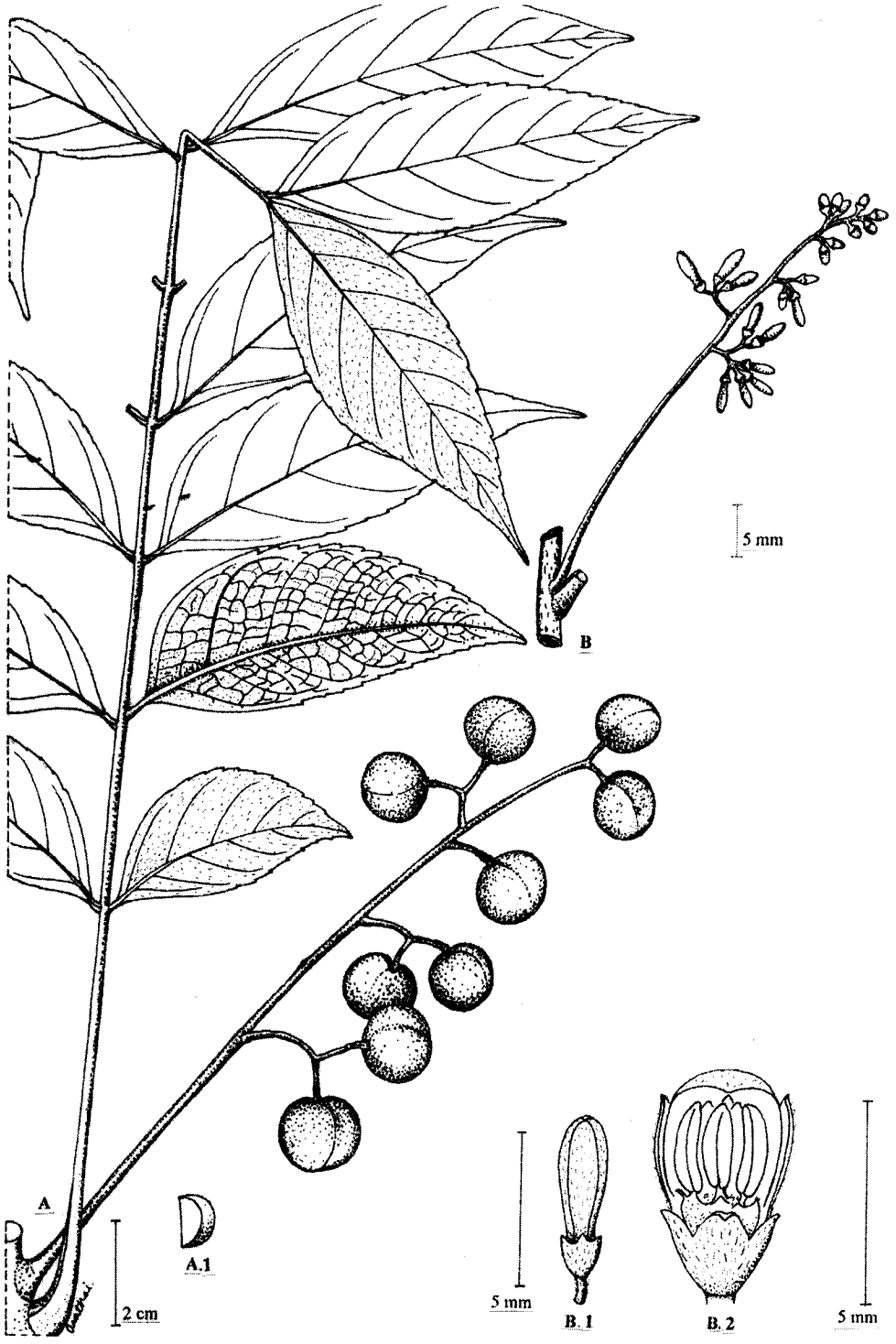

Fig. 73. *Dysoxylum mollissimum* Blume A. twig with infructescence (B. Everett-KEP. 104905 B.), A.1 seed; B. inflorescence, B.1 flower (D.J. Collins 1534), B.2 longitudinal section of flower.

13. Dysoxylum mollissimum Blume, Bijdr.: 175. 1825; G. Don, Gen. Syst. 1: 683. 1831; Backer & Bakh.f., Fl. Java 2: 123. 1965: Mabb. in Tree Fl. Malaya 4: 245. 1989; Mabb., Blumea 38: 309. 1994; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 90. 1995.—*Dysoxylum hamiltonii* Hiern in Hook.f., Fl. Brit. India 1: 548. 1875.—*Dysoxylum teysmannii* C. DC. in DC., Monogr. Phan. 1: 510. 1878.—*Dysoxylum hainanense* Merr., Lingn. Sc. J. 6: 280. 1930.

Trees (5-)8-20 m high, 80-10 cm girth, apical buds with fist-shaped young leaves, 1-2 cm long with minutely fulvous tomentose; young twigs sparsely lenticellate. Outer bark smooth, greyish brown with elongated brown lenticels then scaling; inner bark yellowish brown; sapwood brownish; heartwood dark red. *Leaves* paripinnate, 20-40 cm long, spirally arranged; leaflets 7-10 pairs, opposite or subopposite; elliptic, elliptic-oblong or oblong; 5-12 by 2.5-3.5 cm, chartaceous, sparsely pubescent, especially on lower surface then glabrescent; apex acute to acuminate; base obtuse to slightly cuneate; margin serrulate, serrate, rarely entire, midrib prominent beneath, flat or depressed upside; secondary nerves 7-15 pairs, sharp and narrow ridge on lower surface, hardly seen on upper surface, other veins indistinct. *Petiole* 8-12 cm long, sparsely pubescent, petiolules 0.5-1 cm long, sparsely then glabrescent. *Inflorescence* axillary, a thyrse compound, 6-15 cm long, pubescent, peduncles 4-5 cm long, pedicels, ca. 1 mm long; bracts and bracteoles, narrowly triangular, ca. 0.5 mm long, caducous. *Flowers* polygamous. *Calyx* 4, cupuliform, 1-2 mm long, lobes ca. 1/4 of all length, pubescent outside, glabrous inside. *Corolla* 4, free, linear-oblong, ca. 1 cm long, sparsely pubescent on both sides, white to yellowish. *Staminal tube* tubular, ca. 5 mm long, sparsely pubescent on both sides, margin slightly 8 truncate lobes and more or less emarginate apex. *Stamens* 8, lower or at same level of marginal tube, filaments adnate the tube inside. *Disk* cupuliform, ca. 2 mm long, green, margin with 4 irregularly lobes. *Ovary* ovate or ovoid, ca. 0.5 by 0.5 mm, pilose; 4 loculi, each locule with 1 ovule; style terete, hairy on lower half; stigma dilate, glabrous. *Infructescence* (not seen). *Capsule* ovoid, 1.5-2.5 cm diam., depressed upside, glabrous, 4-valved, reddish brown, smooth, lenticellate, pericarp with white latex. *Seeds* (3)-4, ca. 1.5 cm long, plano-convex enclosed partly with red aril.

T h a i l a n d.—SOUTH-EASTERN: Chon Buri. (uncommon).

D i s t r i b u t i o n.—India, Burma, China, Malaysia, Indonesia, Philippines, Australia.

E c o l o g y.—Evergreen forest.

V e r n a c u l a r.—Ta suea khob chak (ตาเสือขอบจัก).

Fig. 74. *Dysoxylum papillosum* King: A. twig with infructescence (K. Larsen et al. 32958).

14. Dysoxylum papillosum King, J. Asiat. Soc. Bengal 64, 2: 50. 1895; Ridl., Fl. Malay Penins. 1: 397. 1922; Mabb. in Tree Fl. Malaya 4: 245. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 116. 1995.

Trees, 5-8 m high, 20-50 cm girth; apical buds with fist-shaped young leaves, 1.5-2 cm long, densely tawny tomentose. *Twigs* tomentose and lenticellate. Outer bark dark grey with pale patches; inner bark orange. *Leaves* paripinnate, 12-24(-40) cm long, spirally arranged; leaflets strictly 2(-3) pairs, the lower pairs slightly subopposite; obovate, oblanceolate 9-27 by 4-8 cm, many green dots beneath, hairy to sparsely hairy along midrib and nerves, chartaceous to subcoriaceous; apex acuminate, acute; base cuneate to obtuse in outline; margin entire; midrib and secondary nerves prominent beneath, flat or subdepressed on upside; secondary nerves 8-14 pairs, arched but not anastomosing, other veins hardly distinct. *Petiole* 7-20 cm long, densely with tomentose and indumentum scales; petiolules 0.5-1 cm long, other characters as petiole. *Inflorescence* a thyrse compound, axillary or supraaxillary near end of twigs, 3-5 cm long; peduncles 2-3 cm long, pedicels ca. 1 mm long; bracts and bracteoles narrowly triangular, ca. 2 by 1 mm, caducous. *Flowers* polygamous. *Calyx* 4, broadly campanulate, ca. 2 mm long, lobes ca. 3/4 of all length, hairy outside, glabrous inside. *Corolla* 4, free, linear, imbricate, 6-10 mm long, glabrous, white or pinkish. *Staminal tube*, tubular ca. 4 mm long, glabrous on both sides, margin with 8 emarginate lobes. *Stamens* 8, alternate and lower the lobes, filaments adnate the tube inside. *Disk* annular at base of ovary. *Ovary* ovate or ovoid, ca. 0.5 by 0.5 mm, pilose, 4 loculi, each locule with (1-)2 ovules; style cylindrical, ca. 2 mm long, pilose on lower half; stigma dilate, round, flat top, glabrous. *Infructescence* erected, 1-3 cm long. *Capsules* obovoid, woody, orange red, 2-2.5 cm, strongly with 3-4 longitudinal lobes, each with 1 seed. *Seeds* 4, black, enclosed with bright red aril at seed base.

T h a i l a n d.—PENINSULAR: Narathiwat.

D i s t r i b u t i o n.—Malaysia (Type).

E c o l o g y.—Evergreen forest; altitude 300-500 m.

V e r n a c u l a r.—Suea si hu (เสือสี่หู) (Peninsular).

Fig. 75. *Dysoxylum rubrocostatum* Pierre: A. twig with inflorescences, A.1 another form of leaf; B. flower bud, B.1 ovary, B.2 longitudinal section of flower.

15. Dysoxylum rubrocostatum Pierre, Fl. Forest Cochinch., Fasc. Pl. 348; Pellegr. in Lecomte, Fl. Indo-Chine 1: 747. 1911.

Trees 8-15 m hairs; 60-100 cm girth, apical buds with fist-shaped young leaves, 1-2 cm long with soft fulvous hairs; young twigs spacially pubescent then glabrescent, longitudinally lenticellate remained. *Leaves* imparipinnate or rarely paripinnate, 10-30 cm long, spirally arranged; leaflets (1-)2-5(-7) pairs, subopposite, rarely opposite; obovate to obovate-oblong, 5-15 by 3-6 cm, chartaceous, sparsely pubescent beneath then glabrescent, dark green upside, pale beneath; apex shortly acute; base slightly cuneate and unequal sides; margin slightly undulate and more or less ciliate; midrib prominent beneath, depressed upside, glabrous except puberulous beneath; secondary veins, arched and more or less anastomosing near margin, slightly distinct beneath; other veins conspicuous on lower surface. *Petiole* 4-15 cm long, petiolules 2-3 mm long, all sparsely pubescent then glabrescent. *Inflorescence* axillary, a short thyrse compound, 3-10 cm long, rather slightly erected, greenish, pubescent, peduncles 2-5 cm long, pedicels ca. 1 mm long; bracts and bracteoles narrowly triangular, 2-3 mm long, caducous. *Flowers* polygamous. *Calyx* 4, up to 4 mm long, slightly campanulate, lobes ca. 1/3 of all length, pubescent outside, glabrous inside. *Corolla* 4, free, linear-oblong, valvate, 5-10 mm long, pubescent on both sides. *Staminal tube* cylindrical, ca. 5 mm long, sparsely pubescent inside, glabrous outside, margin crenulate. *Stamens* 8, lower than the marginal tube, filaments adnate the tube inside. *Ovary* ovoid or subobovate, 3 loculi, each locule with 2 ovules; style short, cylindrical; stigma peltate. *Infructescence* (not seen). *Capsules* subglobose or slightly ovate, ca. 2.5 by 2 cm, pubescent, dehiscent when dry. *Seeds* 1(-3), ellipsoid, 1.5-2 cm long, enclosed partly with orange aril.

T h a i l a n d.—EASTERN: Si Sa Ket.

D i s t r i b u t i o n.—Cambodia (Type).

8. HEYNEA

Heynea Roxb. ex Sims, Curtis, Bot. Mag.: 41. t. 1738. 1815; Harms in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 19 b 1: 117. 1940; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 41. 1995.—*Ailantopsis* Gagnep., Not. Syst. 11: 163. 1944.—*Picroderma* Gagnep., Not Syst. 11: 165. 1944.—*Trichilia* (non L.) Bentv., Acta Bot. Neerl. 11: 12. 1962; T.D. Penn., Blumea 22: 467. 1975.

Trees or small shrubs, polygamo-dioecious, pubescent to glabrous. *Leaves* spirally arranged, imparipinnate; leaflets opposite, except the top one, lower surface papillate, glandular. *Inflorescence* a thyrse compound with long peduncles. *Calyx* 4(-5) lobed, the lobes free, imbricated. *Petals* 4(-5) lobed, free, imbricated. *Androecium* with cylindrical staminal tube to 1/3 length. *Stamens* (6-)-10, with bifid apices. *Disk* annular. *Ovary* 2-3 loculi, each locule with 2-ovules; stigma (2-)-3 lobed. *Capsule* ovoid or ellipsoid, red to dark red. *Seeds* 1-(2) black, arillate.

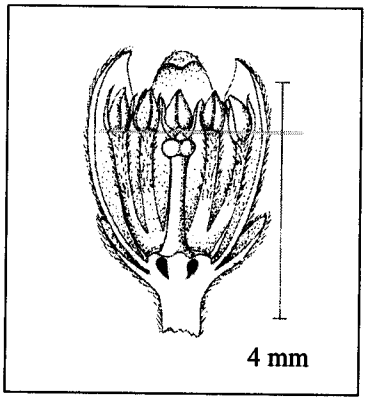

Fig. 76. *Heynea trijuga*: longitudinal section of flower.

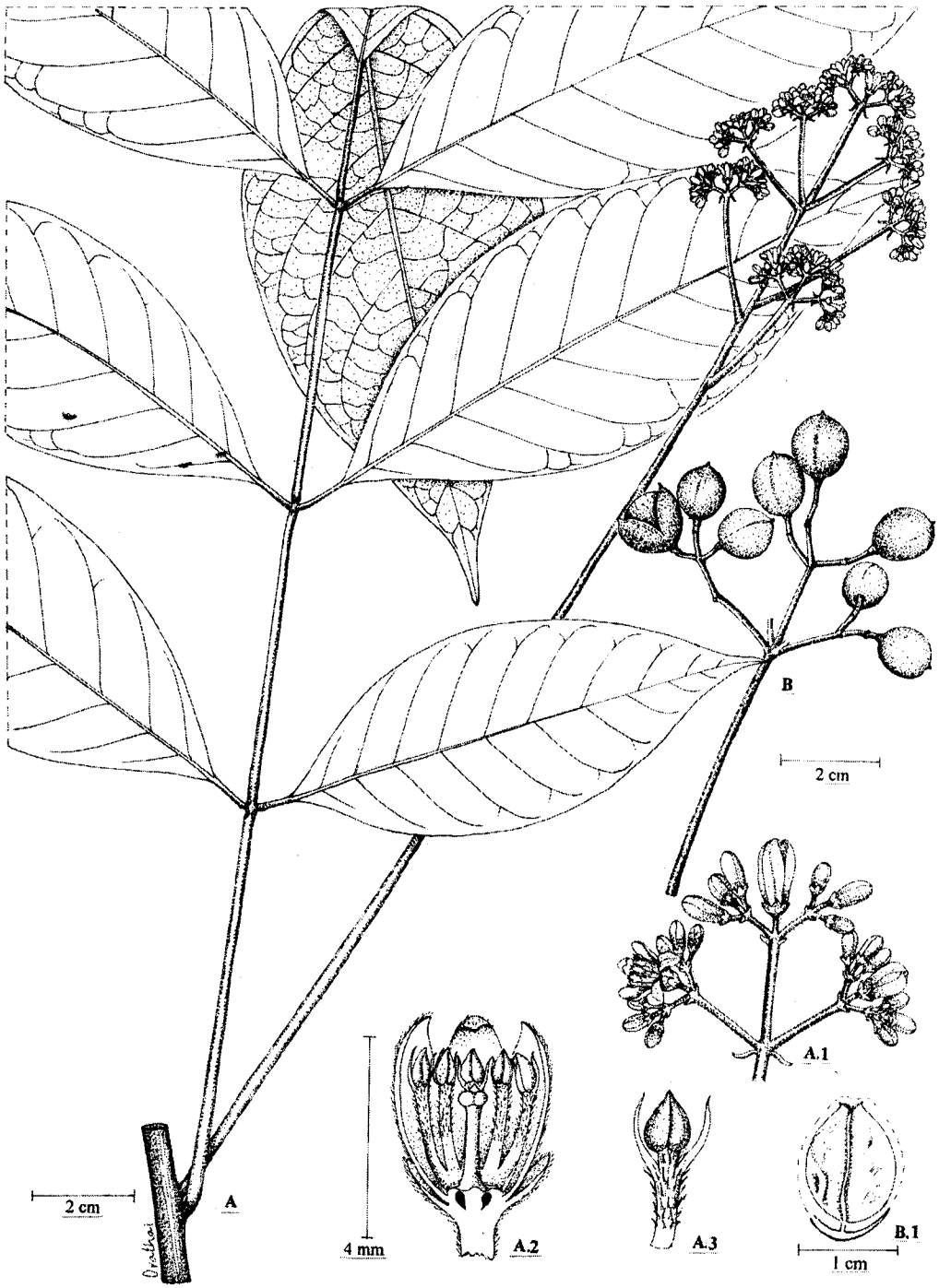

Fig. 77. *Heynea trijuga* Roxb. ex Sims: A. twig with inflorescence, A.1 part of inflorescence, A.2 longitudial section of flower, A.3 stamen (F. Konta 10882); B. infructescence, B.1 longitudinal section of drupe (N. Fukuoka T-63752).

Heynea trijuga Roxb. ex Sims, Curtis, Bot. Mag. 41, t. 1738. 1815; Hiern in Hook.f., Fl. Brit. India 1: 565. 1875; Pierre, Fl. Forest. Cochinch. 5: t. 355 a. 1897; Brandis, Indian Trees: 134, f 64. 1906; Ridl., Fl. Malay Penins. 1: 413. 1922; Craib, Fl. Siam Enum. 1: 264. 1931; Corner, Wayside Trees Mal. 1: 462. 1940; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 41. 1995.—*Walsura trijuga* (Roxb. ex Sims) Kurz, J. Asiat. Soc. Bengal 44(2): 148. 1875 & Forest Fl. Brit. Burma 1: 225. 1877.—*Heynea connaroides* (Wight et Arn.) Voigt., Hort. Suburb. Calc.: 136. 1845.—*Walsura intermedia* Craib, Bull. Misc. Inform. Kew : 345. 1926.—*Walsura pallida* Craib, Bull. Misc. Inform. Kew: 345. 1926;—*Trichilia connaroides* (Wight et Arn.) Bentv., Acta Bot. Neerl. 11: 13. 1962; Mabb. in Tree Fl. Malaya 4: 251. 1989; Hô, III. Fl. Vietnam 2, 1: 488. 1992.

Shrubs to trees (1-)5-20 m high, (12-)70-80(-120) cm girth. *Twigs* reddish or dark brown. Outer bark dark to blackish, slightly rugged with brown lenticels, usually shallowly fissured; inner bark creamy to yellowish. *Leaves* imparipinnate, 5-27 cm long (including petiole), spirally arrangment; leaflets opposite (except the terminal one), (3)5-11 leaflets, elliptic-oblong to ovate-lanceolate, 3-17 by 1.5-8 cm, chartaceous, glossy green upside, pale beneath, glabrous and sparsely or densely papillate glandular dots beneath; apex acuminate, rare mucronate; base oblique, broadly acute to obtuse; margin entire to slightly undulate; midrib and secondary nerves prominent beneath and subdepressed upside; secondary nerves 6-12 paris, arched and more or less anastomosing near the margin; others veins hardly distinct. *Petiole* slender, 3-10 cm long, usually wrinkling and blackish at base when dry; petiolules 0.5-1 cm, glabrous. *Inflorescence* a thyrse compound, fragrant, 8-30 cm long, slender, erected and glabrous; subpeduncles 5-16 cm long and pedicels 1.5-2 mm long, all pubescent. *Calyx* (4-)5 lobes, free or minutely united near base, lobes ovoid, ± 0.5 by 0.5 mm, sparsely pubescent outer part then glabrescent, glabrous inner parts, ciliate. *Corolla* (4-)5, ovoid to ellipsoid lobes, lobes ± 3-4 by 2 mm, glabrous, 3 longitudinal nerves inner side. *Staminal tube* broadly campanulate, up to 1/5-1/3 of stamens, glabrous, white. *Stamens* (6-)10, with bifid apices; filaments hairy on the upper half. *Disk* annular. *Ovary* obovoid, 2-3 loculi, each locule with 2 ovules; style cylindrical, glabrous, stigma (2-)3 lobed. *Infructescence* as inflorescence. *Capsule* ellipsoid or ovoid, ± 1.5 by 1.2 cm, green when young, pink to dark red when mature, dehiscent. *Seeds* 1-(-2) black, enclosed with thin aril

T h a i l a n d.—NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Nan, Lampang, Uttaradit, Tak, Sukhothai, Phitsanulok; NORTH-EASTERN: Phetchabun, Loei, Nong Khai, Sakon Nakhon, Mukdahan, Kalasin, Maha Sarakham; SOUTH-WESTERN: Uthai Thani, Kanchanaburi; PENINSULAR: Chumphon, Ranong Surat Thani, Nakhon Si Thammarat, Pattani, Yala.

D i s t r i b u t i o n.—India, Burma, Laos, Vietnam, Cambodia, Malaysia, Indonesia (Type?).

E c o l o g y.— In evergreen to hill evergreen forest, scrub forest, oak-pine forest, mixed deciduous or dipterocarp forest; altitude (70-)200-1,000(-1,600) m.

V e r n a c u l a r.—Chok khon (โจ๊กขน) (Northern); Ta pla ton (ตาปลาต้น), Nang yai (นางใย), Fan noi (แฟนน้อย), Chang chuet (จางจืด) (Northeastern).

9. LANSIUM

Lansium Corrêa, Annuaire Mus. Nat. Hist. Nat. Paris10: 157. 1807; T. D. Penn., Blumea 22: 483. 1975; Mabb. in Tree Fl. Malaya 4: 246. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 314. 1995.

Trees or shrubs, of the narrow buttress, polygamo-dioecious young parts pubescent. *Leaves* spirally arranged, imparipinnate, leaflets subopposite to alternate, the terminal one usually largest, petiolules pulvinate at base. *Inflorescence* spikes, racemes or with basally branching panicles with spicate branches, borne on twigs or bole. *Flowers* unisexual (if dioecious) and bisexual, the latter larger than male ones. *Calyx* 5, imbricated. *Petals* 5, quincuncial and united with staminal tube about 1/3 to a half. *Staminal tube* globose or cyathiform, margin undulate. *Stamens* (8-)10 in one whorl, inside the throat of tube, not exceed the marginal tube. *Disk* absent. *Ovary* ovate or ovoid, 3(-5) loculi, each locule with (1-)2 ovules. *Berry* or *drupe* ovoid or obovoid, with soft pericarp. *Seed* with thick and fleshy aril.

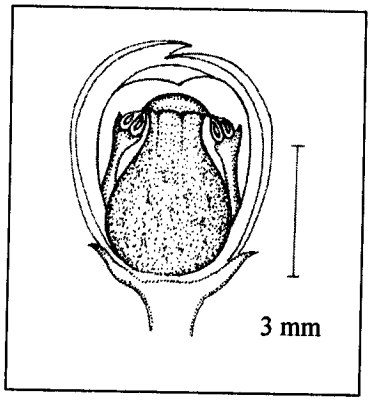

Fig. 78. *Lansium domesticum*: longitudinal section of flower.

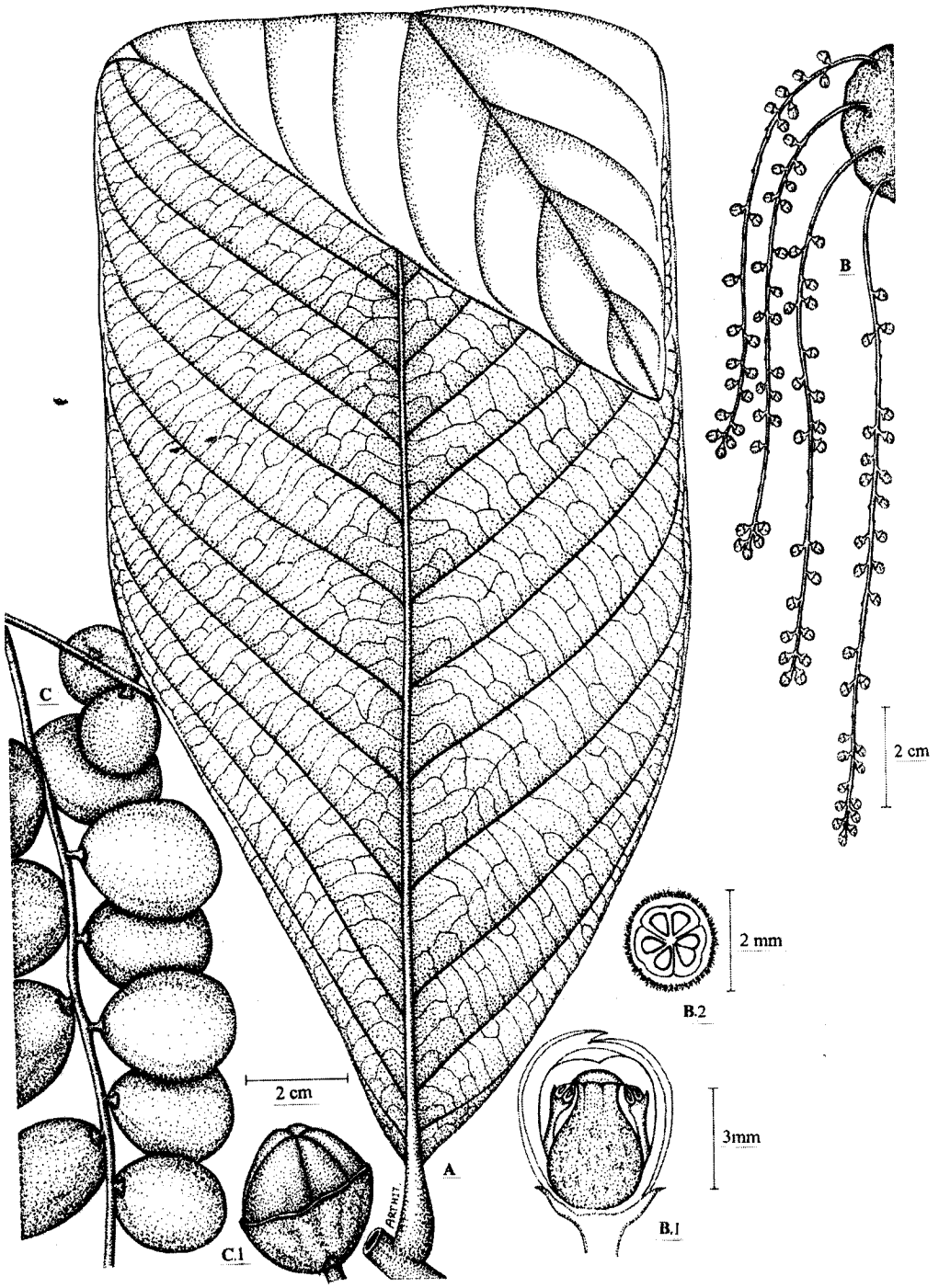

Fig. 79. *Lansium domesticum* Corrêa: A. leaf; B. inflorescences, B.1 longitudinal section of flower, B.2 cross section of ovary (R. Geesink 5196); C. infructescence (J.F. Maxwell 85-513), C.1 aril.

Lansium domesticum Corrêa, Annuaire Mus. Nat. Hist. Nat. Paris 10: 157. 1807; A. Juss., Mém. Mus. Natl. Hist. Nat. Paris 19: 233. 1832; Blanco, Fl. Filip. ed. 2: 228. 1845; Hiern in Hook.f., Fl. Brit. India 1: 558. 1875; Brandis, Indian Trees; 144. 1906; Ridl., Fl. Malay Penins. 1: 411. 1922; Craib, Fl. Siam Enum. 1: 259. 1926; P. H. Hô & Duong, Fl. Vietnam: 248. 1960; Backer & Bakh.f., Fl. Java 2: 484. 1975; Mabb., Blumea 31: 141. 1985; Corner, Wayside Trees Mal. ed 3: 501. 1988; Mabb. in Tree Fl. Malaya 4: 246. 1989, & Fl. Males. ser. I 12(1): 315. 1995.—*Aglaia domestica* (Corrêa) Pellegr. in Lecomte Fl. Indo-Chine 1: 766. 1911.—*Amoora racemosa* Ridl., J. Fed. Malay States Mus. 10: 88. 1920; Craib, Fl. Siam Enum. 1: 261. 1926.

Trees or treelets 5-10 m high, 40-80(-170) cm girth; terminal buds oblong, densely pubescent. Twigs smooth, greyish pubescent, sparsely with oblong and brownish lenticels; outer bark creamy, flaking and sticky with white latex when exposed; inner bark pale eream or purplish red; sapwood whitish brown. *Leaves* imparipinnate 5-35(-100) cm long (including petiole), spirally arranged; leaflets (1-)3-9, alternately arranged; oblong, obovate-oblong, obovate or elliptic; dark green upside, pale beneath; 8-37 by 4-17 cm, coriaceous or subcoriaceous, glabrous on both sides, lenticel-liked dots on lower surface; apex broadly then shortly acute, or obtuse; base cuneate, broadly cuneate, obtuse and sharply oblique; margin entire; midrib prominent beneath, subdepressed upside; secondary nerves 7-18 pairs, first straight then arched and ± anastomosing near margin, strong sharp ridge beneath and depressed upside; scalariform distinct beneath. *Petiole* 4-20 cm long, swollen near base, pubescent then glabrescent; petiolules 1-2 cm long, swollen near base, ± glabrous. *Inflorescence* spikes, racemes, ament or catkin on trunk, twigs or axillary sometimes, 5-15 cm long, pedicels 2-3 mm long; unisexual or bisexual flowers, female one without staminode and much bigger than the male flowers. *Calyx* 5, free or minutely united near base, broadly ovate, 1.5-2 by 1.5-2 mm, pubescent outer part, glabrous inner part, ciliate. *Corolla* 5, free, obovate or spathulate, 1.5-2 by 1.5 mm, yellowish green to yellow. *Staminal tube* globose or cyathiform, undulate margin. *Stamens* (8-)10, in one whorl, inside the throat of tube, not exceed the tube margin. *Disk* absent. *Ovary* ovate or ovoid, 2-3 by 2-3 mm, pubescent; 3(-5) loculi, each locule with (1-)2 ovules; style 3, stout, each with 2 dilate apex. *Infructescence* reflexed or hanging, up to 25 cm long. *Drupes* globose or obovoid, 2-3.5 by 2.5 cm, brownish or yellow, with white sticky latex, indehiscent. *Seeds* oblong, slightly 3-longitudinal angles, enclosed with white, thick and soft aril. Calyx of drupes not accressent but still persisted.

T h a i l a n d.—SOUTH-EASTERN: Chanthaburi; PENINSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Phuket, Krabi, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Songkhla, Pattani, Yala, Narathiwat.

D i s t r i b u t i o n.—Malaysia (Type).

E c o l o g y.—Under cultivation throughout the peninsular and southeastern of the country.

V e r n a c u l a r.—Lang sat (ลางสาด), Long gong (ลองกอง), Langsat pa (ลางสาดป่า) (Peninsular).

10. MELIA

Melia L., Sp. Pl. 1: 384. 1753; Harms in Engl. & Prantl, Nat. Pflanzenfam., ed 2, 19 b 1: 99. 1940; T. D. Penn., Blumea 22: 463. 1975; Mabb., Gard. Bull. Sing. 37: 463. 1984; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 329. 1995.—*Azedarach* Mill., Gard. Dict., Abr. ed. 4: 170. 1754.

Trees, polygamo-dioecious, young parts with simple and stellate hairs. *Leaves* spirally arranged, 2(-3) imparipinnate, subbranches opposite; leaflets opposite, except the top one. *Inflorescence* a thyrse compound, axillary near terminal twigs. *Calyx* 5(-6), united near base. *Petals* 5(-6), free, imbricated. *Staminal tube* narrowly cylindrical, slightly expanded at mouth, with 10(-12) longitudinal ribs, margin with 10-12 serrate lobes. *Stamens* 10(-12) inserted at margin and alternate with lobes. *Disk.* undulate and enclosed base of ovary. *Ovary* (4-)8 loculi, each locule with 2 ovules. *Drupe* globose, indehiscent. *Seed* 1-(-2), with fleshy aril.

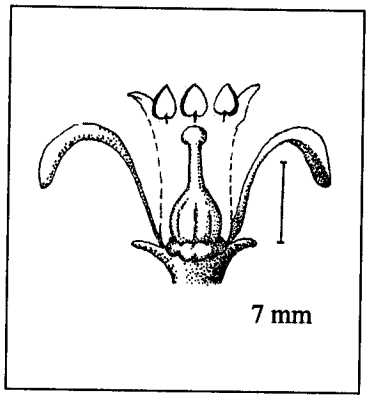

Fig. 80. *Melia azedarach*: longitudinal section of flower.

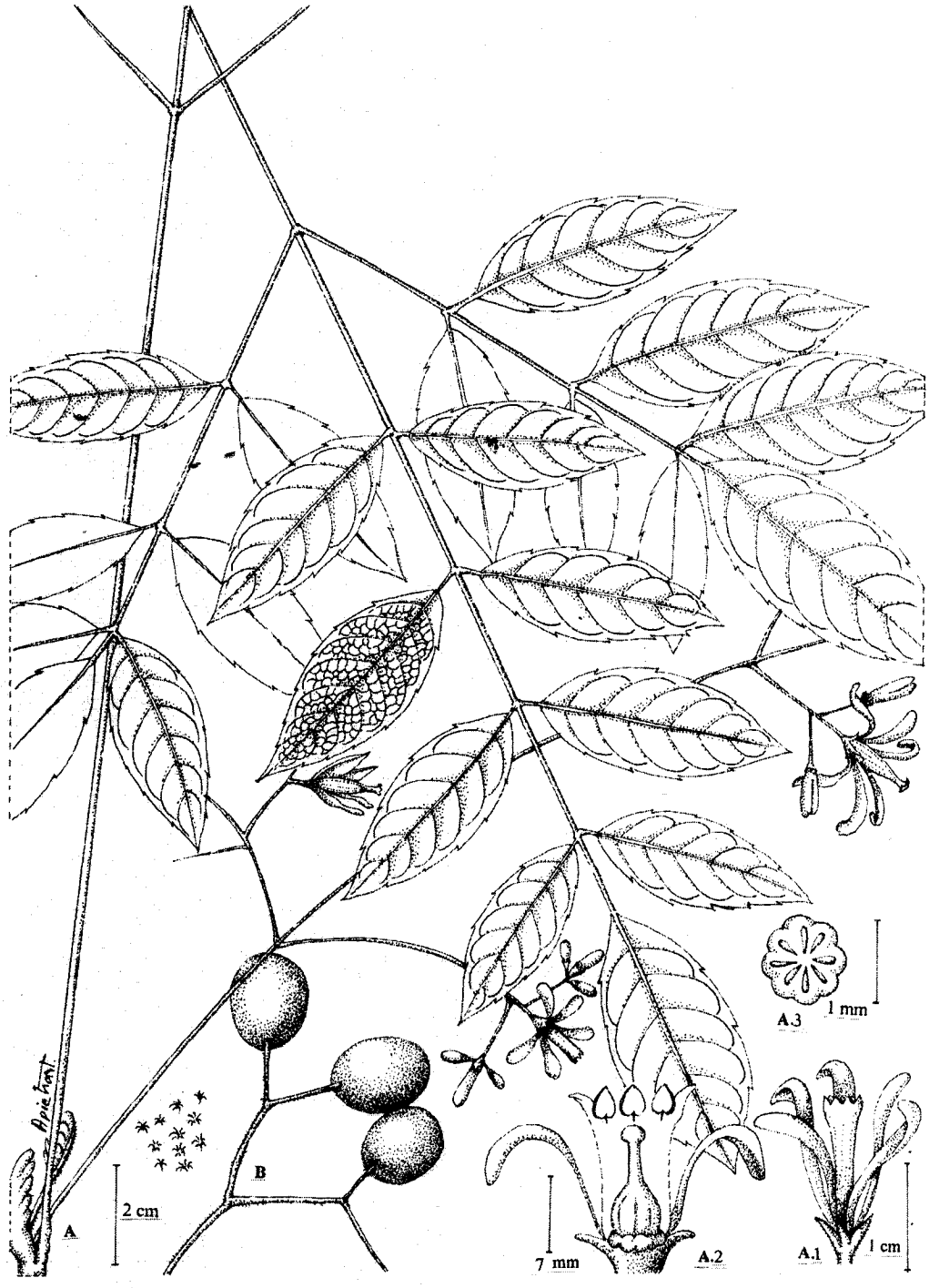

Fig. 81. *Melia azedarach* L.: A. twig with inflorescences, A.1 flower, A.2 stamens & ovary, A.3 cross section of ovary (C. Phengklai 10801); B. infructescence (R. Pooma 2418).

Melia azedarach L., Sp. Pl.: 384. 1753; Burm.f., Fl. Ind.: 101. 1767; A. Juss., Mêm. Mus. Natl. Hist. Nat. Paris 19: 219. 1832; Hiern in Hook.f., Fl. Brit. India 1: 544. 1875; Pierre, Fl. Forest Cochinch. 5: t. 356B. 1897; Pellegr. in Lecomte, Fl. Indo-Chine 1: 727. 1911; Ridl., Fl. Malay Penins. 1: 384. 1922; Corner, Wayside Trees Mal.:464. 1940; Backer et Bakh.f., Fl. Java 2: 120. 1965; T. D. Penn., Blumea 22: 461. 1975; Mabb., Gard. Bull. Sing. 37: 55. 1984, et in Fl. Males. ser. I, 12(1): 330. 1995.—*Melia sempervirens* (L.) Sw., Prodr.: 67. 1788; Backer & Bakh.f., Fl. Java 2: 120. 1965.—*Melia dubia* Cav., Diss. 7, Septima Diss. Bot.: 364. 1789; Hiern in Hook.f., Fl. Brit. India 1: 545. 1875; Backer & Bakh.f., Fl. Java 2: 120. 1965.—*Melia composita* Willd., sp. Pl., ed. 4.2(1): 559. 1799; Pierre, Fl. Forest Cochinch. 5: t. 356 A. 1897; Ridl., Fl. Malay Penins. 1: 384. 1922.—*Melia birmanica* Kurz, J. Asiat. Soc. Bengal 43, 2: 183. 1874.—*Melia toosendan* Sieber & Zucc. in Abh. Akad. München 4, 2: 159. 1843.

Trees (3-)10-25 m high, 60-180 cm girth; terminal buds oblong in outline, densely brownish stellate hairs. *Twigs* brown, sparsely pale epidermis and sparsely with stellate hairs. Outer bark grey to brown, sparsely with light brown lenticels, ± 1 cm thick, finely longitudinal fissured.; inner bark yellowish; hartwood brown. *Leaves* bi-tri imparipinnate, subbranches opposite; each with 3-5-7-9 leaflets; leaflets elliptic. obovate to ovate-oblong, 2-6 by 1-2.5 cm; apex acuminate, caudate, acute or broadly then cuspidate; base oblique with obtuse-cuneate; margin slightly serrate or smooth; midrib prominent beneath and subdepressed upside; secondary nerves 5-10 pairs, conspicuous beneath; reticulate veins hardly distinct. *Petiole* 5-10 cm long, first densely or sparsely with stellate hairs, then glabrescent. *Inflorescence* up to 30 cm long, axillary, near end of twigs, greenish; all part with stellate indumentum; budding oblong or tubular, 0.5-1 cm long. *Calyx* 5(-6), united near base, hairy outer part, lobes lanceolate ± 2 by 0.5 mm. *Corolla* 5(-6), free, lobes spathulate or oblanceolate, ± 1.5 by 0.2 cm, whitish purple to light purple, faintly lilac, simple and stellate hairs outer parts, glabrous inside. *Staminal tube* purple, narrow cylindrical; anthers 10(-12). *Stamens* 10(-12), anthers green or yellowish, inserted at margin and alternate with lobe of margin. *Disk* undulate and enclosed the base of ovary. *Ovary* ovate, green, slightly 8 longitudinal grooves; (4-)8 loculi, each locule with 2 ovules, style tubular, greenish; stigma round, yellowish. *Infructescence* axillary or upper leaf-scars. *Drupes* globose or broadly ellipsoid, glabrous, 1.5-2.5 by 1.5-2.5 cm; dull green, glaucous green, brownish; fruit-stalk ± 0.5 cm, glabrous. *Seed* ellipsoid, woody 1.5-2 by 1-1.5 cm, with 6-7-8 longitudinal grooved. Aril yellowish white, thin.

T h a i l a n d.—(Exotic): Cultivated throughout the country.

D i s t r i b u t i o n.—North America, Africa, Australia, Fiji, India (Type), Malaysia, Indochina, Philippines.

E c o l o g y.—Under cultivation throughout the country.

V e r n a c u l a r.—Lien (เลี่ยน) (General).

11. MUNRONIA

Munronia Wight, Ic. 1,5: [1]. 1838; Harms in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 19 b 1: 91. 1940; T. D. Penn., Blumea 22: 452. 1975. Mabb. & Pannell, Fl. Males. ser. I, 12(1): 30. 1995.—*Philastrea Pierre*, Bull. Mens. Soc. Linn. Paris 1: 475. 1885.

Shrublets or under shrubes, sometimes suckering with apparently short-lived shoots. All parts with simple and stellate hairs. *Leaves* simple, imparipinnate, often crenate to serrate; leaflets opposite, except the top one. *Inflorescence* solitary or thyrses, axillary. *Flowers* hermaphrodite, pseudopedicellate. *Calyx* 5, united near base, somewhat foliaceous. *Petals* 5, united and adnate with staminal tube ± 2/3 to the base. *Staminal tube* narrowly cylindrical or slightly obconical, the margin with 10 entire or bilobed appendages or, rarely, with 10 reflexed filiform appendages recurved some distance below margin. *Stamens* 10, inserted on tube rim, alternating with appendages, connective often produced apically forming an appendage, which is rarely filiform, anthers sparsely pubescent. *Disk* indistinct. *Ovary* 5 loculi, each locule with 2 ovules. *Capsule* obconical, with conspicuous 5 longitudinal valves. *Seeds* 2 in each valve, plano-convex.

KEY TO THE SPECIES
(based on flowering and leaf specimens)

1. Leaves simple, margin serrate to undulate. Flowers with erected corolla lobes; disk absent **1. M. humilis**
1. Leaves imparipinnate, margin of leaflets entire. Flowers with reflexed corolla lobes; disk present **2. M. pinnata**

KEY TO THE SPECIES
(based on fruiting and leaf specimens)

1. Leaves simple, margin serrate to undulate. Capsules with hirsute hairs **1. M. humilis**
1. Leaves imparipinnate, margin of leaflets entire. Capsules with stellate hairs **2. M. pinnata**

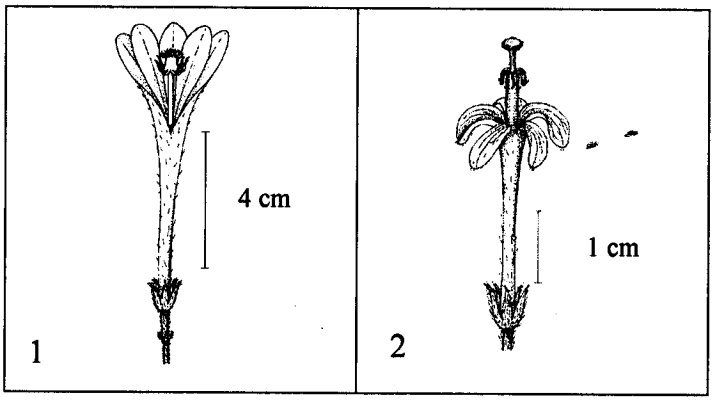

Fig. 82. Longitudinal section of flower in Genus *Munronia*: 1) *Munronia humilis*; 2) *M. pinnata*.

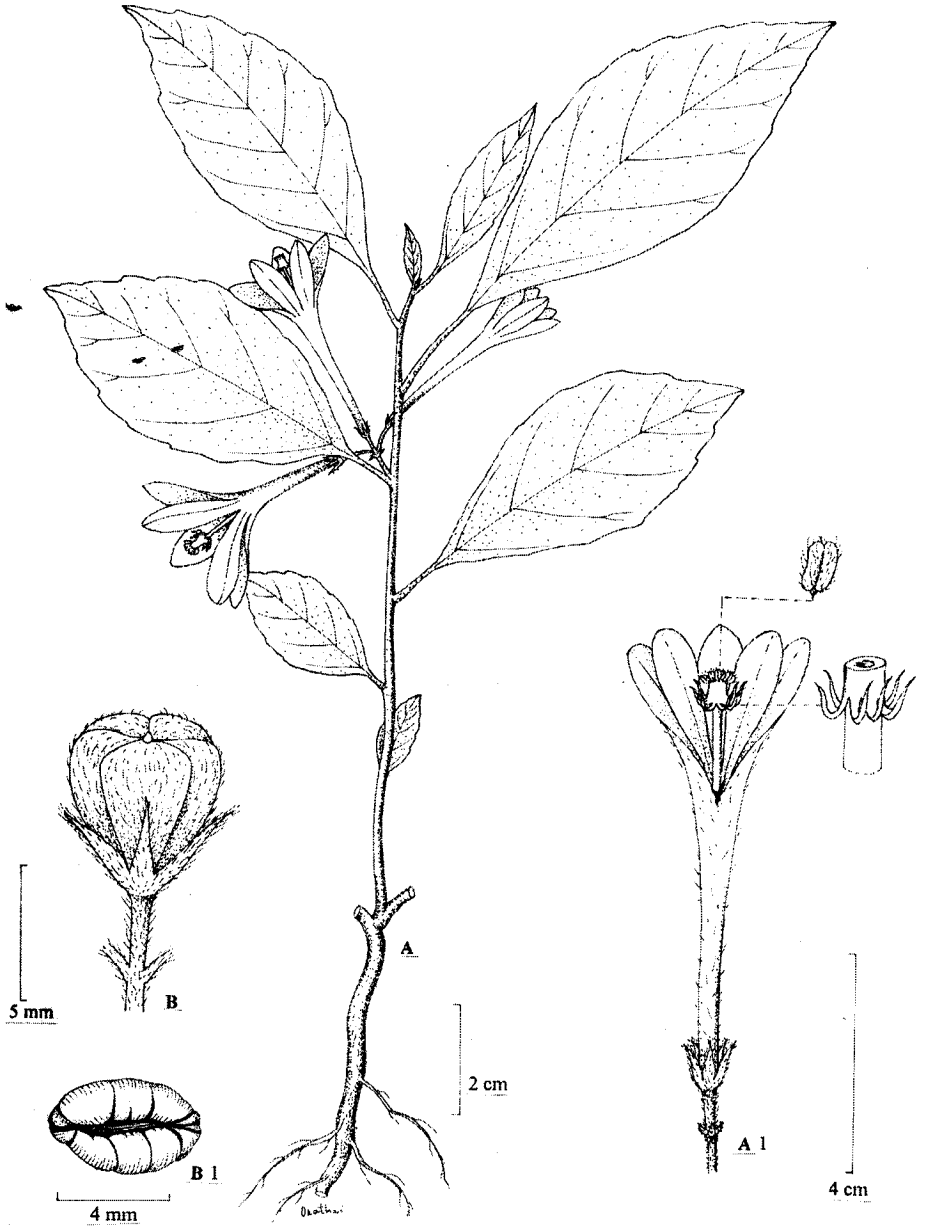

Fig. 83. *Munronia humilis* (Blanco) Harms.: A. habit, A.1 flower (Th. Wongprasert 075-2); B. capsule, B.1 seed (Th. Wongprasert 075-2).

1. Munronia humilis (Blanco) Harms, Ber. Deutsch. Bot. Ges. 35: 80. 1917; Pellegr. in Fl. Indo-Chine, Suppl.: 688. 1946; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 32, 1995.—*Plagianthus humilis* Blanco, Fl. Filip.: 526. 1837.—*Turraea humilis* (Blanco) Merr., Philipp. Govt. Lab. Bur. Bull. 27: 30. 1905; Craib, Fl. Siam Enum.1: 248. 1926; Backer & Bakh.f., Fl. Java 2: 119. 1965.—*Turraea pumila* Benn., Pl. Jav. Rar.: 183. 1840; C. DC. in DC., Monogr. Phan. 1: 440. 1878.

Perennial with rootstock herb, 15-40 cm high, erect, 5-8 mm girth, rootstock up to 20 cm long. Terminal bud tubular, 1-1.5 by 0.5 mm, densely with simple or stellate hairs; usually unbranched, stems densely pubescent then glabrescent; wood white or yellowish white. *Leaves* simple, spirally arranged; elliptic, elliptic-oblong or obovate; 3-8 by 1.5-3.5 cm; papery; sparsely adpressed pubescent upside, stellate with adpressed beneath, then glabrescent except along nerves both sides; green upside, pale beneath; apex acuminate, acute to broadly acute; base acute to attenuate; margin serrate to undulate; midrib fine distinct with stellate hairs beneath, pinkish when dry, subdepressed with simple and stellate hairs upside; secondary nerves 4-7 pairs, usually seperating near margin, conspicuous on both sides; other nerves hardly distinct. *Petiole* linear, 0.5-1.5 cm long, densely simple and stellate hairs, then glabrescent. *Inflorescence* thyrses; axillary flowers hermaphrodite; 1-1.5 cm long; buds oblong, 1-1.5 cm long, covered with simple or stellate hairs; bracts and bracteoles 0.5-1 mm long, subulate, caducous. *Calyx* 5, lanceolate lobes, united near base, ca. 0.5 cm long, densely then glabrescent. *Corolla* 5, salverform, 3-4 cm long, pale green to white, divided ca. 1/3 of all length to 5 oblanceolate lobes, sparsely pubescent outside. *Staminal tube* narrow cylindrical, white, with 10 reflexed filiform appendages and curved outward at tips to form a subapical ruff. *Stamens* 10, filaments indistinct, at resultant apex, orange. *Disk* absent. *Ovary* obconical, ca. 1 by 1 mm hairy; 5 loculi, each locule with 2 ovules; style narrowly tubular, 5-7 cm long, glabrous, stigma crowned with anthers and appendage hooked below. *Capsules* obconical, ca. 1 by 0.8 cm, distinct 5 longitudinal valved, each with 1(-2) seeds; persisted fruiting calyx, hairy. *Seed* plano-convex, ca. 5 by 3 mm, without aril.

T h a i l a n d.—NORTHERN: Mae Hong Son, Chiang Mai, Lamphun, Lampang, Tak; NORTH-EASTERN: Loei; EASTERN: Chaiyaphum; SOUTH-WESTERN: Kanchanaburi, Ratchaburi; CENTRAL: Lop Buri, Saraburi.

D i s t r i b u t i o n.—Burma, Philippines (Type).

E c o l o g y.—On limestone bedrock, nearby stream, in evergreen or mixed deciduous forest; altitude (20-)100-500 m.

V e r n a c u l a r.—Mook tia (มูกเตี้ย) (Central).

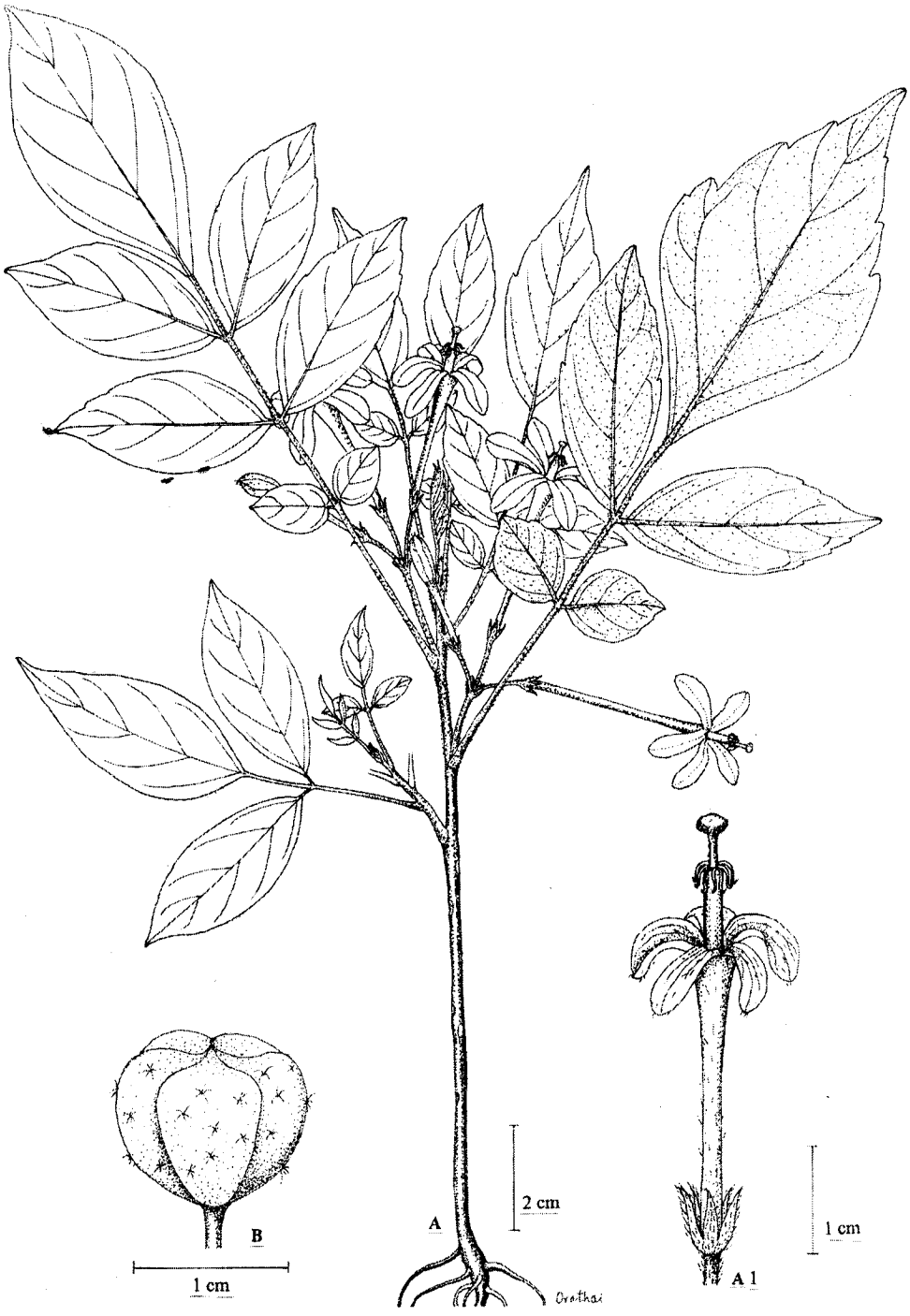

Fig. 84. *Munronia pinnata* (Wall.) Theob.: A. habit with inflorescences, A.1 flower (S. Indrapong 108); B. capsule (J.F. Maxwell 87-893).

2. Munronia pinnata (Wall.) Theob. in Mason, Burma., ed. 4, 2: 581. 1883; Harms, Ber. Deutsch. Bot. Ges. 35: 78. 1917; Whitmore, Enum. Fl. Pl. Nepal 2: 85. 1979; B. C. Stone, Malayan Nat. J. 37: 189. 1984; Mabb. in Tree Fl. Malaya 4: 202. 1989, et in Fl. Males. ser. I, 12(1): 30. 1995.—*Turraea pinnata* Wall., Pl. Asiat. Rar. 2: 21. 1830.—*Munronia wallichii* Wight, 3.1: 147. 1840; Hiern in Hook.f., Fl. Brit. India 1: 543. 1875.—*Munronia javanica* Benn., Fl. Jav. Rar.: 176. 1840; C. DC. in DC., Monogr. Phan. 1: 448. 1878; Backer & Bakh.f., Fl. Java 2: 119. 1965.

Perennial undershrubs or shrublets, 15-40 cm high, 1-1.5 cm girth, stout primary root bigger than stem or some branchlets. Terminal bud linear-lanceolate, 5-10 by 1 mm, densely with stellate hairs; twigs densely pubescent then glabrescent; outer bark smooth, brownish, sparsely lenticellate; wood brownish. *Leaves* imparipinnate, 5-15 cm long, rachis pubescent; leaflets 3-7, elliptic, elliptic-oblong, opposite except the apical one, 1-8 by 1-4.5 cm, chartaceous to subcoriaceous, glabrous upside, sparsely pubescent beneath, then glabrescent except along midrib and secondary nerves; apex acute; base cuneate, obtuse to oblique; margin entire,slightly to deeply serrate on the upper half, the apical one tri-lobed sometime; midrib distinct on lower surface, conspicuous or subdepressed on the upper surface; secondary nerves 3-5 pairs, conspicuous beneath and hardly distinct upside; other nerves hardly distinct. *Petiole* 1.5-6 cm long, pubescent; petiolules 0.1-1.5 cm pubescent. *Inflorescence* thyrses; axillary flowers hermaphrodite; 1.5-2.5 cm long; buds oblong, 1-1.5 cm long, covered with simple or stellate hairs; bracts and bracteoles 0.5-1 mm long, subulate, caducous. *Calyx* 5, lanceolate or linear lobes, free or minutely united near base, 3-4 mm long, pubescent outside, then glabrous inside. *Corolla* 5, 3-5 cm long, oblong or oblanceolate lobes white, divided ca. 1/3 of all length, sparsely pubescent outside. *Staminal tube* narrow cylindrical, white, with 10 entire appendages reflexed at anthesis. *Stamens* 10, filaments indistinct. *Disk* conical, 2-3 mm high, pubescent. *Ovary* obconical, ca. 1 by 1 mm, hairy; 5 loculi, each locule with 2 ovules; style narrowly tubular, 5-7 cm long, glabrous, stigma capitate, higher than anthers. *Capsule* obconical, ca. 1 by 1 cm, strictly 5 longitudinal valved, each with 1(-2) seed; persisted fruiting calyx, stellate hairs. *Seed* plano-convex, ca. 5 by 3 mm, without aril.

T h a i l a n d.—NORTH-EASTERN: Loei; SOUTH-WESTERN: Kanchanaburi, Ratchaburi, Prachuap Khiri Khan.

D i s t r i b u t i o n.—India (Type), Sri Lanka, Malaysia, Indonesia.

E c o l o g y.—In dry evergreen forest; altitude 200-600 m.

V e r n a c u l a r.—Kradueng piek (กระดึงเพียก), Saribat (สาริบาท) (Southwestern).

12. PSEUDOCLAUSENA

Pseudoclausena T.P. Clark, Blumea 38: 291. 1994; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 55. 1995.

Trees, polygamo-dioecious to hermaphrodite, pubescent to glabrous. *Leaves* spirally arranged, imparipinnate, leaflets opposite except the top one. *Inflorescence* thyrse compounds; axillary near terminal. *Calyx* 5, united ± 2/3 to the base. *Petals* 5, free, imbricated, *Staminal tube* cotyliform to short cylindrical, margin smooth or minutely apiculate. *Stamens* 10, protrude higher from the rim of tube. *Disk* indistinct. *Ovary* 4(-5) loculi, each locule with 1 ovule. *Drupe* ovoid, indehiscent. *Seed* ellipsoid, without aril.

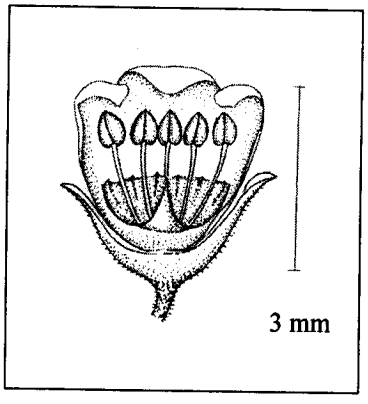

Fig. 85. *Pseudoclauseana chrysogyne*: longitudinal section of flower.

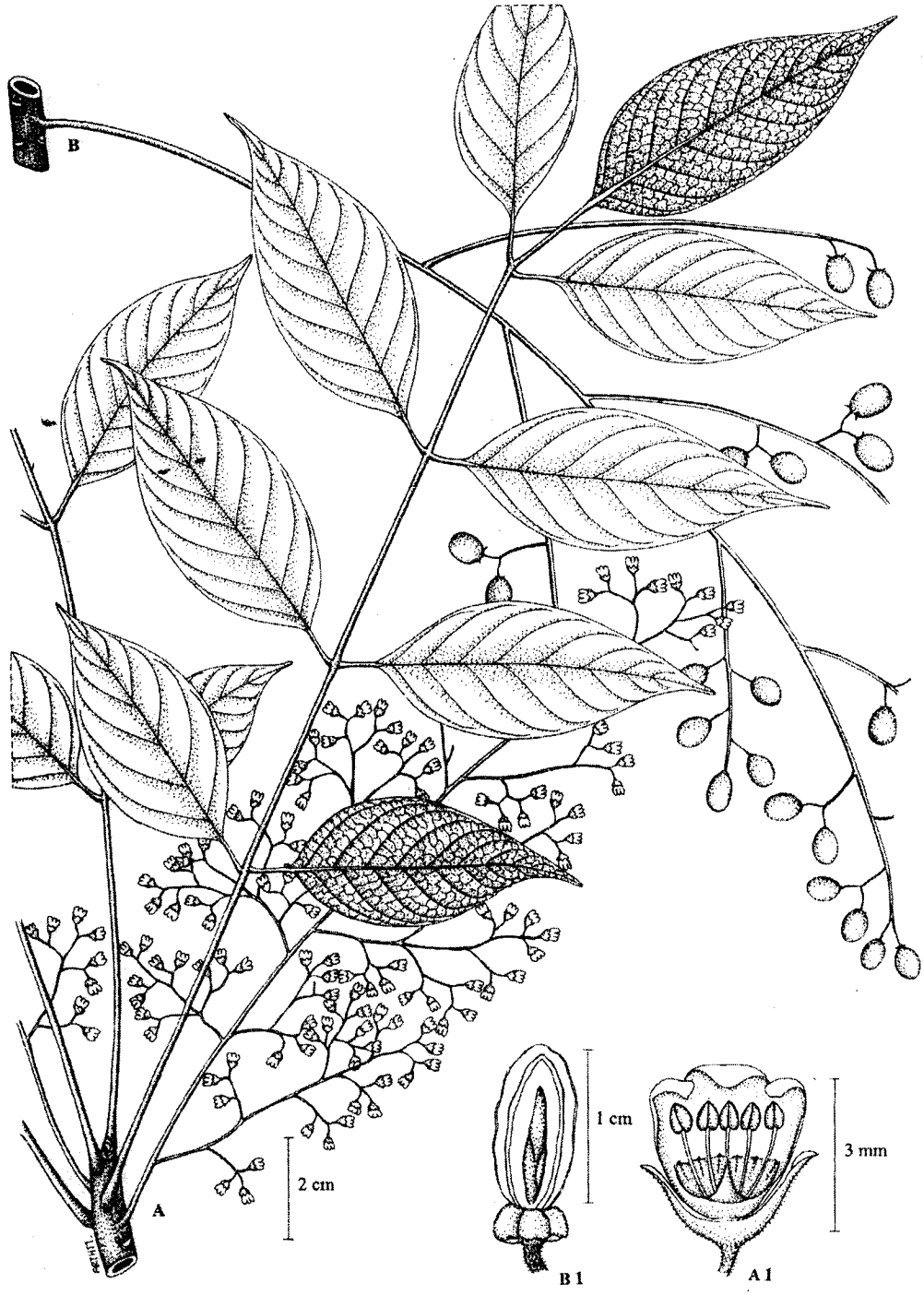

Fig. 86. *Pseudoclauseana chrysogyne* (Miq.) T.P. Clark: A. twig with inflorescences, B.1 longitudinal section of flower (Th. Wongprasert 083-25); B. infructescence, B.1 longitudinal section of fruit (W. Nanakorn 4106).

Pseudoclausena chrysogyne (Miq.) T.P. Clark, Blumea 38: 291, f. 20, 21: 1994; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 55. 1995.—*Clausena chrysogyne* Miq., Fl. Ind. Bat., Suppl. 1: 502. 1861.—*Walsura chrysogyne* (Miq.) Bakh.f., Blumea 16: 359. 1968.—*Walsura multijuga* King, J. Asiat. Soc. Bengal 64, 2: 83. 1895; Ridley, Fl. Malay Penins. 1: 412. 1922.

Trees, 10-20 m high; outer bark smooth, brown; inner bark pink with dark stripes, about 1.5 cm thick; sapwood whitish with red or pink tinge. *Leaves* imparipinnate, 12-24 cm long; leaflets elliptic, ovate-lanceolate, 5-9 foliolate, opposite except the top one, glabrous, 7-15 by 2.5-3 cm, chartaceous, pale beneath, glossy green upside; apex caudate or acuminate; base ovate, minute to strongly oblique; margin entire or slightly undulate; midrib prominent and sharp ridge beneath when dry; secondary nerved 8-20 pairs, arched but not anastomosing, usually with dryobalanoid nerves interval; reticulate veins conspicuous beneath. *Petiole* 5-10 cm long, glabrous; petiolules 0.5-1 cm long, except the top one up to 3 cm long. *Inflorescence* a thyrse compound, panicle-liked, on the top or upper leaf scars near end of twigs, up to 20 cm long, densely pubescent all parts. *Flowers* hermaphrodite, rarely polygamous, scented. *Calyx* 5, free or minutely united near base, 1-1.5 mm long, pubescent outside, glabrous inside. *Corolla* 5, free, lobes obovate or oblanceolate, 2-2.5 by 1-1.5 mm, dark purple, whitish, yellow or purplish red, glabrous. *Staminal tube* a cotyliform, about a half length of stamens. *Stamens* 10, in one row, filaments glabrous or pubescent on lower half. *Disk* absent. *Ovary* 4 loculi, each locule with 1 ovule, always develop one; style glabrous. *Drupe* globose or ellipsoid, ca. 1 by 0.5 cm (young?). *Seed* 1(-2), spear-shaped, without aril.

T h a i l a n d.—NORTHERN: Chiang Mai.

D i s t r i b u t i o n.—Indochina, Malaysia, Indonesia (Type), Philippines.

E c o l o g y.—Evergreen forest; altitude 500-1,400(-1,650) m.

V e r n a c u l a r.—Yom luk leep (ยมลูกลีบ), yom heb (ยมเหี๊ยบ) (Northern).

13. SANDORICUM

Sandoricum Cav., Diss. 7, Septima Diss. Bot. 7: 359. 1789; Harms in Engl. & Prantl. Nat. Pflanzenfam., ed. 2, 19 b1: 170. 1940; T. D. Penn., Blumea 22: 507.1975; Mabb., Blumea 31: 146. 1985; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 344. 1995.

Trees, polygamous, subglabrous to fulvous tomentose. *Leaves* spirally arranged, leaflets trifoliolate. *Inflorescence* a thyrse compound, axillary. *Calyx* 4-5, united on lower half. *Petals* (4)-5, free, imbricated. *Staminal tube* cylindrical or slightly urceolate, margin dentate. *Stamens* (8-)10, within throat of tube. *Disk* cotyliform, free, margin coarsely toothed. *Ovary* (4-)5 loculi, each locule with 2 ovules. *Drupe* ovoid or obovoid, indehiscent. *Seeds* kidney-shaped, enclosed with soft and fibrous mesocarp.

KEY TO THE SPECIES
(based on flowering and leaf specimens)

1. Leaflets obovate, glabrous all. Thyrses up to 6 cm long. Petals glabrous both sides. Stigma protruded the rim **1. S. beccarianum**
1. Leaflets ovate; pubescent especially on lower surface. Thyrses not less than 10 cm long. Petals pubescent outer parts. Stigma at same level of the rim **2. S. koetjape**

KEY TO THE SPECIES
(based on fruiting and leaf specimens)

1. Leaflets obovate, glabrous all. Drupes obovoid, more or less curved to one side **1. S. beccarianum**
1. Leaflets ovate; pubescent especially on lower surfaces. Drupes globose or flattened-globose **2. S. koetjape**

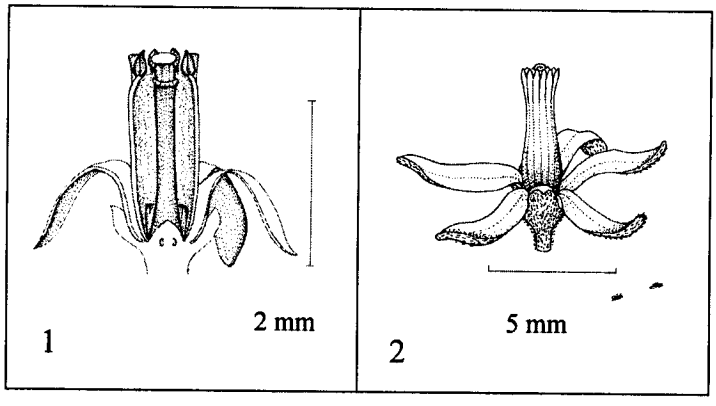

Fig. 87. Longitudinal section of flower in Genus *Sandoricum*: 1) *Sandoricum beccarianum*; 2) *S. koetjape*.

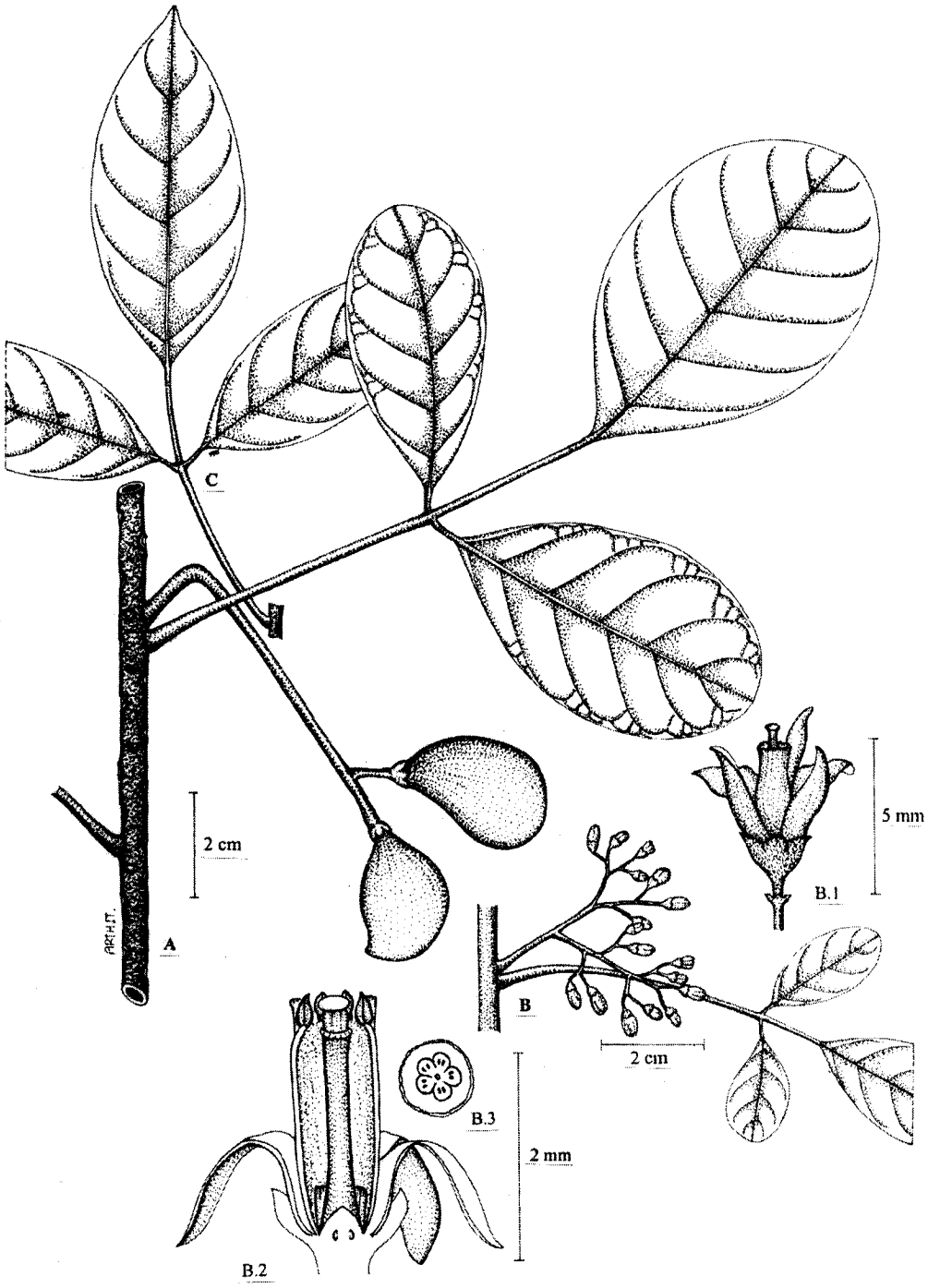

Fig. 88. *Sandoricum beccarianum* Baill.: A. twig with infructescence; B. inflorescences, B.1 flower, B.2 longitudinal section of flower, B.3 cross section of ovary (W. Heijer 2382); C. another form of leaf (C. Niyomdham 841).

1. Sandoricum beccarianum Baill. Adansonia 11: 264. 1874; Mabb., Blumea 31: 151. 1985; Mabb. in Tree Fl. Malaya 4: 249. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 353. 1995.—*Sandoricum emarginatum* Hiern in Hook.f., Fl. Brit. India 1: 264. 1875; Ridl., Fl. Malay Penins. 1: 385. 1922; Burkill, Dict. Econ. Prod. Malay Penins.: 1946. 1935; Corner, Gard. Bull. Singapore, Suppl. 1: 77, 86, 89. 1978.

Trees 20-35 m high, 80-150 cm girth; twigs glabrous, sparsely with pale lenticels; outer bark brown or reddish brown, many horizontal lenticels, minute cracks to deeply fissured; inner bark reddish brown, up to 1 cm thick; sapwood whitish to brownish; heartwood pink to reddish brown. *Leaves* trifoliolate, 10-25 cm long; leaflets obovate, 4-8 by 2-7 cm, glossy green upside, pale beneath, sparsely gland dots beneath, glabrous on both sides, coriaceous; midrib prominent beneath, depressed upside; secondary nerves 4-7 pairs, arched and more or less anastomosing; other nerves hardly distinct; apex round, usually minutely emarginate (young leaf of seedling usually acuminate apex); base slightly cuneate; margin entire or slightly undulate, more or less recurved. *Petiole* 2.5-6.5 cm long, glabrous; petiolules 1-4.5 cm long, glabrous, the apical one always extra. *Inflorescence*, a thyrse compound, axillary, on twigs or near the end of twigs; 3-5 cm long; pedicels 4-6 mm long, pubescent; bracts narrowly triangular, ca. 1 mm long, caducous, pubescent, bracteoles ca. 0.5 mm likely bract. *Calyx* 5, united near base, all 2-2.5 mm long, funnel-formed, pubescent; lobes ca. 1/2 of all length, ciliate. *Corolla* (4-)5 oblanceolate lobes, 3-4 mm long, yellowish green to white, glabrous. *Staminal tube*, tubular to salverform, up to 2 mm long, with (8-)10 emarginate lobes at margin. *Stamens* (8-)10, opposite with lobes, filaments adnate the inner tube. *Disk* cotyliform, ca. 0.5 mm high, glabrous. *Ovary* ovoid, glabrous, 5 loculi, each locule with 2 ovules; style cylindrical, up to 2 mm long; stigma protrude or same level of marginal tube. *Infructescence* with peduncles 3-6 cm long, more or less glabrous; fruit-stalk 0.5-1 cm long. *Drupe* obovoid or ovoid, 2.5-3 by 1.5-2 cm, usually curved to one side, densely tomentose, then glabrescent. Fruiting calyx ca. 6 mm diam; lobes 5, broadly ovate, ca. 1.5 by 1.5 mm, pubescent outside. *Seeds* 2, ca. 2 by 1 cm (usually 2 ovules developed), enclosed with soft pulp.

T h a i l a n d.—PENINSULAR: Narathiwat.

D i s t r i b u t i o n.—Malaysia, Indonesia (Type), Singapore.

E c o l o g y.—In peat swamp forest; altitude 0-10 m.

V e r n a c u l a r.—Sathon nok (สะท้อนนก), Sathon phru (สะท้อนพรุ), Sato burong (สะโตบุรง) (Peninsular).

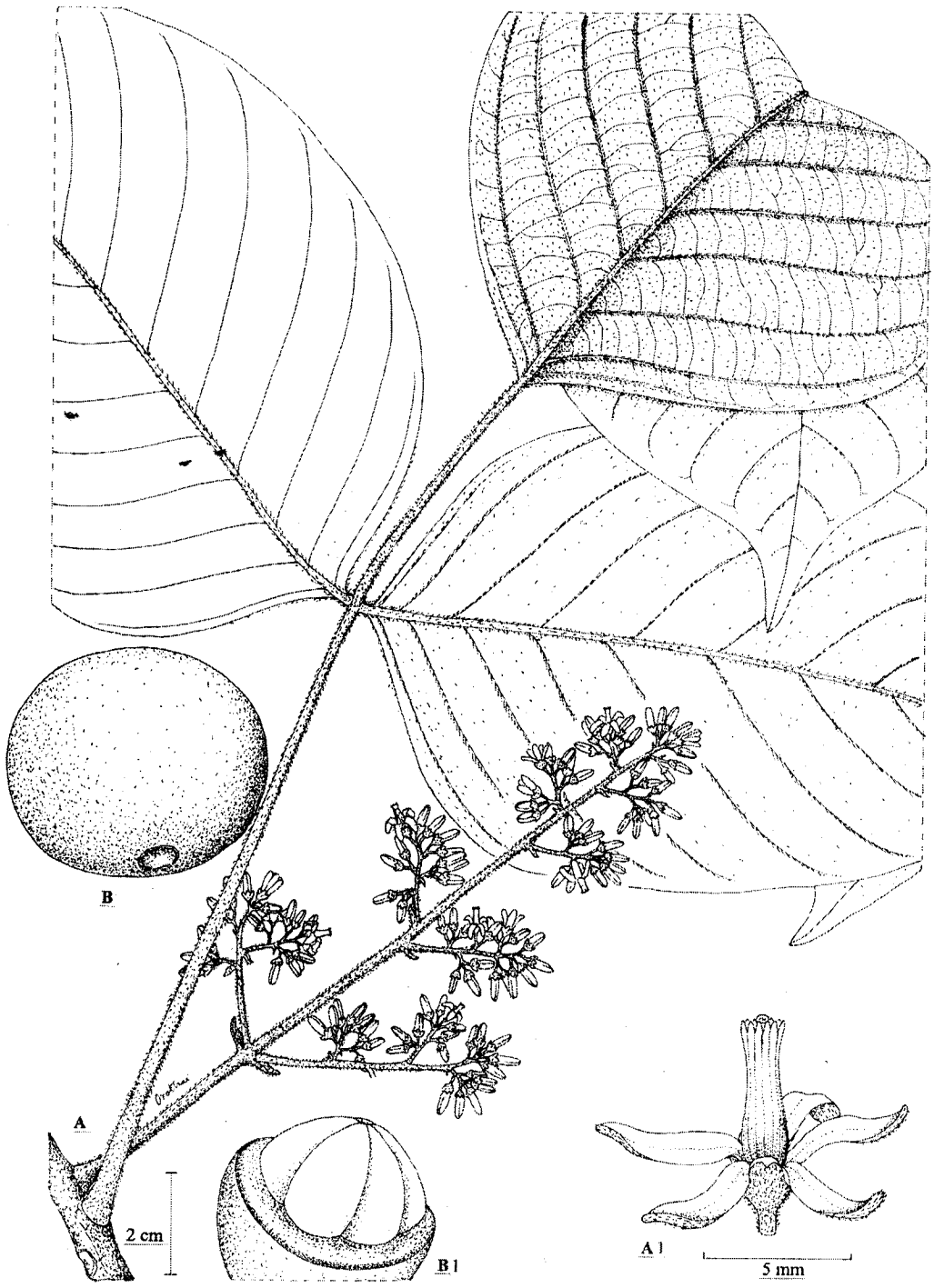

Fig. 89. *Sandoricum koetjape* (Burm.f.) Merr.: A. twig with inflorescences, A.1 flower (B. Sangkachand 3165); B. drupe, B.1 drupe with seeds (Th. Wongprasert 086-27).

2. Sandoricum koetjape (Burm.f.) Merr., Philipp. J. Sc., Bot. 7: 237. 1912; Merr., Fl. Manila: 247. 1912; Corner, Wayside Trees Mal. 1: 446. 1940; Backer & Bakh.f., Fl. Java 2: 121. 1965; Mabb. in Tree Fl. Malaya 4: 249, f. 8B. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 345. 1995. *Melia koetjape* Burm.f., Fl. Ind. 101. (1768).—*Sandoricum indicum* Cav., Diss.:359, t 202. 1789; Hiern in Hook.f., Fl. Brit. India 1: 553. 1875; Kurz, Forest Fl. Burma 1: 217. 1877; Pierre, Fl. Forest Cochinch. 5 t. 353A. 1897; Brandis, Indian Trees: 137. 1906; Ridley, Fl. Malay Penins. 1: 385. 1922; Craib, Fl. Siam Enum. 1: 353. 1926.—*Sandoricum nervosum* Blume, Bijdr.: 163. 1825; Ridley, Fl. Malay Penins. 1: 385. 1922; Craib, Fl. Siam Enum. 1: 254. 1926.—*Sandoricum maingayi* Hiern in Hook.f., Fl. Brit. India 1: 554. 1875; Ridley, Fl. Malay Penins. 1: 385. 1922

Trees 10-30 m high, 80-200 cm girth, buttress up to 3 m high; twigs brown, pubescent then glabrescent. Outer bark pale pinkish brown, finely fissured, lenticellate to peeling with round flakes; inner bark reddish brown to dark brown, ca. 3 cm thick; sapwood yellowish; heartwood pink or reddish. *Leaves* imparipinnate, trifoliolate, 15-30 cm long; leaflets ovate, 15-18 by 8-12 cm, the apical one always bigger than the side leaves, hairy along midrib upside and densely along midrib beneath, other parts sparsely hairy then glabrous, coriaceous; midrib prominent beneath, depressed upside; secondary nerves 12-15 pairs, arched but not anastomosing, conspicuous on both sides, other nerves slightly conspicuous beneath; apex acute; base obtuse to broadly obtuse; margin entire. *Petiole* 8-12 cm long, hairy; petiolules 0.5-6 cm, pubescent. *Inflorescence* a thyrse compound, axillary or supraaxillary; 10-20 cm long, densely hairs, pedicels 2-5 mm long, pubescent; bracts and bracteoles narrowly oblong 1-5 by 0.5-2 mm, densely hairs, caducous. *Calyx* (4-)5, united near base, all 2-2.5 mm, lobe ca. 1/2 of all length, cupuliform, pubescent both sides. *Corolla* (4-)5, linear-lanceolate lobes, free, 4-5 by 1-2 mm, white, greenish white to orange when mature, pubescent outside. *Staminal tube* tubular or slightly salverform, up to 5 mm long, with (16-)20 obtuse lobes at margin. *Stamens* (8-)10, not protrude the margin, filaments adnate the inner tube. *Disk* cupuliform, ca. 1 mm high, glabrous. *Ovary* ovoid, glabrous, 5 loculi, each locule with 2 ovules; style cylindrical, up to 4 mm long; stigma not protrude from the marginal tube. *Infructescence* with peduncles, 5-10 cm long. *Drupe* flattened-globose, 5-8 cm diam., velvety, yellow or brownish when ripe, smooth. Fruiting calyx usually persisted. *Seeds* (4-)5, 2-3.5 by 1-2 cm, and 1-2 cm thick.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai, Lampang; EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Kanchanaburi, Uthai Thani, Ratchaburi; CENTRAL: Saraburi, Bangkok; SOUTH-EASTERN: Chachoengsao, Chanthaburi, Trat; PENINSULAR: Ranong, Surat Thani, Trang, Songkhla.

D i s t r i b u t i o n.—India, Sri Lanka, Burma, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, Brunei.

E c o l o g y.—In evergreen forest, nearby streams; altitude 50-600(-800) m.

V e r n a c u l a r.—Kra thon (กระท้อน) (General); ma tong (มะต้อง) (Northern).

14. SWIETENIA

Swietenia Jacq., Enum. Syst. Plan 4: 1760; P. Hua et D.J. Mabberly, in Fl. China 11: 116. 2008.

Evergreen tree. *Leaves* even-pinnate, spirally arranged; leaflets opposite to subopposite, glabrous. *Inflorescences* axillary or subterminal thyrses. *Flowers* small, (4-)5 merous; *Staminal tube* cup-shaped, apically (8-)10 lobed. *Stamens* (8-)10, inserted inside of tube throat and alternate with the lobe of staminal tube. *Disk* annular. *Ovary* ovoid, with (4-)5(-6) locular, each locule with 9-16 pendulous ovules; style cylindrical, stigma disciform with (4-)5 lobes. *Capsule* woody, oblong, 5 locular. *Seeds* 9-16 per locule, winged, hanging by wing-end from distal part of columella, endosperm more or less fleshy; cotyledon thin; redicle short.

KEY TO THE SPECIES

1. Capsule not less than 10 by 6 cm; seed (wing included) not less than 7.5 cm long. Calyx lobes sparsely pubescent outside **1. S. macrophylla**
1. Capsule up to 10 by 5.5 cm; seed (wing included) upto 5 cm long. Calyx lobes glabrous outside **2. S. mahogani**

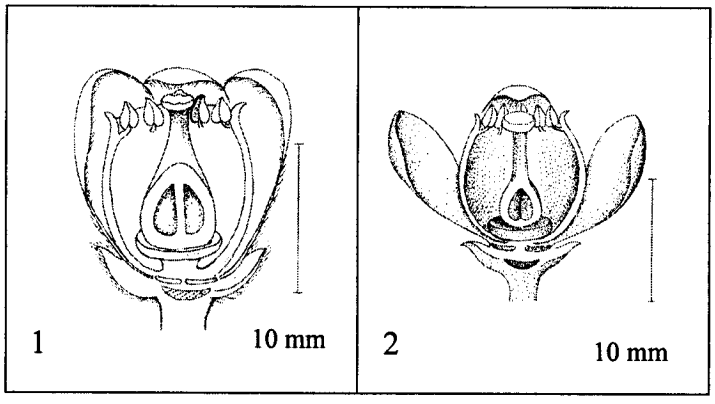

Fig. 90. Longitudinal section of flower in Genus *Swietenia*: 1) *Swietenia macrophylla*; 2) *S. mahagoni*.

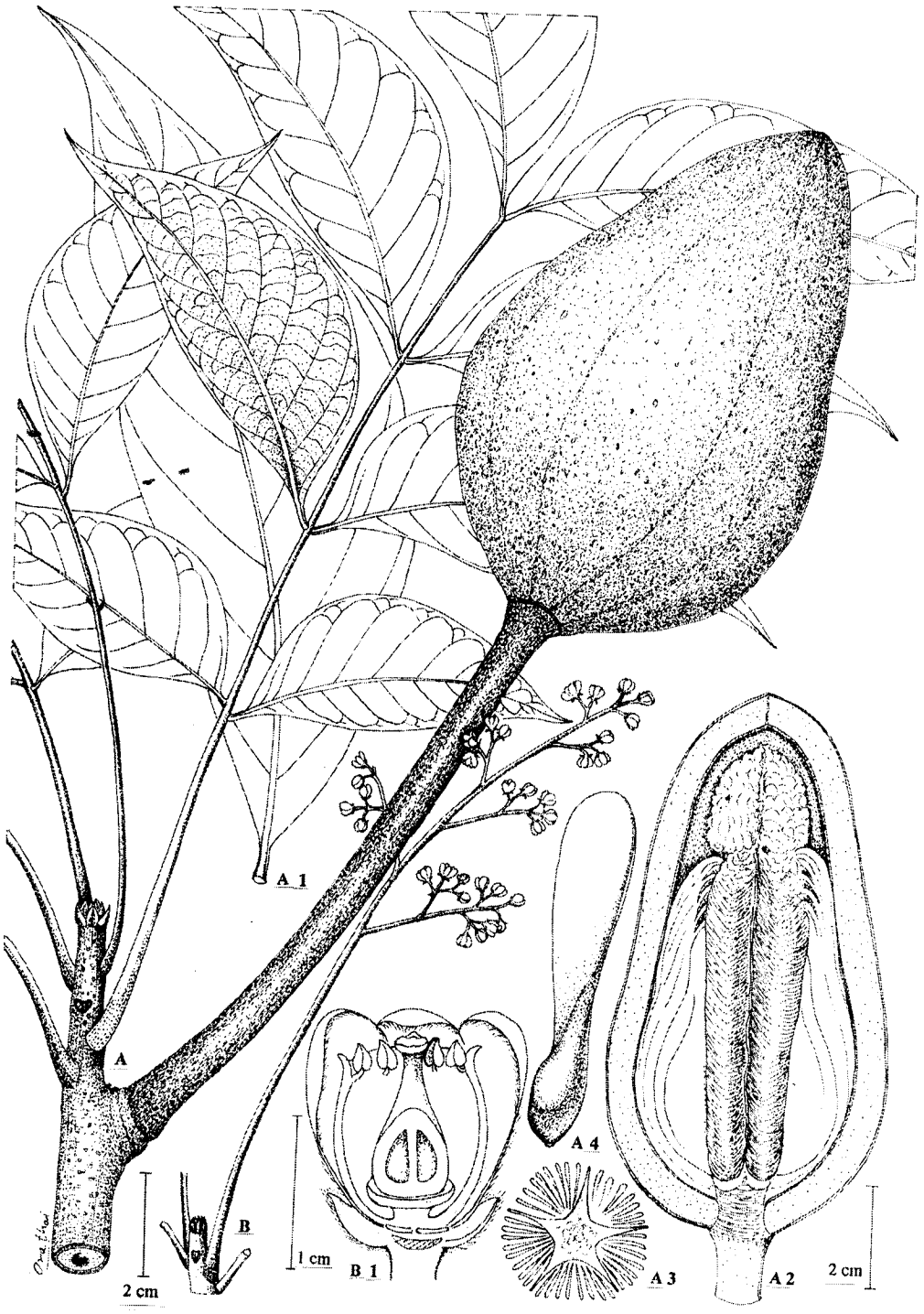

Fig. 91. *Swietenia macrophylla* King: A. twig with infructescence, A.1 leaf, A.2 longitudinal section of capsule, A.3 cross section of core, A.4 seed (Th. Wongprasert 077-45); B. inflorescences, B.1 longitudinal section of flower (Th. Wongprasert 074-1).

1. Swietenia macrophylla King in Hook. Icon. Pl. 16: t. 1550. 1886; Corner, Wayside Trees Mal. 1 : 468. 1940; Backer & Bakh.f., Fl. Java 2:118. 1965

Trees 10-40 m high, 80-200 cm girth, buttress plank-liked; buds a crown-shaped, glabrous; young twigs sparsely lenticellate, glabrous. Outer bark grey, thick scales; inner bark reddish brown or pinkish red; sapwood yellowish or white, heartwood reddish or pinkish. *Leaves* paripinnate, 15-40 cm long, spirally arranged; leaflets 5-6(-8) pairs, opposite, glossy green upside, pale beneath; elliptic-oblong or ovate-oblong, (8-)9-15(-18) by 3-5(6) cm, usually curved to one side; chartaceous to subcoriaceous; apex caudate, cuspidate to acuminate; base cuneate, unequal sides, obtuse in outline; margin entire or undulate (young stage); midrib and secondary nerves prominent beneath, depressed upside; secondary nerves 7-15 pairs, arched and anastomosing near margin; reticulate veins conspicuous beneath; nerves usually pinkish when dry, especially on lower surfaces. *Petiole* 6-12 cm long, slender and swollen near base; petiolules 2-5 mm long, all glabrous. *Inflorescence* axillary, near and of twigs, a short thyrse compound, 10-8(-20) cm long, erected; unisexual; peduncles 7-15 cm long, pedicels 2-3 mm long, glabrous all parts; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate to a plate-liked, 0.2 mm diam.; lobes ca. 1/3 of all length, truncate apex; reflexed, sparsely pubescent outside, glabrous inside. *Corolla* 5, free, white, linear or slightly obovate, 4-5 mm long, contorted, ciliate, and strongly reflexed at anthesis. *Staminal tube* tubular or urceolate, ca. 1 mm lomg, glabrous on both sides, margin with (8-)10 truncate lobes. *Stamens* (8-)10, apical of anthers more or less level of marginal tube; filaments adnate the tube inside. *Disk* a plate-like, glabrous. *Ovary* ovate, glabrous 5 loculi, each locule with 9-16 ovules; style slightly narrow upward, glabrous; stigma dilate. *Infructescence* erected, woody, ca. 1 cm diam., up to 15 cm long; and with a single capsule, lenticellate. *Capsule* ovate, woody, 10-15(-20) by 6-7 cm; usually 5 valves; receptacle or core with 5- winged and with a spongy dome-liked on top. *Seeds* numerous, winged, 7.5-12 cm (wing included) long, flat, imbricated, 2- rows per a locule.

T h a i l a n d.—Exotic plant, cultivated for shade.

D i s t r i b u t i o n. —Central America, Honduras (Type).

E c o l o g y.—Cultivated along roadside; altitude up to 100 m.

V e r n a c u l a r.—Mahokkani bai yai (มะฮอกกานีใบใหญ่) (Central).

Fig. 92. *Swietenia mahagoni* (L.) Jacq.: A. twig with inflorescences, A.1 longitudinal section of flower; B. capsule, B.1 cross section of core.

2. Swietonia mahagoni (L.) Jacq. Enum. Syst. Pl. Carib.: 20.1760; Corner, Wayside Trees Mal. 1: 463. 1940; Backer & Bakh.f., Fl. Java 2:118. 1965

Trees 10-30 m high, 80-200 cm girth, buttress short or blunt; buds a crown-shaped, glabrous; young twigs sparsely lenticellate, glabrous. Outer bark grey, scaly; inner bark reddish brown or pinkish red; sapwood yellowish or white, heartwood reddish or pinkish. *Leaves* paripinnate, 10-20(-25) cm long, spirally arranged; leaflets 4-5(-7) pairs, opposite, glossy green upside, pale beneath; elliptic-oblong or ovate-oblong, 4-6(-8) by (1.5-)2.5-3 cm, usually curved to one side; chartaceous to subcoriaceous; apex caudate to acuminate; base cuneate, unequal sides, cuneate in outline; margin entire or undulate (young stage); midrib and secondary nerves prominent beneath, depressed upside; secondary nerves 7-15 pairs, arched and anastomosing near margin; reticulate veins conspicuous beneath; nerves usually pinkish when dry, especially on lower surfaces. *Petiole* 5-10 cm long, slender and swollen near base; petiolules 2-5 mm long, all glabrous. *Inflorescence* axillary, near end of twigs, a short thyrse compound, (5-)8-15(-20) cm long, erected; unisexual; peduncles 5-10 cm long, pedicels 2-3 mm long, glabrous; bracts and bracteoles narrowly triangular, caducous. *Flowers* polygamous. *Calyx* 5, broadly campanulate to a plate-liked, ca. 1 mm long; lobes ca. 1/3 of all length, apex truncate or frinked, reflexed, glabrous on both surfaces. *Corolla* 5(-4), free, white, linear, 2-2.5 mm long, contorted, glabrous, strongly reflexed at anthesis. *Staminal tube* urceolate, ca. 1 mm lomg, glabrous on bith sides, margin with (8-)10 truncate lobes. *Stamens* (8-)10, apical of anthers more or less level of marginal tube; filaments adnate the tube inside. *Disk* a plate-liked, glabrous. *Ovary* ovate, glabrous 5 loculi, each locule with 9-16 ovules; style tubular, glabrous; stigma, dilate, depressed. *Infructescence* erected, woody, ca. 1 cm diam., up to 1.5 cm long; and with a single capsular, lenticellate. *Capsule* ovate, woody, (4.5-)6-10 by 4-5.5 cm; usually 5 valves; receptacle or core with 5- winged and with a spongy dome-liked on top. *Seeds* numerous, winged, 4-5 cm (wing included) long, flat, imbricated, 2- rows per a locule.

T h a i l a n d.—Exotic plant, cultivated for shade.

D i s t r i b u t i o n. —Tropical America, Australia, Caribbean islands (Type).

E c o l o g y.—Cultivated along roadside; altitude up to 100 m.

V e r n a c u l a r.—Mahokkani bai lek (มะฮอกกานีใบเล็ก) (Central).

15. TOONA

Toona (Endl.) M. Roem., Fam. Nat. Syn. Monogr. 1: 131, 139. 1846; Pellegr. In Lecomte, Fl. Indo-Chine 1: 792. 1911; Harms in Engl. & Prantl, Nat. Pflanzenfam. 3, 4: 269. 1896. T.D. Penn. & Styles, Blumea 22: 512. 1975; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 358. 1995.—*Cedrela* L., sect. *Toona* Endl., Gen. Pl. 2: 1055. 1840

Tree, monoecious, rare polygamo-dioecious, pubescent to glabrous. *Leaves* spirally arranged, paripinnate, rarely imparipinnate, leaflets opposite to subopposite. *Inflorescence* a thyrse compound, axillary near the end of twigs. *Calyx* 5, free or united near base. *Petals* 5, free, imbricated. *Staminal tube* absent but androgynophore instead, hairy or glabrous. *Stamens* 5, free, arising from the androgynophore. *Disk* absent. *Ovary* 5 loculi, each locule with 6-10 ovules, vestigial in male flowers. *Capsules* ellipsoid, pendulous and woody, dehiscent. Columella 5- angled, softly woody. *Seeds* winged.

KEY TO THE SPECIES
(based on flowering and leaf specimens)

1. Leaflets entire. Ovary hairy. Patals ciliate. Fresh bark of stems sweetly aromatic
 2. Leaflets glabrous. Styles glabrous **1. T. ciliata**
 2. Leaflets pilose along midrib on upper and lower surfaces. Styles pilose **3. T. sureni**
1. Leaflets serrate or serrulate. Ovary glabrous. Petals not ciliate. Fresh bark of stems pungent **2. T. sinensis**

KEY TO THE SPECIES
(based on fruiting and leaf specimens)

1. Leaflets serrate or serrulate. Bark of capsules smooth; seed with one wing. Fresh bark of stems pungent **2. T. sinensis**
1. Leaflets entire. Ovary hairy. Bark of capsules with verrucose lenticels. Seed with two wings. Fresh bark of stems sweetly aromatic
 2. Leaflets glabrous **1. T. ciliata**
 2. Leaflets pilose along midrib on upper and lower surface **3. T. sureni**

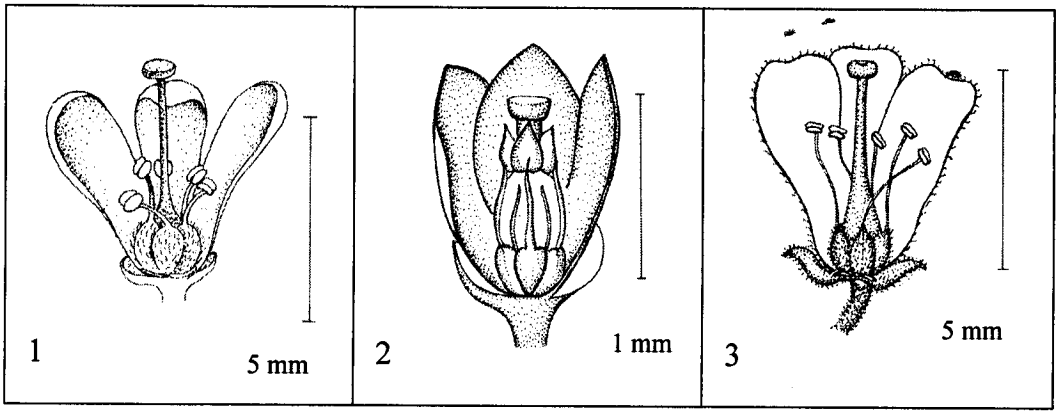

Fig. 93. Longitudinal section of flower in Genus *Toona*: 1) *Toona ciliata*; 2) *T. sinensis*; 3) *T. sureni*.

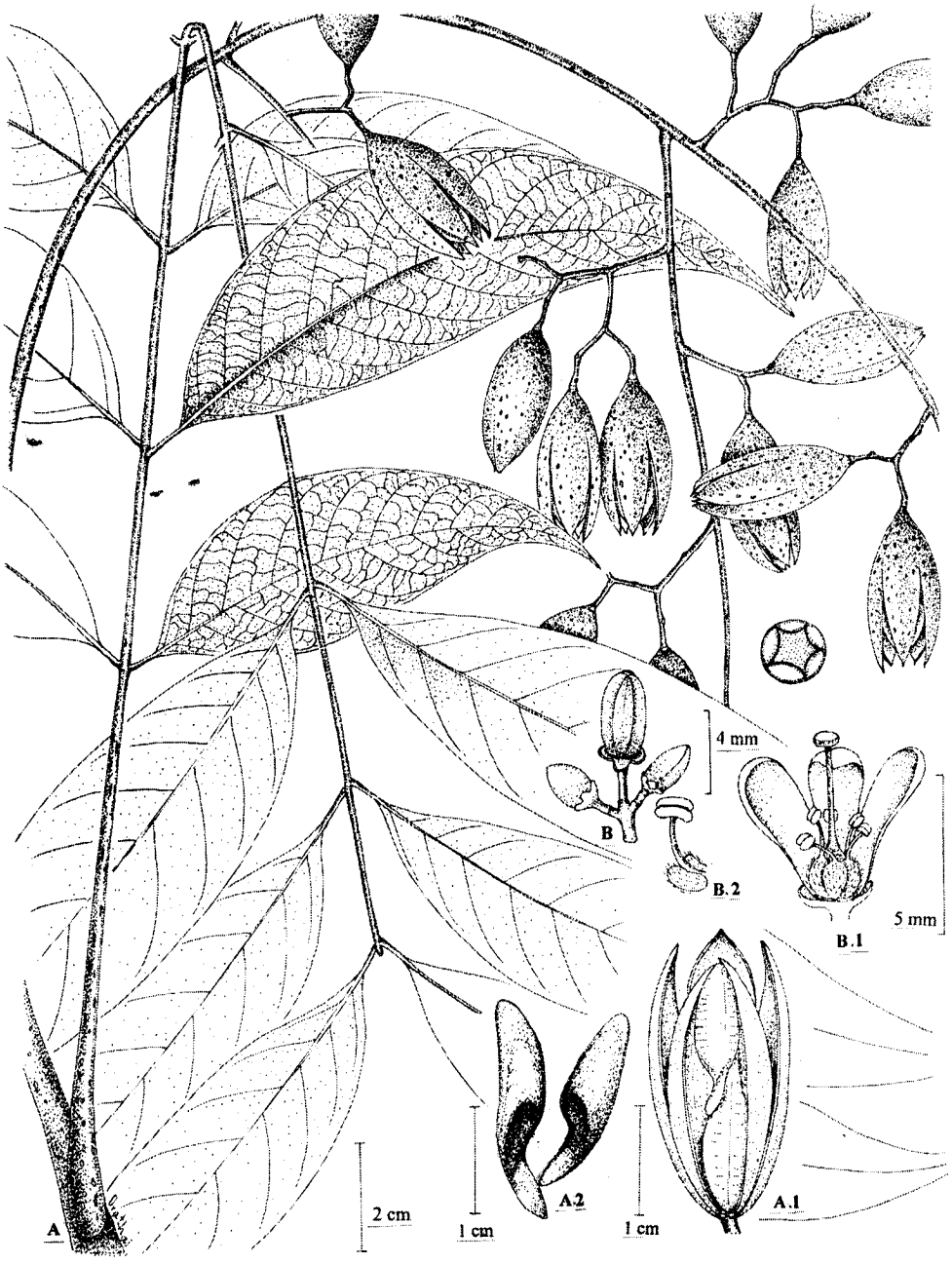

Fig. 94. *Toona ciliata* M. Roem.: A. twig with infructescences, A.1 longitudinal section of drupe, A.2 seeds (Th. Wongprasert 072-14); B. part of inflorescence, B.1 longitudinal section of flower, B.2 stamen (Th. Wongprasert 0612-1).

1. Toona ciliata M. Roem., Fam. Nat. Syn. Monogr. 1: 139. 1846; Kitam. in H. Kihara, Fauna & Fl. Nepal Himalaya. 1: 170. 1955; C.Y. Wu, Fl. Yunnan 1: 207. 1977; Mabb. & Pannell, Fl. Males. ser. I, 12(1) : 366. 1995.—*Cedrela toona* Roxb. ex Rottler & Willd., Neue Schr. Naturf. Freunde Berlin 4: 198. 1803; Hiern in Hook.f., Fl. Brit. India 1 : 568. 1875; Kurz, Forest Fl. Brit. Burma 1: 228. 1877; Brandis, Indian Trees: 249. 1910; Craib, Fl. Siam Enum. 1: 267 1926.—*Toona microcarpa* C. DC. in A. DC., Monogr. Phan. 1: 745. 1878; Brandis, Indian Trees: 145. 1906; Craib, Fl. Siam Enum. 1: 267. 1926

Trees 10-30(40) m high, 100-300 cm girth, twigs olive green, lenticellate; outer bark brown, shallowly or flaking fissured; inner bark brown to pinkish, scented, without latex; sapwood white or pink; heartwood reddish brown, scented. *Leaves* paripinnate, 20-70 cm long, spirally arranged; leaflets 8-10 pairs, opposite or subopposite, ovate-oblong or ovate lanceolate, usually curved to one side, 8-14 by 3-3.5 cm, glabrous, glossy green upside, pale beneath, chartaceous ; apex acuminate to long caudate; base oblique to strongly oblique; margin entire; midrib prominent beneath, depressed upside, dark red when dry; secondary nerves 8-15 pairs, arched ± anastomosing; dark red when dry; scalariform and reticulate veins conspicuous beneath. *Petiole* 10-20 cm long, glabrous, sparsely with lenticles, dark pink when dry; petiolules 1-1.5 cm glabrous. *Inflorescence* a thyrse compound, 20-50 cm long, axillary, glabrous or pubescent, dull light green, peduncles and pedicels green. *Calyx* 5, united near base, lobes ca. 1 by 1 mm round, whitish near margin. *Corolla* 5, free, spathulate-obovate, 5 by 1.5-2 mm white or greenish white, ciliate, fragrant; androgynophore 3-5 mm long. *Stamens* 5, filaments swollen and hirsute at base, 2-3 mm, long. *Ovary* ovate or ellipsoid, ca. 1 by 0.5 mm, 5 angular valves, each with many ovules, hirsute; style cylindrical ca. 3 mm long, glabrous, stigma flat, glabrous. *Infructescence*, pendulous, 30-50 cm long. *Capsule* ellipsoid 2.5-4 by 3 cm, greenish, yellowish to dark brown when mature, sparsely to densely brown lenticels, dehiscent to 5 longitudinal parts when dry. *Seeds* winged, flat, 1.5-2 cm long; the upper wing ca. 1 cm, the lower ca. 0.5 cm, papery.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai, Tak, Sukhothai, Phisanulok; NORTH-EASTERN: Phetchabun; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Uthai thani, Kanchanaburi; CENTRAL : Nakhon Nayok; SOUTH-EASTERN: Chanthaburi; PENINSULAR: Ranong, Nakhon Si Thammarat, Trang, Satun.

D i s t r i b u t i o n.—Africa, Nepal, Pakistan, Bangladesh, India, Burma, China, Laos, Vietnam, Cambodia, Malaysia (Type), Australia.

E c o l o g y.—In evergreen and mixed deciduous forest, nearby stream, on limestone or granite bedrock; altitude (30-)100-800(-1,300) m.

V e r n a c u l a r.—Yom hom (ยมหอม) (General); Sied om (เสียดอ้อม) (Northern); Sadao pa (สะเดาป่า) (Southeastern).

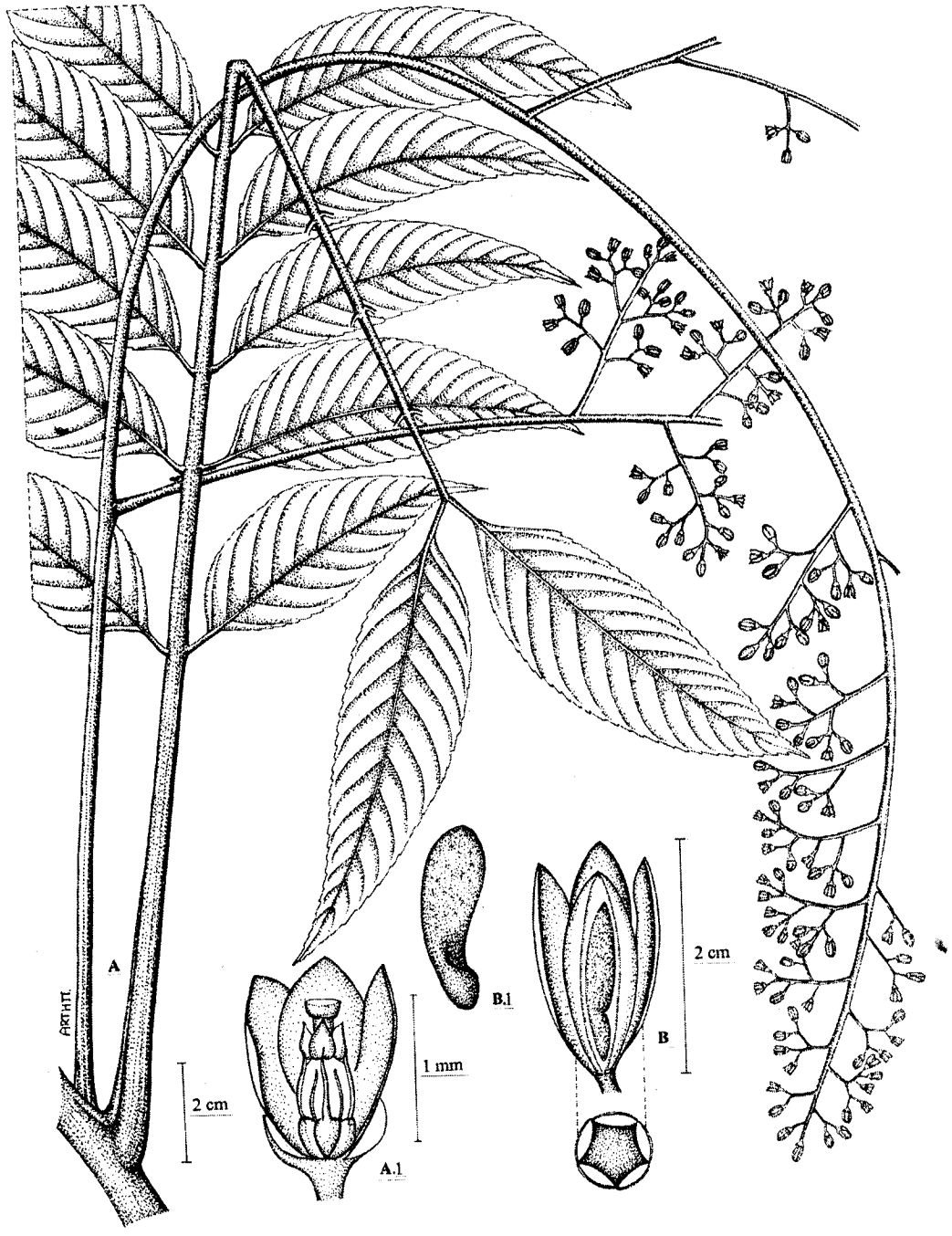

Fig. 95. *Toona sinensis* (A. Juss.) M. Roem.: A. twig with inflorescences, A.1 longitudinal section of flower; B. longitudinal section of drupe, B.1 seed.

2. Toona sinensis (A. Juss.) M. Roem., Fam. Nat. Syn. Monogr. 1: 139. 1846; Backer & Bakh.f., Fl. Java 2: 117 1965; C.Y. Wu, Fl. Yunnan. 1: 210. 1977; Mabb. in Tree Fl. Malaya. 4: 256. 1989.—*Cedrela sinensis* A. Juss., Bull. Sci. Nat. Geol. 23: 241. 1830.—*Cedrela serrata* Royle, 111. Bot. Him.: 144, t. 25. 1839; Kurz, Forest Fl. Brit. Burma 1: 229. 1877; Brandis, Indian Trees: 145. 1906.

Trees 20-35 m high, 100-250 cm girth; twigs olive green, lenticellate; outer bark grey to dark brown, shallowly or flaking fissured; inner bark pink or red, fibrous, strongly garlic odor, without latex; sapwood creamy, heartwood reddish brown. *Leaves* paripinnate, 30-120 cm long, spirally arranged; leaflets 9-15 pairs, opposite or subopposite, narrowly lanceolate to linear-lanceolate, usually curved to one side, 11-22 by 3-5.6 cm, glabrous or minutely pilose on midrib and nerved, glandular hairs on upper midrib, rachis and petiole, glossy green upside, pale beneath, chartaceous; apex acuminate, base oblique and obtuse in outline; margin serrate or serrulate; midrib prominent beneath, depressed upside; secondary nerves 10-13 pairs, arched but not anastomosing; other nerves hardly distinct. *Petiole* 5-20 cm long, glabrous or sparsely pilose, petiolules 3-10 mm, glabrescent. *Inflorescence* a thyrse compound, 50-100 cm long, axillary or supraaxillary, glabrous or sparsely pubescent. *Calyx* 5, united near base, all 1.5–2.5 mm; lobes ca. 1/2 of the length ciliate. *Corolla* 5, free, spathulate-obovate, 3-4 by 1-3 mm white or pinkish, glabrous outside; androgynophore 2.0-4 mm, long. *Stamens* 5, free, filaments swollen and glabrous at base. *Ovary* ovate or ellipsoid, ca. 1 by 0.5 mm, 5 angular valves, each with many ovules, glabrous; style cylindrical, ca. 5 mm long, glabrous, stigma flat, glabrous. *Infructescence*, pendulous, up to 1 m long. *Capsule* ellipsoid 1.5-3 by 0.5-1 cm, reddish to dark brown, sparsely lenticels, dehiscent to 5 longitudinal parts when dry. *Seeds* winged, a wing per one seed, 0.8-1.6 cm long, seed up to 1 cm long.

T h a i l a n d.—PENINSULAR: Krabi.

D i s t r i b u t ion.—Nepal, India, Sri Lanka, Burma, China (Type), Malaysia, Indonesia.

E c o l o g y.—In evergreen forest; altitude 700-800 m.

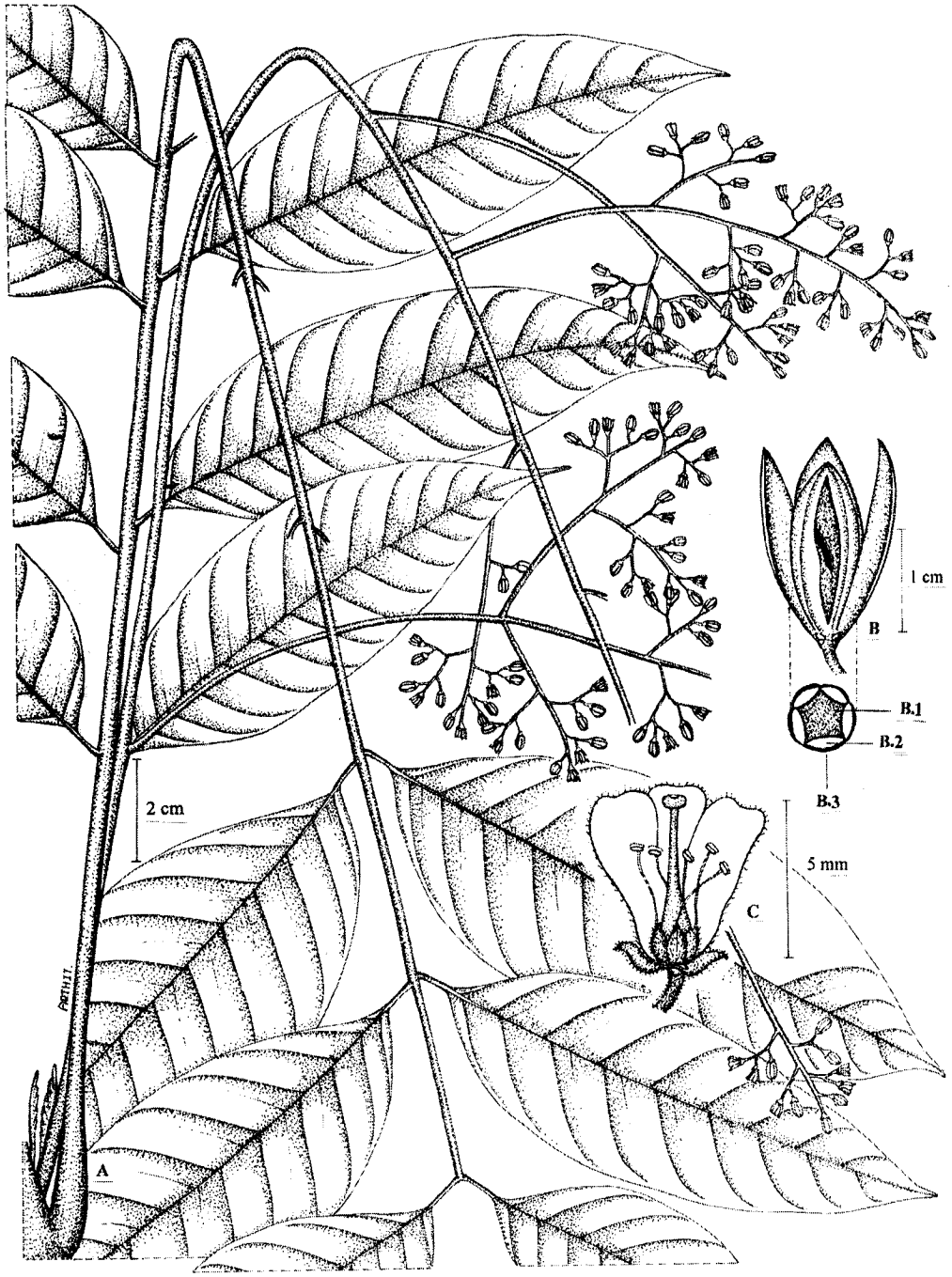

Fig. 96. *Toona sureni* (Blume) Merr.: A. twig with inflorescences, C. longitudinal section of flower (B. Sangkhachand 1564); B. capsule, B.1 core, B.2 space for seeds, B.3 cross section of capsule.

3. Toona sureni (Blume) Merr., Interpr. Rumph. Herb. Amb.: 305. 1917; Backer & Bakh.f., Fl. Java 2: 117 1965; Mabb. in Tree Fl. Malaya. 4: 258. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 363. 1995.—*Cedrela febrifuga* Blume, Verh. Batav. Gen. 9: 135. 1823; Brandis, Indian Trees: 146. 1906; Ridley, Fl. Malay Penins. 1: 415. 1922.—*Toona febrifuga* (Blume) M. Roem., Synops. Monogr. 1: 139. 1846; Pellegr. in Fl. Indo-Chine 1: 793. 1911.

Trees 12-25 m high, 100-150 cm girth, twigs lenticellate with verrucose lenticels; outer bark whitish, greyish brown, brown, usually fissured and flaking; inner bark pinkish white brown, reddish brown, fibrous, without latex; sapwood whitish pink or reddish, scented, heartwood reddish brown. *Leaves* paripinnate, 30-80 cm long, spirally arranged; leaflets 8-10 pairs, opposite or subopposite; lanceolate or ovate-lanceolate, slightly curved to one side, 8-13(-16) by 3-5(-6) cm, hairy on the upper midrib, pilose beneath, then glabrescent, chartaceous; apex acuminate, rarely acute; base slightly unequal sides, ovate in outline; margin entire; midrib prominent beneath, depressed upside, secondary nerves 8-14 pairs, arched but not anastomosing; other nerves hardly distinct. *Petiole* 6-12 cm long, pubescent then glabrescent, petiolules 0.4-1 cm pilose then glabrescent. *Inflorescence* a thyrse compound, 30-50 cm long, reflexed, sparsely hairs, pedicels 0.5-1 mm long, pilose. *Flowers* monoecious. *Calyx* 5, united near base, all 1-1.5 mm long, pilose then glabresent, lobes divided 1/2 of the length. *Corolla* 5, free, oblong, 3.5-5 by 1-3 mm, white or yellow, scented, pilose then glabrescent, ciliate. Androgynophore 2.-5 mm, long. *Stamens* 5, filaments free, 1.2-3 mm long, swollen and hairy on lower half. *Ovary* ovate or ellipsoid, pilose, 5-(6) loculi, each locule with 8 ovules, style cylindrical, 3-4 mm long, pilose on lower half, stigma round and flat top. *Infructescence*, pendulous, 40-60 cm long. *Capsule* ellipsoid 1.5-2 by 5-7 mm, valves dark to blackish brown, with conspicuous lenticels. *Seeds* winged, at both ends, all 5-8 by 1.5-2 mm, papery.

T h a i l a n d.—NORTHERN: Chiang Mai; NORTH-EASTERN: Phetchabun; PENINSULAR: Trang.

D i s t r i b u t i o n. —Nepal, Bhutan, India, Burma, China, Laos, Vietnam, Cambodia, Malaysia, Indonesia (Type), Philippines.

E c o l o g y.—In evergreen, nearby stream; altitude 80-550 m.

V e r n a c u l a r.—Su rian (สุเหรียน) (Peninsular).

16. TURRAEA

Turraea L., Mant. Altera: 150. 1771 ; Harms in Engl. & Prantl, Nat. Pflanzenfam., ed 2, 19b1: 85, t. 20. 1940; T.D. Penn., Blumea 22: 455. f. 3. 1975; Mabb. & Cheek, Taxon 41: 541. 1992; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 24. 1995.

Shrubs, hermaphrodite, pubescent. *Leaves* simple, spirally or alternate. *Inflorescence* fasciculate cymose or solitary; ramiflorus or axillary. *Flowers* bisexual. *Calyx* (4-)5, united at lower half. *Petals* 5, free, imbricated or contorted. *Staminal tube* cylindrical, complete or filaments at least 2/3 united, fringed and reflexed, as many as and opposite the anthers. *Stamens* 10. *Disk* absent. *Ovary* ovate, (3-)5(-10) loculi, each locule with 2 ovules. *Capsule* ovoid or obovoid, 3-5 valved, each with 1(-2) seed.

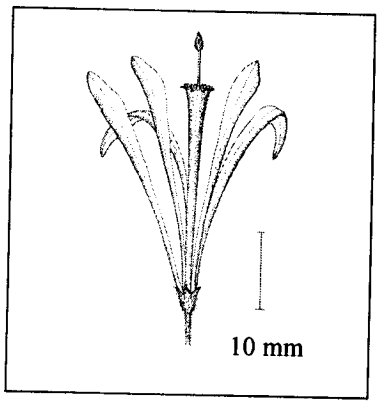

Fig. 97. *Turraea pubescens*: longitudinal section of flower.

Fig. 98. *Turraea pubescens* Hellen: A. twig with inflorescences, A.1 flower, A.2 ovary (Winit 1398); B. infructescence, B.1 seed (K. Larsen et al. 32143).

Turraea pubescens Hellen, Kongl. Vetensk. Acad. Nya. Handl. 9: 308, t . 10 f. 3. 1788; Pellegr. in Lecomte, Fl. Indo-Chine 1: 735, t . 80, f. 5-12. 1911; Backer & Bakh.f., Fl. Java 2: 191. 1965; T.D. Penn., Blumea 22: 456, f. 3b. 1975; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 25. 1995.—*Turraea villosa* Benn., Fl. Jav. Rar.: 182. 1840; Hiern in Hook.f., Fl. Brit. India 1: 542. 1875; Brandis, Indian Trees: 134. 1906.

Straggling shrubs or shrubs, 0.5-4 m high. Terminal buds linear to lanceolate, 5-10 mm long, pubescent; twigs often scrambling, pubescent and lenticellate; outer bark silvery grey to reddish, sparsely with round lenticels; inner bark with white fibrous. Sapwood creamy or yellowish. *Leaves* simple, spirally arranged, elliptic, elliptic–oblong or obovate; 3-9 by 1.5-4.5 cm, chartaceous; densely pubescent especially along nerves and veins on lower surface, then glabrescent; apex acuminate to caudate; base slightly cuneate or obtuse; margin smooth or slightly undulate or serrate on upper half; midrib and secondary nerves finely distinct on lower and subdepressed on the upper surface. *Petiole* ± 1 cm long; densely pubescent. *Inflorescence* fascicle, cymose or solitary. *Flowers* bisexual. *Calyx* (4-)5, campanulate, ± 22 mm long; lobes narrowly triangular, 1/2 of all length, hairy depressed outer part, glabrous inner part. *Petals* (4-)5, free, imbricated or contorted, 2-3 cm by 1-2 mm, white, chartaceous, scented. *Staminal tube* salverform, 2-5 cm long, fringed and reflexed limb; Anthers 10, at mouth, opposite with the the frinks. *Disk* absent. *Ovary* ovate, ± 1.5 by 1 mm, 5–longitudinal lobes, glabrous; 5 loculi, each locule with 2 ovules; style linear, 2.5-4 cm long; stigma ovoid, many glandular dots. *Capsule* ovoid or obovoid, ± 1.8 by 1.5 cm, on young twigs in cluster of 2-5 capsules a group; green or dark brown, glabrous more or less shining; dehiscing in 5 parts, each part with 1-(2) seed. *Seed* plano–convex, black and shining, woody, ± 1.5 by 0.8 cm, without aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Lampang, Phrae, Nakhon Sawan; NORTH-EASTERN: Nong Khai, Khon Kaen; EASTERN: Si Sa Ket; SOUTH-EASTERN: Chanthaburi.

D i s t r i b u t i o n.—India, China (Type), Indonesia, Philippines, Australia.

E c o l o g y.—In evergreen or moist mixed deciduous forest, preferred nearby stream; altitude (50-)100-300 m.

V e r n a c u l a r.—Muk tia (มูกเตี้ย) (Northeastern).

17. WALSURA

Walsura Roxb., Fl. Ind. (Carey & Wallich. ed.) 2: 386. 1832; C. DC. in DC., Monogr. Plan. 1: 633. 1878; Harms in Engl. & Prantl, Nat. Pflanzenfam. 3, 4: 302. 1896; T.D. Penn., Blumea 22: 472. 1975; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 45. 1995.

Trees, polygamo-monoecious, young part with simple and stellate hairs. *Leaves* imparipinnate with opposite leaflets, 1-3-jugate. *Inflorescence* axillary, thyrse compound. *Flowers* hermaphrodite or unisexual, ovoid to obconical. *Calyx* 5, divided up to 2/3 to the base. *Petals* 5, free, valvate to imbricated, hairy outer part. *Staminal tube* cup–shaped, lower than the stamens (Anthers). *Stamens* 10, filaments united at half or near base. *Disk* annular, glabrous or pubescent. *Ovary* ovoid or flat, densely hairy or glabrous, 2 loculi, each locule with 2 ovules, *Drupe* ovoid or ellipsoid, indehiscent. *Seeds* with transparent fleshy aril.

KEY TO THE SPECIES
(based on flowering and leaf specimens)

1. Ovary depressed, flattened; Style and stigma glabrous
   2. Ovary glabrous; stigma flat top. Staminal tube divided ± 1/2 of the length. Stamens with short and long intervally. Leaflets 5-7(-9) **4. W. villosa**
   2. Ovary hirsute; Stigma curved up top. Staminal tube divided ± 1/3 of the length. Stamens at same level. Leaflets 3-5(-7) **1. W. pinnata**
1. Ovary curved up or conical shape; style and stigma hairy or glabrous
   3. Disk smooth margin. Ovary curved up; style hairy; stigma smooth and flat top, pubescent. Leaflets with white–dotted on lower surface **2. W. robusta**
   3. Disk undulate margin. Ovary conical; style glabrous; stigma slightly 6- angled, glabrous.Leaflets normal on lower surface **3. W. trichostemon**

KEY TO THE SPECIES
(based on fruiting and leaf specimens)
(All species in Thailand with 1-seeded; frs. indehiscent, some are wrinkled)

1. Drupes ellipsoid, length doubled the width, velutinous or tomentose; aril white or yellowish. Seeds conical. Leaflets not geniculate with the rachis **4. W. villosa**
1. Drupes globose, length as long as width, hairy or pubescent
   2. Leaflets with white dots on lower surface. Pericarp puberulous **2. W. robusta**
   2. Leaflets without white dots
      3. Pericarp glabrous or nearly glabrous, usually wrinkled when dry. Leaflets much geniculate **3. W. trichostemon**
      3. Pericarp densely hirsute or tomentose, not wrinkled when dry. Leaflets not geniculate **1. W. pinnata**

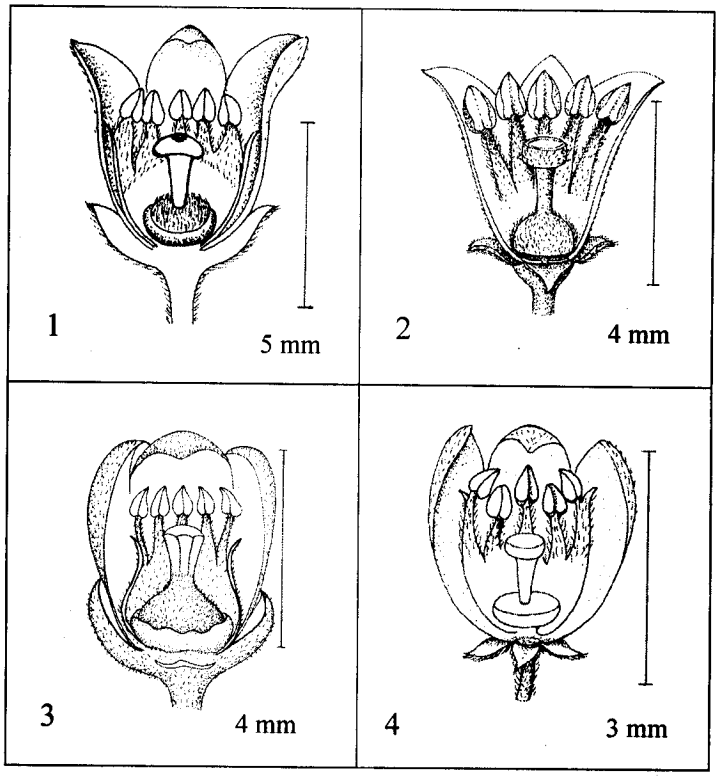

Fig. 99. Longitudinal section of flower in Genus *Walsura*: 1) ***Walsura pinnata***; 2) *W. robusta*; 3) *W. trichostemon*; 4) *W. villosa*.

Fig. 100. *Walsura pinnata* Hassk.: A. twig with inflorescences, A.1 longitudinal section of flower (R. Geesink 8356); B. infructescence, B.1 capsule, B.2 longitudinal section of capsule (Martin van de Bult 764).

1. Walsura pinnata Hassk., Retzia 1: 147. 1855; Miq., Fl. Ind. Bat., Suppl. 1, 2: 542. 1859; Backer & Bakh.f., Fl. Java 2: 129. 1965; Mabb. in Tree Fl. Malaya 4 t. 9 B: 254. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 48. 1995.—*Walsura hypoleuca* Kurz, J. Asiat. Soc. Bengal 42(2): 296. 1872; Hiern in Hook.f., Fl. Brit. India 1: 564. 1875; Kurz, Forest Fl. Brit. Burma 1: 224. 1877.—*Walsura neurodes* Hiern in Hook.f., Fl. Brit. India 1: 564. 1875; Ridl., Fl. Malay Penins. 1: 412. 1922.—*Heynea cochinchinensis* Baillon, Adansonia 11: 265. 1879.—*Walsura elata* Pierre, Fl. Forest Cochinch. Fasc. 21: pl. 355. 1897.—*Napeodendron altissimum* Ridl., J. Roy. As. Sor. Str. Br. 82: 179. 1920; et Fl. Malay Penins 1: 505. 1922.—*Walsura angulata* Craib, Bull. Misc. Inform. Kew: 344. 1926; et Fl. Siam Enum. 1: 261. 1926.

Trees 5-15 m high, 40-100 cm girth; terminal buds slender, 1-1.5 cm long; twigs glabrous with greyish brown and sparsely lenticellate. Outer bark smooth and thin, greyish brown, often with lenticels, peeling in patches; inner bark pinkish brown; sapwood pink to pinkish yellow. *Leaves* imparipinnate, 10-20 cm long; leaflets 3-5(-7), opposite, except the apical one; ovate, obovate to ovate–oblong, 6-15 by 2.5-5 cm, chartaceous to subcoriaceous; apex acute, caudate or sometime broadly obtuse; base obtuse or slightly cuneate; margin entire; midrib prominent beneath, slightly depressed upside; secondary nerves 8-12 pairs, narrow ridge prominent beneath, inconspicuous upside, arched and more or less anastomosing, scalariform veins conspicuous beneath. *Petiole* 2-5 cm long, petiolules 0.5-1.5 cm, all glabrous. *Inflorescence* a thyrse compound, axillary near end of twigs, ca. 30 cm long, pedicels 0.3-0.5 mm, tomentose all; bracts and bracteoles triangular, ca. 1.5 by 1 mm, hairy, caducous. *Flowers* bisexual or male separate. *Calyx* 5, broadly campanulate, all 1-2 mm long, lobed divided ca. 1/2 of all length, pubescent outside. *Corolla* 5, free, broadly campanulate, 4-5 mm long, imbricated, pubescent outside, white or yellowish white. *Staminal tube* campanulate ca. 2.5 mm, long, hairy inside on the upper half. *Stamens* 10, opposite the lobes of marginal tube.; filaments hairy and attached with the tube inside. *Disk* annular–liked. *Ovary* depressed, hirsute, 2 loculi, each locule with 2 ovules; style slightly tubular, ca. 1.5 mm long, glabrous; stigma dilate, glabrous curved. *Infructescence* as inflorescence. *Drupes* globose, 1 by 1 cm, yellowish; tomentose, indehiscent; fruiting–calyx remained with accrescent from flower. *Seed*, globose, ca. 0.7 cm, enclosed with fleshy white and sweet aril.

T h a i l a n d.—NORTHERN : Chiang Mai; NORTH-EASTERN: Nakhon Phanom; EASTERN: Nakhon Ratchasima; CENTRAL: Saraburi; SOUTH-EASTERN: Chon Buri, Chanthaburi; PENINSULAR: Ranong, Phangnga.

D i s t r i b u t i o n.—Burma, China, Cambodia, Vietnam, Malaysia, Indonesia (Type) Philippines.

E c o l o g y.—In evergreen or mixed deciduous forest, preferred nearby stream; altitude 70-500 m.

V e r n a c u l a r.—Kaeo lao (แก้วลาว) (Southeastern).

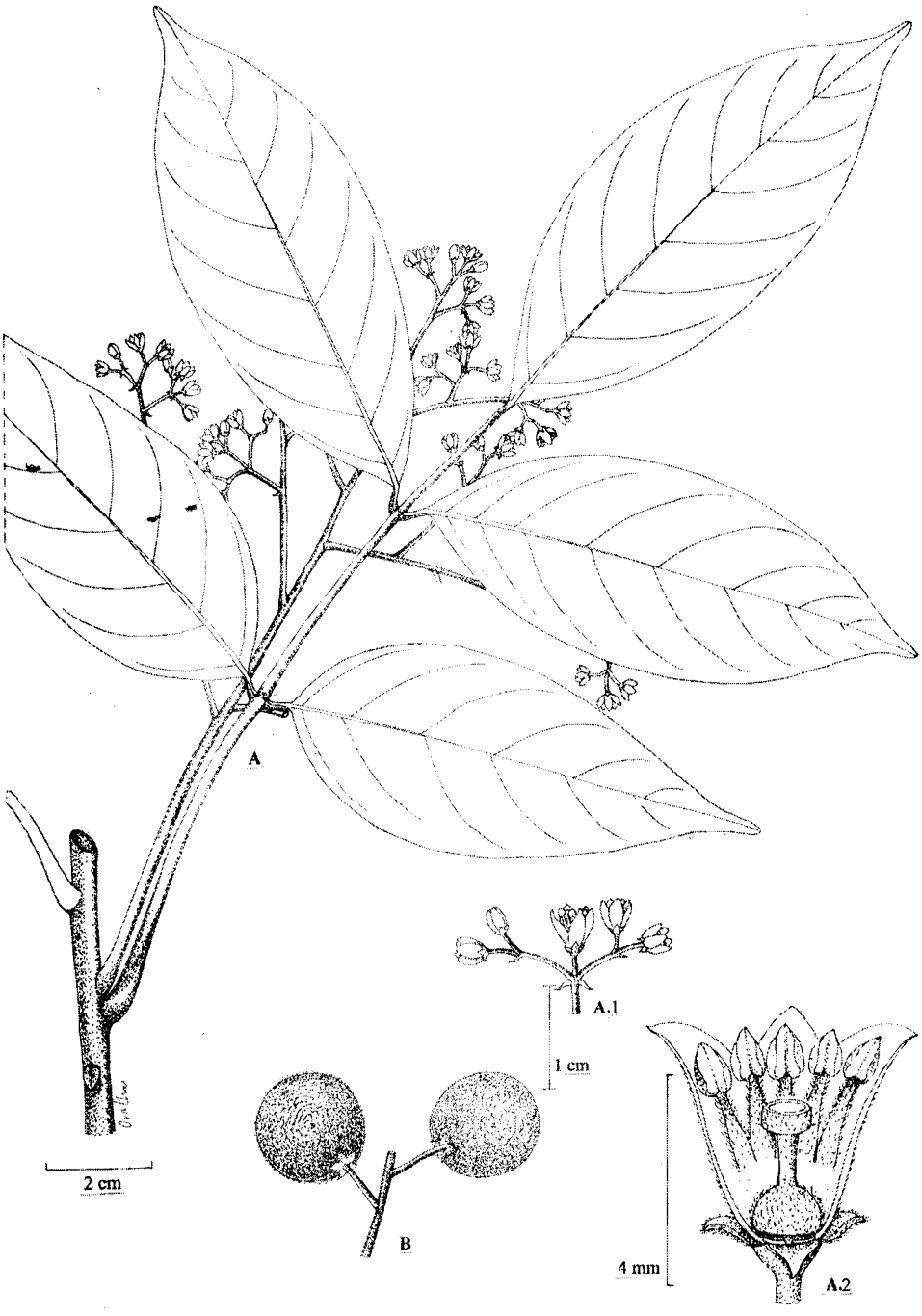

Fig. 101. *Walsura robusta* Roxb.: A. twig with inflorescence, A.1 part of inflorescence, A.2 longitudinal part of flower (S. Phusomsaeng 79); B. part of infructescence (C. Phengklai 1041).

2. Walsura robusta Roxb., Fl. Ind., ed. Carey, 2: 386. 1832; Hiern in Hook.f., Fl. Brit. India 1: 565. 1875; Kurz, Forest Fl. Brit. Burma 1: 223. 1877; Brandis, Indian Trees: 137. 1906; Lecomte in Fl. Indo – Chine: 785. 1911; Schmidt, Fl., Koh Chang : 405. 1916, Craib, Fl. Siam Enum.: 262. 1926; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 47. 1995.

Trees 8-20 m high, 60-140 cm girth; terminal buds slender, 2-3 cm long; twigs pubescent then glabrescent, sparsely to densely yellowish or reddish lenticels. Outer bark brown, rather smooth to flaking; inner bark pink to reddish, fibrous; sapwood white to yellowish, heartwood brown. *Leaves* imparipinnate, 10-25 cm long; *Leaflets* 3-5-7, opposite, except the apical one; oblong, elliptic–oblong or lanceolate, 5.5-13 by 2.5-5 cm, subcoriaceous; glossy green upside, pale and densely white round spots beneath, glabrous; apex caudate, acuminate or acute; base eauneate, broadly cuneate, to obtuse and equal sides; margin entire or undulate; midrib finely prominent beneath, flat to subdepressed upside; secondary nerves 5-8 pairs, arched and ± anastomosing; all pinkish when dry; reticulate veins hardly distinct with naked eyes. *Petiole* 3-5.5 cm long, petiolule 0.5-3.5 cm, usually geniculate with midrib, all with white indumentum, dark brown when dry. *Inflorescence* a thyrse compound, axillary near end of twigs, 8-15 cm long, pedicels 2-3 mm long, few branchlets, densely and shortly tomentose; bracts and bracteoles triangular, ca. 1.5 by 1 mm, hairy, caducous. *Flowers* bisexual or male separate. *Calyx* 5, broadly campanulate, all ±1.5 by 2 mm long, lobes triangular, ca. 2/3 of all length, pubescent outside, glabrous inside. *Corolla* 5, free, broadly campanulate, 3-4 by 1-1.5 mm long, lobes imbricate, pubescent outside, greenish, white or yellowish. *Staminal tube* campanulate ca. 3 mm long, hairy inside on the upper half. *Stamens* 10, opposite the lobe of marginal tube; filaments hairy and attached with the tube inside. *Disk* annular–liked. *Ovary* broadly ovoid, hirsute, ca. 1.5 mm, 2 loculi, each locule with 2 ovules; style tubular, ca. 1.5 mm pubescent; stigma dilate, flat top, pubescent. *Infructescence* as inflorescence. *Drupes* globose, 1-1.5 cm diam., yellowish; tomentose, not dehiscent; fruiting calyx persisted, with accressent from flower. *Seed* 1, globose or ellipsoid, enclosed with fleshy white and sweet aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Lampang, Uttaradit, Phitsanulok, Nakhon Sawan; NORTH-EASTERN: Loei, Udon Thani, Nong Khai, Nakhon Phanom, Khon Kaen; EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Uthai Thani, Ratchaburi, Prachuap Khiri Khan;CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Prachin Buri, Chon Buri, Chanthaburi, Trat; PENINSULAR: Chumphon, Ranong, Surat Thani, Krabi, Nakhon Si Thammarat, Trang, Satun.

D i s t r i b u t i o n. —India, Bangladesh, Burma (Type), China, Laos, Vietnam, Malaysia.

E c o l o g y.—In evergreen or mixed deciduous forest, on granite bedrock, preferred nearby stream; altitude (30-)100-400(800) m.

V e r n a c u l a r.—Khee ai (ขี้อ้าย) (Northern), Daeng dong (แดงดง) (Northeastern).

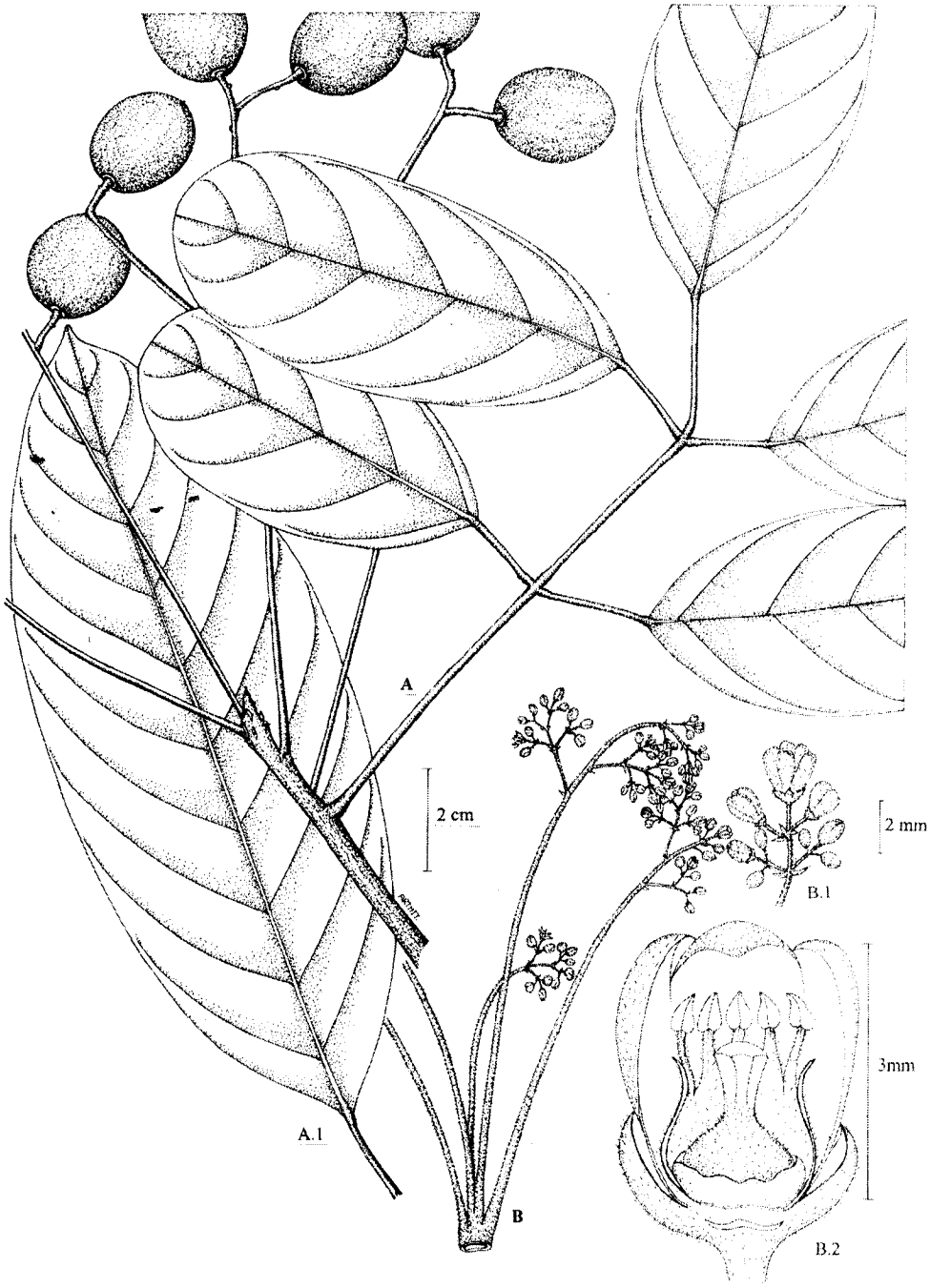

Fig. 102. *Walsura trichostemon* Miq.: A. twig with infructescence, A.1 top most leaflet (Th. Wongprasert 077-15); B. inflorescences, B.1 part of inflorescence, B.2 longitudinal section of flower (P. Suvanakoses 1875).

3. Walsura trichostemon Miq., Ann. Mus. Bot. Lugduno-Batavi 4: 60. 1868;—*Walsura villosa* (non Wall.) Kurz, in J. Asiat. Soc. Bengal 39. 2 : 72. 1870.

Trees 7-20 m high, 60-140 cm girth; twigs pubescent to glabrescent, many oblong lenticels. Outer bark scaly brown, flaking, thick and longitudinal groove; inner bark dark red with white stripe interval, fibrous; sapwood white; heartwood brown to dark brown. *Leaves* imparipinnate, 5-10(-17) cm long; leaflets (3-)5(-7), opposite, except the terminal one; elliptic–oblong, slightly obovate, rarely oblong, 4-23 by 2.5-9.5 cm, coriaceous, rarely chartaceous, glossy green upside, glaucous or whitish beneath, young leaves brick colour upside and pale beneath; apex round, obtuse, acute rarely acuminate or minutely acuminate; base slightly acute to obtuse, usually equal sides; margin entire; midrib and secondary nerves prominent beneath, sparsely depressed upside; secondary nerves 6-10 pairs, arched and more or less anastomosing near margin; other nerves hardly distinct with naked eyes. *Petiole* 2-11 cm, pubescent, swollen at base and base of petiolule, alway geniculate; petiolules 0.5-3.5 cm, geniculate with rachis. *Inflorescence* a thyrse compound, axillary near end of twigs, 6-20 cm long, densely or sparsely pubescent and tomentose; pedicels 1-3 mm densely pubescent; bracts and bracteoles narrowly triangular ca. 2 by 1 mm, hairy, caducous. *Flowers* bisexual or male separate. *Calyx* 5, broadly campanulate, all-1.5 mm long, lobe divided, ca. 1/2 of all length, tomentose outside, glabrous inside. *Corolla* 5, free, imbricated, broadly campanulate, lobes obovate–oblong 3-3.5 by 1-1.5 mm, white or yellowish white, pubescent outside, glabrous inside except near base inside. *Staminal tube* broadly urceolate, ± 3 mm by 2-2.5 mm, hairy on both sides. *Stamens* 10, opposite the lobes of marginal tube; filaments hairy and longer than the marginal tube. *Disk* annular, undulate, glabrous. *Ovary* ovoid or funnelform, ca. 1 by 1.5 mm, hairy, 2 loculi, each locule with 2 ovules; style with 6 longitudinal angles, ca. 0.5 mm long, glabrous; stigma dilate, curved and glabrous. *Infructescence* doubled to tripled the length of inflorescence; *Drupes* globose or ovoid, greyish green, yellowish green, to yellow, densely hairs or indumentum, 2-3 by 1.5-3 cm, indehiscent; fruiting- calyx not accressent, persisted. *Seed* 1, ca. 1.3 by 1 cm, minutely depressed along longitudinal sides, enclosed with fleshy white or yellowish sweet aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai, Lampang, Phrae, Uttaradit, Tak, Phichit; NORTH-EASTERN: Phetchabun, Loei, Sakon Nakhon, Nakhon Phanom, Khon Kaen; EASTERN: Chaiyaphum, Nakhon Ratchasima, Surin, Si Sa Ket, Ubon Ratchathani; SOUTH-WESTERN: Uthai Thani; CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN : Prachin Buri; PENINSULAR :Ranong, Krabi, Nakhon Si Thammarat, Trang, Yala, Narathiwat.

D i s t r i b u t i o n. —Burma (Type).

E c o l o g y.—On granite, sandstone or limestone bedrock, in mixed deciduos or evergreen forest; altitude (40-)100-500(840) m.

V e r n a c u l a r.—Kat lin (กัดลิ้น), Lam yai pa (ลำไยป่า) (Northern).

Fig. 103. *Walsura villosa* Wall. ex Hiern: A. twig with infructescence, A.1 longitudinal section of capsule (Th. Wongprasert 964-4); B. part of inflorescence, B.1 longitudinal section of flower (J.F. Maxwell 89-216).

4. Walsura villosa Wall. ex Hiern, Fl. Brit. Ind. Wall. Cat. n. 1264; Wight & Arn. Prod.: 120

Trees (4-)6-20(-32) m high, 50-140 cm girth; terminal buds slender, 1-2 cm long, hairy; twigs sparsely pubescent then glabrescent, with sparsely brown lenticels; outer bark brown or grey, smooth or flaking or peeling; inner bark ca. 0.5 cm thick, pink or reddish; sapwood whitish; heartwood brownish. *Leaves* imparipinnate, 15-30 cm long, pubescent; leaflets 5-7(-9), opposite, except the apical one; oblong, ovate–oblong, 15-30 by 4-12 cm, coriaceous or subcoriaceous; pubescent then glabrescent, except along midrib and nerves upside, dull dark green upside, greenish beneath; apex broadly acute, rarely acuminate or obtuse; base obtuse, slightly cuneate, rarely slightly oblique; margin entire or undulate; midrib and secondary nerves prominent beneath, pinkish to dark red when dry, slightly depressed upside; secondary nerves 7-12 pairs, arched and more or less anastomosing; scalariform veins conspicuous beneath. *Petiole* 5-8 cm long, petiolules 0.5-1.5-4 cm long, densely pubescent. *Inflorescence* a thyrse compound, axillary or upper leaf scars near end of twigs, 15-20 cm long; pedicels 1-2 mm, villose; bracts and bracteoles triangular, ca. 1.5 by 1 mm, hairy, caducous. *Flowers* bisexual or male separate. *Calyx* 5, broadly campanulate, all 1.5 by 0.5 mm, lobe divided ca. 2/3 of all length, villose outside, glabrous inside. *Corolla* 5, free, broadly campanulate, lobe oblong, imbricated 3-4 by 1 mm, pubescent outside, white or yellowish. *Staminal tube* campanulate ca. 2 by 1 mm, hairy on the upper half both sides. *Stamens* 10, opposite the lobes of marginal tube; filaments hairy and attached with the tube inside. *Disk* annular–liked, support the ovary. *Ovary* depressed, plate–liked, 0.5-1 mm, glabrous; stigma obconical, 0.5-1 mm long, glabrous, stigma dilate, depressed upside, glabrous. *Infructescence* as inflorescence. *Drupes* strongly ellipsoid, 2-3 by 1-1.5 cm, densely tomentose to velutinous, indehiscent; fruiting-calyx, not accressent, persisted. *Seed* 1, pyriform-liked to ellipsoid, ca. 1.5 by 0.8 cm, enclosed with white and sweet aril.

T h a i l a n d.—NORTHERN: Chiang Mai, Chiang Rai; NORTH-EASTERN: Nakhon Phanom; EASTERN: Nakhon Ratchasima, Ubon Ratchathani; SOUTH-WESTERN: Uthai Thani, Prachuap Khiri Khan; CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Chon Buri, Chanthaburi, Trat; PENINSULAR: Phatthalung, Trang, Narathiwat.

D i s t r i b u t i o n. —Burma (Type), China, Laos, Vietnam, Cambodia, Malaysia, Indonesia, Philippines.

E c o l o g y.—From hill evergreen to dry evergreen or deciduous forest, on granite or limestone bedrock, preferred nearby stream; altitude (5-)100-600(-2,500) m.

V e r n a c u l a r.—Khee ai dong (ขี้อ้ายดง) (Northern).

18. XYLOCARPUS

Xylocarpus K.D. Koenig, Naturf. orscher 20: 2. 1784; Harms in Engl. & Prantl, Nat. Pflanzenfam., ed 2, 19 b 1: 81. 1940; T.D. Penn., Blumea 22: 525. 1975; Mabb., Malaysian Forester 45: 448. 1982; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 371. 1995

Trees, dioecious or polygamo-dioecious, pubescent to glabrous. *Leaves* spirally arranged, paripinnate, leaflets opposite. *Inflorescence* a thyrse compound, axillary, near end of twigs. *Calyx* 4, valvate. *Petals* 4, free, ovoid in budding. *Staminal tube*, ovoid, with dentate-liked lobes at margin. *Stamens* attached the staminal tube, with 8 free anthers, at same level with the tube. *Disk* cushion-shaped, beneath or enclosed and united with ovary. *Ovary* 4(-5) loculi, each locule with 3-4 ovules. *Capsules* large spherical shape, tardily dehiscent. *Seed* irregularly pyramidal-liked shape, without aril.

KEY TO THE SPECIES
(based on flowering and leaf specimens)

1. Leaflets ovate, broadly obtuse to cordate base. Inflorescence 10-18 cm long, pedicels not swollen near calyx. Staminal tube entire margin. Trees on rocks **3. X. rumphii**
1. Leaflets elliptic, elliptic-oblong, obovate or obovate-oblong. Staminal tube serrate or undulate margin.Trees of mangrove swamps
   2. Leaflets elliptic or elliptic-oblong, chartaceous. Inflorescence 5-15 cm long; petals glabrous. Root with pneumatophores **2. X. moluccensis**
   2. Leaflets obovate or obovate-oblong, coriaceous or sub-coriaceous. Inflorescence 5-10 cm long; petals with glandular hairs outer part. Roots with buttresses **1. X. granatum**

KEY TO THE SPECIES
(based on fruiting and leaf specimens)

1. Fruits globose or round; bark woody, 5 mm or more thick
   2. Fruits with 10-14 cm diam., slightly 4- longitudinal lobes **1. X. granatum**
   2. Fruits with 7-7.5 cm diam., conspicuous 4- longitudinal lobes, dehiscing in 4-parts when dry **3. X. rumphii**
1. Fruits obovoid, 7-10 cm diam.; bark ± 4 mm. thick, slightly 4- longitudinal lobes. Seeds irregular shape **2. X. moluccensis**

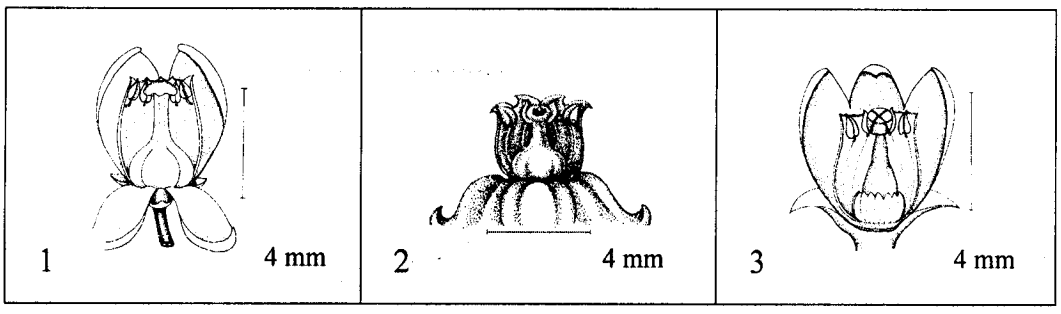

Fig. 104. Longitudinal section of flower in Genus *Xylocarpus*: 1) *Xylocarpus granatum*; 2) *X. moluccensis*; 3) *X. rumphii*.

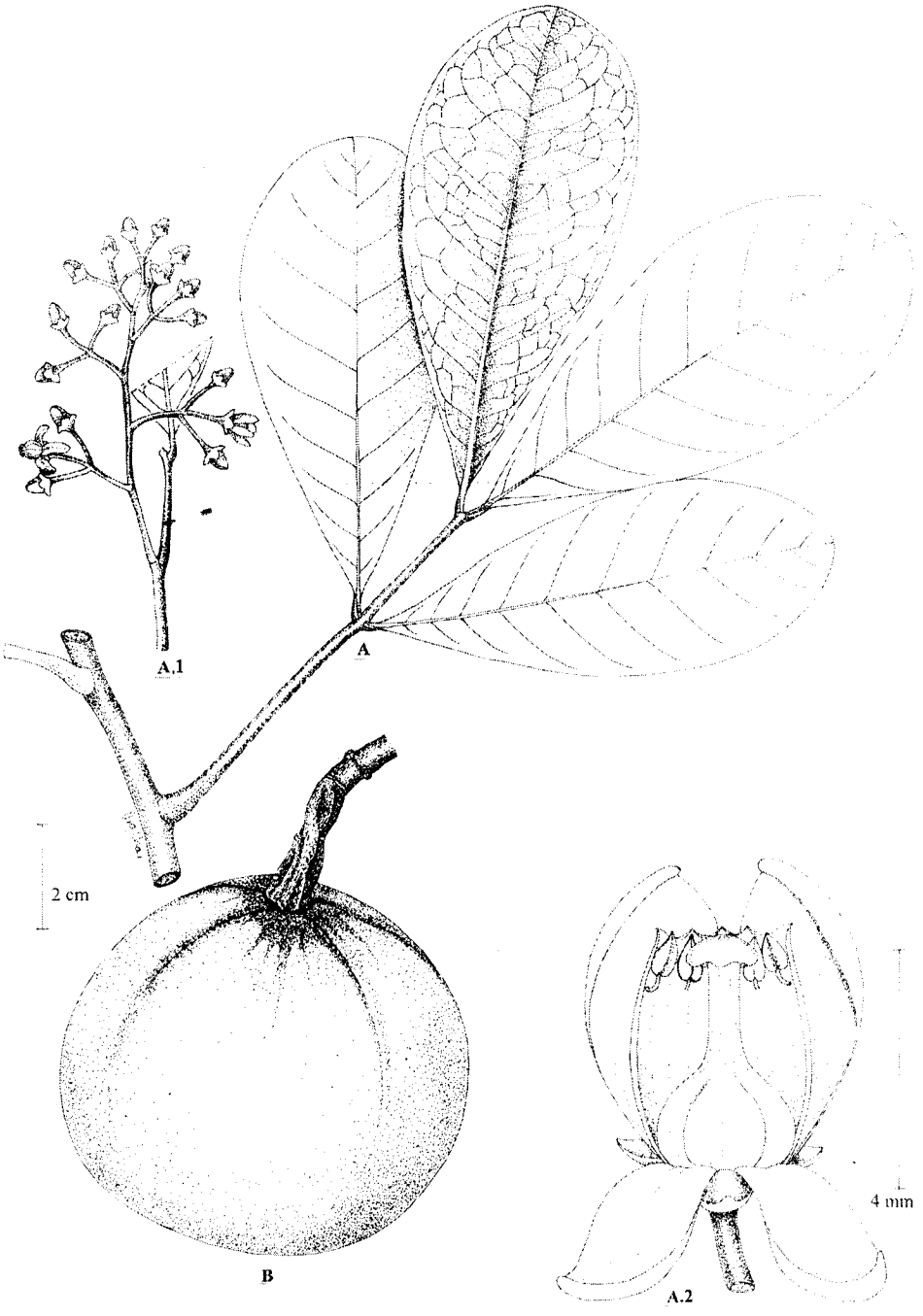

Fig. 105. *Xylocarpus granatum* Koenig: A. twig, A.1 part of inflorescence, A.2 flower (Th. Wongprasert 078-54); B. drupe (N. Fukuoka T-35700).

1. Xylocarpus granatum Koenig, Naturf. 20:2. 1784; Backer & Bakh.f., Fl. Java 2: 118. 1965; Mabb., Malaysian Forester 45:450. 1982; Mabb. in Tree Fl. Malaya 4:260,f. 12B. 1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1):378. 1995.—*Carapa granatum* (Koenig) Alston in Trim., Handb. Fl. Ceylon 6:45. 1931; Corner, Wayside Trees Mal. 1:458. 1940.—*Carapa moluccensis* (non Lam.) DC., Prodr. 1:626. 1824; Hiern in Hook.f., Fl. Brit. India 1:567. 1875; Ridl., Fl. Malay Penins. 1:414. 1922.—*Carapa obovata* Blume, Bijdr. 179. 1825; Ridl., Fl. Malay Penins. 1;414. 1922.—*Xylocarpus obovatus* (Blume) A. Juss., Mem Mus. Natl. Hist. Nat. Paris 19: 244. 1832

Trees 5-15(-20) m high, 40-100 cm girth; buttresses spreading out from base; twigs dark red, glabrous, sparsely with round lenticels, more or less coated with oil; outer bark thin, smooth, scaly as irregular flakes, pale brown; inner reddish or pink. *Leaves* paripinnate, spirally arranged, 3-7 cm long, rachis coated with oil; leaflets 2-(3) pairs, opposite, obovate or obovate–oblong, 8-10 by 3-4.5 cm, coriaceous to subcoriaceous, glossy green upside, pellucid dots beneath; apex obtuse or round, then slightly narrowed to the base; base cuneate or acute; margin entire to recurved; midrib prominent beneath, flat to subdepressed upside; secondary nerves hardly distinct upside and loosely distinct beneath with 7-10 pairs, then anastomosing near margin; reticulate veins subconspicuous beneath, hardly distinct upside. *Petiole* 3-4 cm long, petiolules 3-5 cm long, glabrous. *Inflorescence* a thyrse compound, 3-6 cm long, on twigs, bracts and bracteoles ca. 0.5 mm, caducous; pedicels 6-10 mm long, purplish brown, glabrous. *Calyx* 4, all 1.5-2.5 mm long, campanulate, limb purple; lobes 1/2–2/3 of all length, broadly ovate, oily coat. *Corolla* 4, free, ovate-oblong, 4-7 by 2-3 mm, white, yellowish or pinkish, greenish orange at base inside, glandular to glabrous outside, glabrous inside. *Staminal tube* broadly tubular, up to 4 by 3 mm, glabrous, serrate margin. *Stamens* 8, anther opposite the lobes, filaments mostly adnate the tube inside. *Disk* cushion–shaped, beneath or enclosed with ovary. *Ovary* broadly ovoid, ca. 2 by 2 mm, 4 loculi, each locule with 3-4 ovules; style tubular, ca. 2 mm long, greenish, glabrous, stigma dilate, round apex. *Infructescence* up to 15 cm long, pendulous. *Capsule*, globose or round, 10-14 cm diam., yelllowish brown or reddish brown, woody, longitudinally dehiscent. *Seeds* irrigular shape, 8-16(-20) seeds, 4-6 cm long, without aril.

T h a i l a n d.—SOUTH-WESTERN : Prachuap Khiri Khan; CENTRAL : Samut Prakan, Samut, Songkhram, Samut Sakhon; SOUTH-EASTERN : Chon Buri, Rayong, Trat; PENINSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Krabi, Trang, Satun, Songkhla.

D i s t r i b u t i o n.—East Africa (Type), Madagascar, India, Burma, China, Indochina, Malaysia, Singapore, Indonesia, Brunei, Philippines, Japan, Australia.

V e r n a c u l a r.—Taboon khao (ตะบูนขาว) (General).

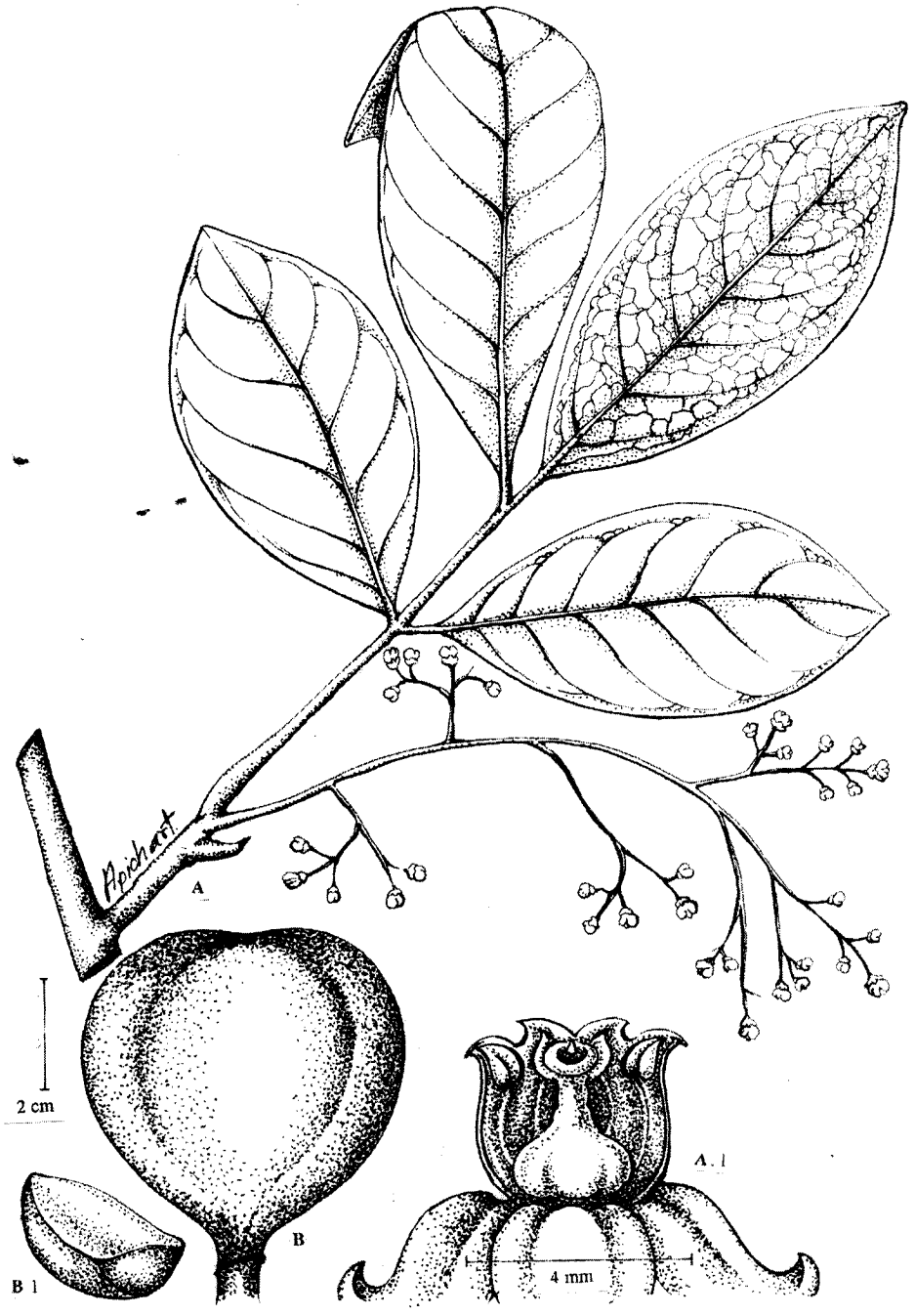

Fig. 106. *Xylocarpus moluccensis* (Lam.) M. Roem.: A. twig with inflorescence, A.1 longitudinal section of flower (Th. Wongprasert 075-5); B. drupe, B.1 seed (K. Iwatsuki 27778).

2. Xylocarpus moluccensis (Lam.) M. Roem., Fam. Nat. Syn. Monogr. 1: 124. 1846; Craib, Fl. Siam Enum. 1: 265. 1926; Backer & Bakh.f., Fl. Java 2: 118. 1965; Mabb., Malaysian Forester 45: 450. 1982; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 376. 1995.—*Carapa moluccensis* Lam., Encycl. Méth. 1: 621. 1785.—*Xylocarpus mekongensis* Pierre, Fl. Forest Cochinch. 5: t. 359 B. 1897.

Tree 6-10 m high, 60-100 cm girth, with numerous pneumatophores; twigs pale brown, glabrous, sparsely with round lenticels; outer bark rough with longitudinal fissures, oblong flakes. Inner bark reddish or pinkish. *Leaves* paripinnate, spirally arranged, 4-12 cm long; leaflets (1-)2-3(-4) pairs, opposite, elliptic or elliptic-oblong, 6.5-16 by 3-7 cm; chartaceous to subcoriaceous, glossy green upside, pale beneath, glabrous; apex acute or broadly-acute; base obtuse, broadly acute to slightly oblique; margin entire or undulate; midrib slightly prominent beneath, flat to subdepressed upside; secondary nerves 5-9 pairs, arched and anastomosing well away from the margin; reticulate veins conspicuous or hardly distinct beneath. *Petiole* 4-7 cm long, glabrous, petiolules, ca. 0.5 cm long, glabrous, pink to dark red when dry. *Inflorescence* a thyrse compound, 5-15 cm long, at end of twigs or axillary near end of twigs, pendulous and glabrous, bracts and bracteoles, ca. 0.5 mm, persisted, pedicels 3-8 mm long. *Calyx* 4, 1.5-2 mm long, campanulate, lobes ca. 2/3 of all length, ovate, glabrous on both sides. *Corolla* 4, free, oblong to obovate, 3-4 by 1.5-2 mm, creamy white to white, glabrous. *Staminal tube* cupuliform, ca. 2 by 2 mm, glabrous, serrate at margin. *Stamens* 8, anthers opposite the lobe, filaments mostly adnate the tube inside. *Disk* cushion-shaped, beneath or enclosed with ovary. *Ovary* broadly ovoid, ca. 2 by 2 mm, 4 loculi, each locule with 3-4 ovules, style tubular, ca. 1 mm long, greenish, glabrous, stigma dilate and apical apex. *Infructescence* up to 20 cm long, pendulous. *Capsule*, obovoid, slightly 4-lobes, 6-7 by 7-10 cm, yellowish brown, woody, longitudinaly dehiscent. *Seeds* 5-10, irregular shape, 4-6.5 cm long, without aril.

T h a i l a n d.—CENTRAL: Samut Prakan; SOUTH-EASTERN: Chanthaburi, Trat; PENINSULAR: Chumphon, Ranong, Phangnga, Trang, Satun.

D i s t r i b u t i o n.—India, Burma, Laos, Cambodia, Vietnam, Malaysia (Type), Indonesia, Philippines, Australia, Somalia.

V e r n a c u l a r.—Taboon dam (ตะบูนดำ) (General) Taban (ตะบัน) (Peninsular).

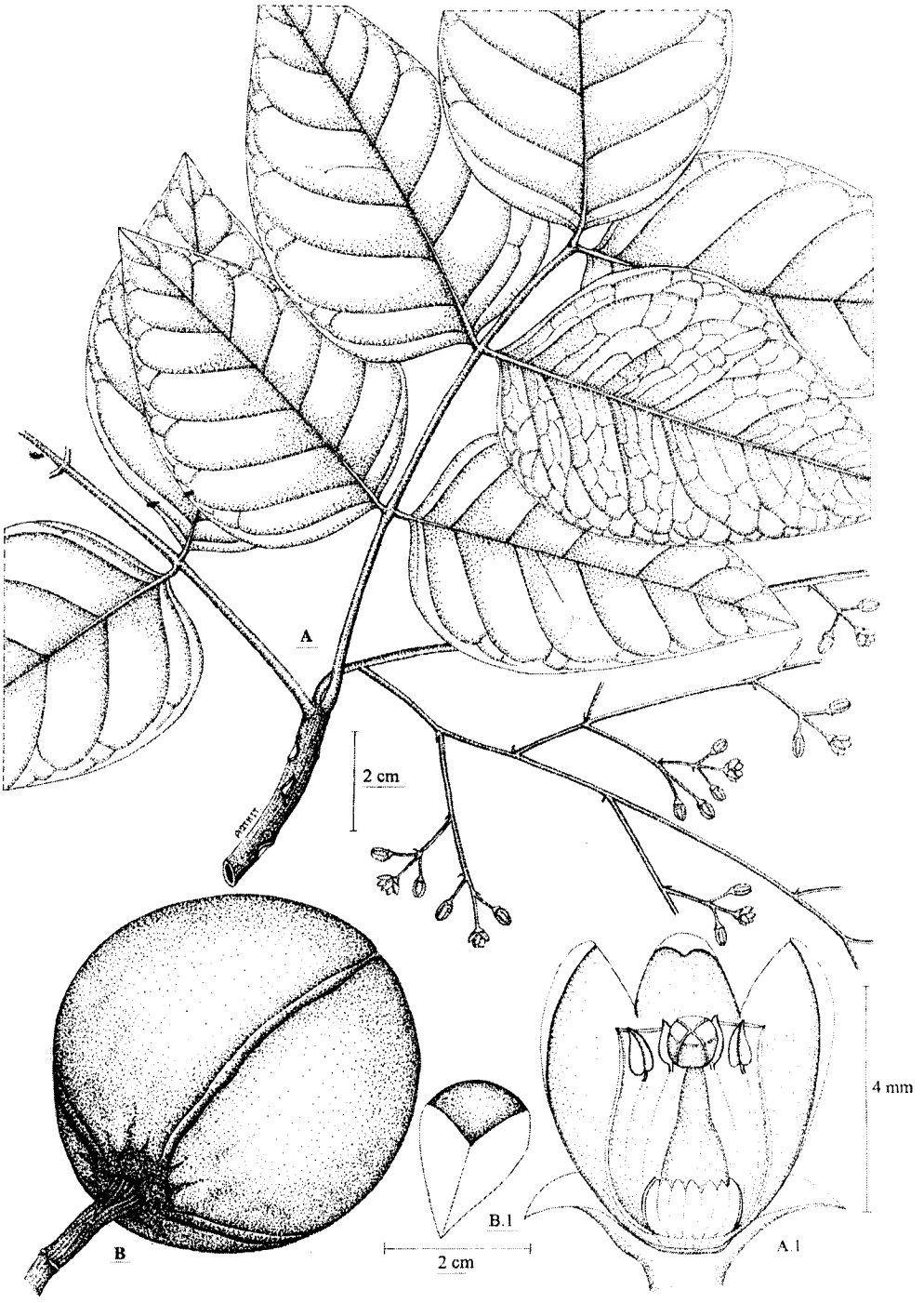

Fig. 107. *Xylocarpus rumphii* (Kostel) Mabb.: A. twig with inflorescence, A.1 longitudinal section of flower (C. Niyomdham 1954); B. capsule, B.1 seed (Th. Wongprasert 994-8).

3. Xylocarpus rumphii (Kostel.)Mabb., Malaysian Forester 45: 450. 1982; Mabb. in Tree Fl. Malaya 4: 260, f. 12 A..1989; Mabb. & Pannell, Fl. Males. ser. I, 12(1): 375. 1995.—*Carapa rumphii* Kostel., Allg. Med. Pharm. Fl. 5: 1988. 1836.—*Carapa moluccensis* (non Lam.) DC., Prodr. 1: 626. 1824; Hiern in Hook.f., Fl. Brit. India 1: 567. 1875.—*Aglaia zollingeri* C. DC., Bull. Herb. Boissier 2: 579. 1894; Backer & Bakh.f., Fl. Java 2: 127. 1965.

Trees 5-10 m high, 50-150 cm girth; terminal bud ovoid, ca. 5 by 3 mm, oily coat, buttressed; twigs grey-brown, sparsely with brown lenticels; outer bark greenish brown, scaly; inner bark pinkish purple, fibrous; sapwood brownish. *Leaves* paripinnate, spirally arranged, 5-16 cm long; leaflets 1-4 pairs, opposite, rarely subalternate, ovate 6-13 by 4-7 cm, subcoriaceous or chartaceous, glabrous, glossy green upside, pale beneath, sparsely black pellucid dots both sides; apex acuminate to acute; base broadly obtuse to cordate; margin entire or minutely undulate and recurved. Midrib subprominent beneath, flat or subdepressd upside; secondary nerves rather faintly 6-8 pairs, distinct beneath, conspicuous upside, joined in outline. *Petiole* 2.5-6 cm long, glabrous, dark brown when dry, petiolules 2-4 mm long also blackish when dry. *Inflorescence* a thyrse compound, 10-18 cm long, axillary near end of twigs, bracts and bracteoles ca. 1 by 1 mm, pubescent outside, caducous; pedicels 2-2.5 mm long, pubescent then glabrescent. *Calyx* 4, all ca. 2 mm long, campanulate, lobe ca. 1/2 of all length, broadly ovate, pubescent outside, glabrous inside. *Corolla* 4, free, oblong, ca. 5 by 2 mm, white, yellowish green to yellow, scented, sparsely hairs outside, glabrous inside. *Staminal tube* urceolate, ca. 3 by 2 mm, red, glabrous, margin entire. *Stamens* 8, filaments mostly adnate the tube inside. *Disk* cotyliform, enclosed ovary, with 16 longitudinal lobes. *Ovary* slightly ovate, ca. 2 by 1 mm, glabrous, 4 loculi, each locule with 3-4 ovules; style slightly tubular ca. 1 mm long, glabrous, stigma dilate, round, flat top. *Infructescence* up to 20 cm long, pendulous, usually one capsule remained. *Capsule* globose, with slightly 4 angulars, 5.5-7 by 7-7.5 cm, woody, usually dehiscing into 4 parts. *Seeds* 6, irrigular in prism-shaped or obpyriform; 3.5-5 by 3.5-5 cm.

T h a i l a n d.—SOUTH-EASTERN: Chon Buri, Rayong, Trat; PENINSULAR: Ranong, Phangnga, Krabi, Satun.

D i s t r i b u t i o n.—East Africa, Madagascar, India (Type), Laos, Cambodia, Vietnam, Malaysia, Philippines Australia, Fiji, Tonga.

E c o l o g y.—On rocky and sandy seashore along beach.

V e r n a c u l a r.—Taban (ตะบัน) (General).

MELIACEAE
CODE GENERA & SPECIES NUMBERS

1. AGLAIA Lour.

1.1 *A. argentea* Blume
1.2 *A. chittagonga* Miq.
1.3 *A. crassinervia* Kurz ex Hiern
1.4 *A. cucullata* (Roxb.) Pellegr.
1.5 *A. edulis* (Roxb.) Wall.
1.6 *A. elaeagnoidea* (A.Juss.) Benth.
1.7 *A. elliptica* Blume
1.8 *A. erythrosperma* Pannell
1.9 *A. eximia* Miq.
1.10 *A. exstipulata* (Griff.) Theob.
1.11 *A. forbesii* King
1.12 *A. grandis* Korth. ex Miq.
1.13 *A. korthalsii* Miq.
1.14 *A. lawii* (Wight.) Sald. ex Raman
1.15 *A. leptantha* Miq.
1.16 *A. leucophylla* King
1.17 *A. macrocarpa* (Miq.) Pannell
1.18 *A. odorata* Lour.
1.19 *A. odoratissima* Blume
1.20 *A. oligophylla* Miq.
1.21 *A. pachyphylla* Miq.
1.22 *A. palembanica* Miq.
1.23 *A. perviridis* Miq.
1.24 *A. rubiginosa* (Hiern) Pannell
1.25 *A. rufinervis* (Blume) Bentv.
1.26 *A. sexipetala* Griff.
1.27 *A. silvestris* (Roemer) Merr.
1.28 *A. simplicifolia* (Bedd.) Harms
1.29 *A. spectabilis* (Miq.) Jain & Bennet
1.30 *A. tenuicaulis* Hiern
1.31 *A. teysmanniana* (Miq.) Miq.
1.32 *A. tomentosa* Teijsm. & Binn.

2. APHANAMIXIS Blume

2.1 *A. polystachya* (Wall.) R. Parker
2.2 *A. sumatrana* (Miq.) Ridl.

3. AZADIRACHTA A. Juss.

3.1 *A. excelsa* (Jack) Jacobs
3.2.1 *A. indica* A. Juss. var. *indica*
3.2.2 *A. indica* A. Juss. var. *siamensis* Valeton

4. CHISOCHETON Blume

4.1 *C. amabilis* (Miq.) C. DC.
4.2 *C. ceramicus* (Miq.) C. DC.
4.3 *C. cumingianus* (C. DC.) Harm subsp. *balansae* (C. DC.) Mabb.
4.4 *C. dysoxylifolius* (Kurz) Hiern
4.5 *C. grandiflorus* (Kurz) Hiern
4.6 *C. macrophyllus* King subsp. *fulvescens* Mabb.
4.7 *C. patens* Blume
4.8 *C. penduliflorus* Planch. ex Hiern
4.9.1 *C. pentandrus* (Blanco) Merr.
4.9.2 *C. pentandrus* (Blanco) Merr. subsp. *paucijugus* (Miq.) Mabb.
4.10 *C. tomentosus* (Roxb.) Mabb.

5. CHUKRASIA A. Juss.

5.1.1 *C. tabularis* A. Juss. var. *tabularis*
5.1.2 *C. tabularis* A. Juss. var. *velutina* (M. Roem.) Phengklai

6. CIPADESSA Blume

6.1 *C. baccifera* (Roth.) Miq.

7. DYSOXYLUM Blume

7.1 *D. acutangulum* Miq.
7.2 *D. alliaceum* (Blume) Blume
7.3 *D. angustifolia* King
7.4 *D. arborescens* (Blume) Miq.
7.5 *D. cauliflorum* Hiern
7.6 *D. cyrtobotryum* Miq.
7.7 *D. densiflorum* (Blume) Miq.
7.8 *D. excelsum* Blume
7.9 *D. flavescens* Hiern
7.10 *D. grande* Hiern
7.11 *D. lenticellatum* Wu
7.12 *D. macrocarpum* Blume
7.13 *D. mollissimum* Blume
7.14 *D. papillosum* King
7.15 *D. rubrocostatum* Pierre

8. HEYNEA Roxb. ex Sims.

8.1 *H. trijuga* Roxb. ex Sims.

9. LANSIUM Rumph.

9.1 *L. domesticum* Corrêa

10. MELIA L.

10.1 *M. azedarach* L.

11. MUNRONIA Wight

11.1 *M. humilis* (Blanco) Harms.
11.2 *M. pinnata* (Wall.) Theob.

12. PSEUDOCLAUSENA T.P. Clark

12.1 *P. chrysogyne* (Miq.) T.P. Clark

13. SANDORICUM Rumph.

13.1 *S. beccarianum* Baill.
13.2 *S. koetjape* (Burm.f.) Merr.

14. SWIETENIA Jacq.

14.1 *S. macrophylla* King
14.2 *S. mahagoni* (L.) Jacq.

15. TOONA (Endl.) M. Roem.

15.1 *T. ciliata* M. Roem.
15.2 *T. sinensis* (A. Juss.) M. Roem.
15.3 *T. sureni* (Blume) Merr.

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17. WALSURA Roxb.

17.1 *W. pinnata* Hassk.
17.2 *W. robusta* Roxb.
17.3 *W. trichostemon* Miq.
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Kerdthong K. 13 : 4.6 (BKF).

Kerr A.F.G. 542 : 8.2.2 (K); 591 : 8.1 (BM, K); 713 : 2.1 (K); 1023 : 17.3 (BM, K); 1034 : 10.1 (BM, K); 1451 : 2.1 (K); 1762 : 8.1 (BM, K); 1841 : 17.4 (BM, K); 2032 : 6.1 (BM); 2123 : 1.29 (BM, K); 2124 : 1.6 (BM, C, K); 2346 : 16.1 (BM, K); 2369 : 1.28 (BM, K); 2373 : 1.2 (BM, C, K); 2417 : 1.14 (BM, C, K); 2478 : 17.4 (BM, K); 2894 : 7.6 (BM, C); 2922 : 4.3 (BM, C, K); 3001 : 1.18 (BM, K); 3173 : 5.2 (BM, K); 3200 : 15.1 (BM, K); 3241 : 2.1 (K); 3247 : 11.1 (BM, K); 3524 : 2.1 (K); 3569 : 15.1 (BM, K); 3577 : 5.2 (BM, K); 3628 : 1.28 (C, K); 4014 : 3.2.2 (K); 4025 : 18.1 (K); 4041 : 7.8 (BM, C, K); 4285 : 18.1 (BM, K); 4285A. 18.1 (BM, K); 4301 : 14.1 (BK, BM); 4644 : 11.1 (K); 4646 : 11.1 (BK, BM, C, K); 4709 : 15.1 (BK, BM, K); 4771 : 2.1 (BK, K); 4799 : 5.2 (BK, BM, K); 4814 : 17.4 (BK, BM, K); 4959 : 8.1 (BM, K); 5109 : 7.6 (BK, BM); 5112 : 17.4 (BK, BM, K); 5135 : 4.3 (BK, BM); 5250 : 17.4 (BK, K); 5449 : 17.4 (BM, K); 5459 : 11.1 (BK, BM, K); 5469 : 17.4 (BK); 5478 : 6.1 (BK, BM, C, K); 5552 : 6.1 (BK, BM, C, K); 5629 : 7.6 (BM, C); 5637 : 3.2.1 (BK, C, K); 5654 : 3.2.2 (BK, K); 5731 : 17.2 (BK, K); 5813 : 8.1 (BM, K); 5972 : 10.1 (BK, BM, K); 6001 : 16.1 (BK, BM, C, K); 6001-A : 16.1 (BK, BM, C, K); 6007 : 17.2 (BK, K); 6034 : 1.18 (BK, BM, K); 6085 : 8.1 (BK, BM, K); 6171 : 4.3 (BM, C, K); 6251 : 6.1 (BM, C); 6251A : 6.1 (BK, BM, C, K); 6288 : 1.14 (BK, BM, C, K); 6439 : 1.14 (BM); 6457 : 7.5 (BK, BM, C, K); 6468 : 17.2 (BK, K); 6639 : 1.14 (BK, C, K); 6748 : 10.1

(BK, BM, C, K); 6754 : 1.4 (BK, BM, K); 6754A : 1.4 (BK, BM, K); 6783 : 7.8 (BM, C, K); 6793 : 17.1 (BM, K); 6902 : 1.20 (BK, BM, K); 7032 : 1.18 (K); 7400 : 1.32 (BK, BM, K); 7533 : 9.1 (BK, BM, K); 7656 : 1.3 (BK, K); 7702 : 2.1 (BK, C, K); 7800 : 1.32 (C, K); 7809 : 1.7 (BM, C, K); 7845 : 17.1 (K); 7851 : 2.1 (BK, K); 7907 : 1.11 (C, K); 8209 : 1.18 (BM, C, K); 8389 : 17.4 (BK, BM, K); 8488 : 16.1 (BK, BM, C, K); 8520 : 17.2 (BK, C, K); 8552: 17.2 (BK, C, K); 8594 : 17.2 (BK, C, K); 8604 : 1.28 (AAU, BK, BM, C, K, L); 8764 : 17.2 (BK, C, K); 8918 : 18.2 (BK, C, K); 9044 : 2.2 (BK, K); 9148 : 11.1 (BK, BM, K); 9177 : 1.27 (BK, BM, K); 9250 : 18.3 (BK, BM, K); 9250A : 18.3 (BK, BM, K); 9560 : 7.6 (BM, C, K); 9566 : 2.1 (K); 9681 : 1.27 (BK, BM, C, K); 9682 : 7.6 (BM, C, K); 9683 : 1.6 (BK, BM, C, K); 9718 : 5.1 (BK, BM, K); 9801 : 17.4 (BM, K); 9810 : 17.3 (BK); 9818 : 2.1 (BK, C, K); 9866 : 17.1 (BK); 9872 : 1.6 (BM, C, K); 9880 : 1.5 (BK, C, K); 10002 : 10.1 (BK, BM, C, K); 10288 : 1.10 (K); 10341 : 10.1 (BK); 10447 : 17.2 (BK, C, K); 10457 : 1.14 (BK, BM, C); 10487 : 1.19 (BK, BM, C, K); 10557 : 10.1 (BK, BM, K); 10632 : 1.18 (BM, C, K); 10882 : 11.1 (BK, BM, K); 11192 : 7.8 (BM, K); 11202 : 1.12 (BK, BM, C, K); 11202A : 1.12 (BK, BM, C, K); 11503 : 1.7 (BK, BM, K); 11529 : 1.17 (BK, C, K); 11573 : 2.1 (BK, C, K); 11638 : 15.1 (BM); 11639 : 15.1 (BK, C, K); 11648 : 17.2 (BK, C, K); 11743 : 1.19 (BK, BM, C, K); 11764 : 1.30 (BK, BM, C, K); 11832 : 7.6 (BM, C, K); 11950 : 1.20 (BK, BM, K); 12029 : 1.19 (BK, BM, C); 12032 : 1.19 (BK, BM, C); 12082 : 9.1 (BK); 12088 : 1.3 (BK, BM, C, K); 12110 : 1.17 (BK); 12138 : 13.2 (BM, K); 12191 : 7.9 (K); 12328 : 5.1 (BK, BM, K); 12452 : 1.19 (BK, BM, C); 12457 : 9.1 (BK, BM); 12606 : 17.2 (BK, C, K); 12701 : 1.5 (BK, C, K); 12766A : 1.14 (BM, C, K); 12791 : 13.2 (BM, K); 12818 : 18.1 (BM, K); 12915 : 1.19 (BM, K); 12964 : 1.12 (BK, BM, C, K); 12983 : 17.2 (BK, C, K); 13251 : 1.15 (BK, BM, C, K); 13303 : 9.1 (BK, BM); 13304 : 1.1 (BK, BM, C); 13408 : 1.15 (C); 13986 : 13.2 (BM, K); 14181 : 18.3 (BK, BM, K); 14390 : 1.17 (BK); 14463 : 1.10 (BK, BM, C, K); 14478 : 7.8 (BM, K); 14482 : 1.32 (BK, BM, C, K); 14877 : 1.2 (BK, BM, C, K); 14999 : 7.2 (BM); 15049 : 2.1 (K); 15213 : 15.1 (BK, BM, C, K); 15282A : 7.8 (BM, K); 15297 : 1.17 (BM, K); 15453 : 1.6 (BK, BM); 15476 : 1.15 (BK, BM, C, K); 15582 : 7.8 (BM, K); 15583 : 7.8 (K); 15659 : 8.1 (BK, BM, C, K); 15923 : 1.19 (BK, BM, C, K); 16018 : 1.7 (BK); 16053 : 1.7 (BK, C, K); 16063 : 1.5 (BK, C, K); 16139 : 1.18 (BK, BM, C, K); 16400 : 1.4 (BK); 16666 : 8.1 (BK, BM, K); 16689 : 9.1 (BK, BM); 16802 1.7 (BM, K); 16890 : 1.19 (BK, BM, C, K); 16913 : 1.19 (BK, BM, C, K); 17016 : 1.21 (BK, BM, C, K); 17055 : 17.2 (BK, C, K); 17121 : 1.32 (BK, BM, C, K); 17124A : 1.19 (BM); 17126A : 1.19 (BK, C); 17140 : 17.4 (AAU, C, K); 17198 : 7.8 (BM, C, K); 17209 : 1.19 (BK, BM, C, K); 17251 : 9.1 (BK, C); 17313 : 1.14 (BK, BM, C, K); 17534 : 7.8 (C, K); 17632 : 7.6 (BM); 17636 : 17.2 (BK, K); 17730 : 1.18 (BK, BM, K); 17780 : 1.18 (BK, BM, K); 17858 : 1.27 (BK, BM, C, K); 17860 : 1.10 (K); 17864 : 13.2 (BM, C, K); 17890 : 17.2 (BK, C, K); 17943 : 16.1 (BK, BM, K); 17974 : 17.1 (BM, K); 17975 : 5.1 (BK, BM); 17976 : 17.1 (C); 18062 : 15.1 (BK, BM, C, K); 18168 : 8.1 (BK, BM, K); 18212 : 1.9 (BK, BM, K); 18216 : 5.2 (BK, BM, K); 18219 : 1.31 (BK, BM, C, K); 18261 : 9.1 (BK, C); 18428 : 1.30 (BK); 18587 : 18.1 (BK, BM, K); 18590 : 18.1 (BK, BM, K); 18596 : 7.8 (BK, BM, K); 18622 : 1.3 (BK, BM, C, K); 18677 : 15.2 (BM, C, K); 18747 : 1.20 (BK, K); 18751 : 1.19 (BK, BM, C); 18760 : 1.10 (BK, BM, C, K); 18783 : 1.10 (BK); 18854 : 18.3 (BK, BM,

K); 18911 : 1.2 (BK, BM, C, K); 18930 : 18.3 (BK, BM, C, K); 18931 : 1.2 (BK, BM, C, K); 18983 : 1.10 (BK, BM, K); 19209 : 7.8 (BK, BM, K); 19217 : 4.8 (BM, C, K); 19387 : 5.2 (BK, BM, K); 19434 : 7.1 (K); 19506 : 11.1 (BK, BM, C, K); 19631 : 5.2 (BK, BM, C, K); 19897 : 17.4 (BK, BM, K); 20048 : 17.3 (BM, K); 20179 : 15.1 (BM, C, K); 20243 : 17.3 (C, K); 20286 : 5.2 (BK, BM, K); 20296 : 17.2 (BK, K); 21480 : 8.1 (BM, C, K); s.n. : 18.2 (BK); s.n. : 18.2 (BK); s.n. 11.2 (K); s.n. (BKF 4525) 1.18 (BK).

Kertsawang K. 292 : 17.2 (QBG); 391 : 18.3 (QBG); 436 : 3.2.1 (QBG).

Kevie H.M. 5 : 18.2 (C); 6 : 18.1 (C, K).

Kiah 24253 : 17.1 (BM, K): 24278 : 1.19 (BK, BM, C, K); 24317 : 7.5 (BM, K); 24325 : 1.10 (BK, K); 24367 : 1.32 (BK, BM, C, K); 24404 : 1.13 (BK, BM, K).

King R.M. 5455 : 17.3 (C, K); 5505 : 17.3 (C, K); 5534 : 2.1 (C, K).

Kloss C.B. 6701 : 13.2 (K); 6898 : 1.19 (K); 6979 : 1.30 (C, K); s.n. : 1.19 (C).

Kongjun W. 215 : 18.3 (BKF).

Konsan N. 1727 : 10.1 (KKU).

Konta F. 3871 : 3.2.2 (BKF); 3873 : 10.1 (BKF); 4007 : 8.1 (BKF); 4015 : 1.2 (BKF); 4179 : 1.29 (BKF); 4197 : 8.1 (BKF); 4398 : 17.1 (BKF); 4411 : 13.2 (BKF); 4429 : 3.2.2 (BKF); 4754 : 8.1 (BKF); T-49075 : 2.1 (BKF).

Kosterman A. 775 : 1.9 (BK, C, K); 858 : 2.1 (K); 6116 : 1.8 (C); 6670 : 1.8 (C).

Koyama H. et al. T-15389 : 12.1 (BKF); T-15643 : 1.14 (AAU); T-31915 : 7.6 (BKF); T-31947 : 8.1 (BKF); T-33004 : 3.2.2 (BKF); T-33093 : 1.14 (BKF); T-33703 : 1.14 (BKF); T-33786 : 7.2 (BKF); T-33845 : 7.2 (BKF); T-39391 : 1.3 (BKF); T-39491 : 8.1 (BKF); T-39558 : 1.14 (BKF); T-39931 : 6.1 (BKF, AAU); T-40051 : 6.1 (BKF); T-48647 : 6.1 (AAU); T-48909 : 3.2.2 (BKF); T-49033 : 2.1 (BKF); T-50110 : 12.1 (BKF); T-50115 : 12.1 (BKF).

Koyama T. 15278 : 3.2.2 (BKF); 15429 : 17.1 (BKF).

Kunaphat P. s.n. (BKF 654) : 18.1 (BKF).

Lakshanakara M.C. 2 : 3.2.1 (BK); 106 : 1.19 (BK); 313 : 18.1 (K); 314A : 18.1 (K); 561 : 17.2 (BK, K); 643 : 4.2 (BK, BM, K); 683 : 7.8 (K); 805 : 1.7 (BK, BM, C); 928 : 8.1 (BK, BM, K); 997 : 17.3 (BK, BM, K); 1312 : 17.4 (BK, BM); 1313 : 17.4 (BK, K); 1343 : 16.1 (BK, BM, K); s.n. (BK 4413) : 11.1 (BK).

Lambinon J. 78-83 : 17.2 (AAU).

Larsen K. et al. 898 : 1.23 (AAU, BKF, C); 923 : 8.1 (BKF); 1341 : 1.18 (C); 1549 : 18.1 (AAU, BKF); 2198 : 5.2 (AAU, BKF, C, K); 2623 : 4.3 (AAU, C); 2949 : 1.2 (AAU, BKF, C); 3113 : 1.6 (AAU, BKF, C, K); 3304 : 1.6 (AAU, BKF, C); 8010 : 18.1 (C); 8836 : 1.14 (C); 9392 : 7.6 (BKF, C); 10269 : 7.6 (C); 10279 : 17.1 (C); 30676 : 1.32 (BKF); 30755 : 1.32 (AAU, BKF, C, K); 30859 : 7.2 (AAU, BKF); 31131 : 1.7 (AAU, BKF, C, K); 31156 : 1.32 (AAU, BKF, C, K); 32047 : 7.5 (AAU); 32143 : 16.1 (AAU, BKF, K); 32251 : 1.5 (AAU, BKF, C, K); 32263 : 4.7 (BKF, C, K); 32493 : 18.3 (AAU, BKF, K); 32928 : 4.8 (AAU); 32958 : 7.14 (AAU, C, K); 33208 : 9.1 (AAU, BKF); 33241 : 1.9 (BKF); 33295 : 7.6 (AAU, BKF); 33371 : 1.1 (AAU, BKF, K);

33853 : 7.7 (AAU, BKF, C, K); 33858 : 7.6 (AAU, BKF, C); 33970 : 1.6 (BKF); 41217 : 2.1 (AAU, PSU); 41417 : 1.2 (AAU, K); 41424 : 17.1 (BKF); 41488 : 1.9 (AAU); 41524 : 1.9 (AAU); 42120 : 1.16 (AAU, BKF, PSU); 42952 : 1.19 (AAU, BKF); 43081 : 1.6 (AAU, BKF); 43146 : 2.2 (AAU, PSU); 43350 : 1.2 (AAU); 43964 : 1.6 (AAU); 44901 : 7.4 (AAU); 45439 : 1.9 (AAU); 45696 : 7.6 (AAU); 45937 : 1.19 (AAU, BKF; 45961 : 7.2 (AAU); 47312 : 8.1 (AAU).

Luan 5 : 5.1 (BKF).

Malinee et al. s.n. (KKU 1660) : 10.1 (KKU).

Marcan A. 280 : 14.1 (BM); 530 : 2.1 (K); 574 : 13.2 (K); 606 : 1.4 (BM, K); 608 : 13.2 (K); 635 : 17.4 (BM, K); 675 : 18.1 (BM); 854 : 18.2 (BM); 869 : 1.18 (BM); 993 : 1.4 (BM); 1145 : 3.2.1 (BK); 1163 : 10.1 (BM, K); 1367 : 1.18 (K); 1689 : 18.2 (BM); 1760 : 11.1 (BM, K); 2052 : 1.13 (C); 2143 : 3.2.1 (C, K); 2209 : 11.1 (BM, K); 2717 : 11.1 (BM, C, K).

Martin van de Bult 59 : 10.1 (BKF); 548 : 1.14 (BKF); 623 : 15.1 (BKF); 764 : 17.1 (BKF).

Matthapha S. 12 : 7.6 (KKU, QBG); s.n. (KKU 7449) : 14.1 (KKU).

Maxwell J.F. 71-166 : 11.1 (BK); 71-197 : 3.2.1 (AAU, BK); 71-519 : 1.18 (BK); 72-12 : 18.3 (BK); 72-21 : 18.2 (AAU); 72-107 : 17.2 (BK, C); 72-315 : 7.2 (AAU); 72-401 : 1.18 (AAU, BK); 72-565 : 1.5 (AAU, BK); 72-570 : 1.18 (AAU, BK); 73-35 : 17.2 (BK); 73-238 : 7.6 (AAU); 73-276 : 1.14 (AAU, BK); 73-484 : 17.1 (AAU); 73-706 : 17.2 (BK); 73-781 : 2.1 (BK); 74-135 : 10.1 (AAU, BK); 74-157 : 13.2 (AAU); 74-265 : 17.2 (BK, BKF); 74-448 : 1.14 (AAU); 74-450 : 7.6 (AAU); 74-453 : 4.3 (AAU, BK); 74-474 : 16.1 (BK); 74-568 : 11.1 (BK); 74-614 : 7.6 (AAU); 74-743 : 1.14 (BK); 74-764 : 5.2 (BK); 74-818 : 16.1 (AAU, BK); 74-838 : 1.6 (AAU, BK); 74-1108 : 1.5 (AAU, BK); 75-28 : 17.1 (AAU); 75-40 : 1.5 (BK); 75-41 : 1.6 (BK); 75-45 : 17.2 (AAU, BK); 75-52 : 7.8 (AAU); 75-56 : 2.1 (AAU, BK); 75-73 : 13.2 (AAU); 75-89 : 16.1 (AAU, BK); 75-93 : 17.1 (AAU); 75-109 : 7.6 (AAU); 75-110 : 1.11 (BK); 75-176 : 17.1 (AAU); 75-189 : 1.5 (AAU, BK); 75-239 : 11.1 (BK); 75-388 : 5.1 (AAU, BK); 75-457 : 4.3 (BK); 75-504 : 1.6 (AAU, BK); 75-521 : 13.2 (AAU); 75-602 : 7.1 (AAU); 75-607 : 1.32 (BK); 75-654 : 17.2 (AAU, BK); 75-666 : 2.1 (AAU, BK); 75-770 : 2.1 (AAU, BK); 75-794 : 1.6 (AAU, BK); 75-912 : 18.1 (BK); 75-913 : 18.2 (AAU, BK); 75-965 : 1.5 (BK); 75-989 : 3.2.1 (AAU, BK); 76-12 : 1.14 (AAU, BK); 76-132 : 1.29 (AAU, BK); 76-143: 7.5 (AAU); 76-175 : 1.29 (AAU, BK); 76-312 : 17.1 (AAU); 76-340 : 1.5 (AAU, BK); 76-341 : 1.14 (AAU); 76-445 : 7.8 (AAU); 76-487 : 1.5 (AAU, BK); 76-621 : 1.6 (BK); 76-651 : 1.6 (AAU); 76-708 : 16.1 (AAU, BK); 80-1005 : 10.1 (BKF); 84-145 : 1.32 (BKF, PSU); 84-337 : 1.32 (BKF); 84-485 : 1.16 (BKF); 84-496 : 7.7 (BK); 85-58 : 1.32 (BKF, PSU); 85-297 : 7.6 (AAU, BKF, PSU); 85-310 : 9.1 (AAU, BKF); 85-339 : 1.20 (AAU, BKF); 85-367 : 9.1 (AAU, BKF, PSU); 85-513 : 9.1 (AAU, BKF, PSU); 85-659 : 1.6 (AAU, BKF); 85-673 : 4.7 (AAU, BKF, PSU); 85-687 : 1.16 (AAU, BKF); 85-794 : 17.1 (PSU); 85-864 : 1.32 (AAU, BKF, PSU); 85-887 : 4.7 (BKF, PSU); 85-907 : 4.1 (AAU, BKF, PSU); 85-1115 : 1.19 (BKF); 86-14 : 7.4 (PSU); 86-175 : 8.1 (AAU, BKF, PSU); 86-207 : 1.14 (AAU, BKF); 86-730 : 1.9 (BKF); 86-739 : 7.4 (BKF, PSU); 86-753 : 1.10 (BKF); 86-845 : 1.18 (BKF); 87-188 : 2.1 (AAU, BKF, PSU); 87-439 : 7.3 (BKF,

PSU); 87-447 : 2.1 (BKF, PSU); 87-458 : 1.14 (AAU, BKF); 87-541 : 7.10 (PSU); 87-545 : 9.1 (BKF); 87-567 : 2.1 (BKF, PSU); 87-571 : 7.4 (AAU, PSU); 87-576 : 4.9.2 (AAU, BKF, PSU); 87-892 : 5.1 (BKF); 87-893 : 11.1 (BKF); 87-1132 : 1.29 (BKF); 87-1517 : 7.6 (BKF); 87-1519 : 7.8 (BKF); 88-192 : 17.4 (AAU, BKF); 88-273 : 1.31 (BKF); 88-291 : 10.1 (BKF); 88-356 : 13.2 (BKF); 88-397 : 8.1 (BKF); 88-409 : 8.1 (BKF); 88-603 : 1.23 (AAU); 88-828 : 1.14 (BKF); 88-1005 : 10.1 (AAU); 88-1078 : 5.2 (AAU, BKF); 88-1386 : 1.31 (AAU, BKF); 89-77 : 4.3 (BKF); 89-85 : 17.1 (AAU, BKF); 89-116 : 7.6 (BKF); 89-194 : 10.1 (BKF); 89-205 : 1.10 (BKF); 89-216 : 17.1 (AAU, BKF); 89-245 : 8.1 (BKF); 89-304 : 2.1 (AAU, BKF); 89-413 : 15.1 (BKF); 89-418 : 17.1 (BKF); 89-547 : 5.2 (AAU, BKF); 89-574 : 7.6 (AAU, BKF); 89-604 : 15.1 (AAU, BKF); 89-612 : 1.14 (AAU, BKF); 89-681 : 13.2 (BKF); 90-729 : 8.1 (BKF); 90-1121 : 10.1 (AAU); 91-202 : 6.1 (AAU); 91-329 : 3.2.2 (AAU); 91-517 : 3.1 (AAU); 91-556 : 1.14 (AAU); 92-292 : 1.23 (AAU); 93-373 : 15.1 (BKF); 93-434 : 8.1 (BKF); 94-1232 : 7.6 (BKF); 95-122 : 13.2 (BKF); 95-133 : 10.1 (BKF); 95-156 : 15.1 (BKF); 95-257 : 8.1 (BKF); 95-419 : 6.1 (BKF); 95-597 : 2.1 (BKF); 95-813 : 8.1 (BKF); 95-1187 : 6.1 (BKF); 96-61 : 6.1 (BKF); 96-345 : 8.1 (BKF); 96-439 : 8.1 (BKF); 96-596 : 1.30 (BKF); 96-743 : 8.1 (BKF); 96-759 : 17.3 (BKF); 96-909 : 11.1 (BKF); 96-940 : 17.3 (BKF); 96-961 : 11.1 (BKF); 96-1152 : 1.10 (BKF); 96-1157 : 5.1 (BKF); 96-1354 : 11.1 (BKF); 96-1489 : 1.1 (BKF); 96-1502 : 8.1 (BKF); 97-131 : 10.1 (BKF); 97-834 : 1.14 (BKF); 97-860 : 10.1 (BKF); 97-874 : 5.1 (BKF); 97-923 : 2.1 (BKF); 97-1558 : 10.1 (BKF); 98-351 : 8.1 (BKF); 98-354 : 2.1 (BKF); 98-608 : 17.3 (BKF); 001-11 : 3.2.2 (BKF); 001-30 : 15.1 (BKF); 001-359 : 1.6 (BKF); 002-176 : 4.5 (BKF); 002-176A : 13.2 (BKF); 002-379 : 7.6 (BKF).

Metachawalit P. et al. s.n. (KKU 1756) : 3.2.1 (KKU).

Middleton D.J. et al. 191: 1.6 (BKF); 232 : 1.20 (AAU, BKF); 421 : 7.6 (BKF); 348 : 4.7 (AAU, BKF, K); 351 : 4.6 (AAU, BKF, K); 352 : 1.32 (AAU, BKF, K); 374 : 1.32 (AAU, BKF); 424 : 5.1 (BKF); 430 : 1.32 (BKF); 436 : 7.10 (BKF); 466 : 1.9 (BKF); 502 : 1.22 (BKF); 504 : 1.3 (BKF); 508 : 1.22 (AAU, BKF, K); 878 : 1.12 (BKF); 898 : 1.19 (BKF); 912 : 5.1 (BKF); 939 : 1.14 (BKF); 1014 : 4.3 (AAU, BKF, K); 1032 : 1.19 (BKF); 1213 : 1.20 (BKF); 1329 : 2.1 (BKF); 1360 : 1.18 (BKF); 1371 : 1.31 (BKF); 1464 : 8.1 (BKF); 1470 : 1.31 (BKF); 1558 : 7.6 (BKF); 1565 : 1.6 (BKF); 1566 : 1.5 (BKF , K); 1585 : 1.6 (BKF); 1679 : 1.23 (BKF, HU, K); 1738 : 1.6 (BKF); 1787 : 8.1 (BKF, K); 1824 : 1.14 (BKF); 2002 : 2.1 (K); 2191 : 7.4 (BKF); 2244 : 1.2 (BKF); 2367 : 2.1 (BKF).

Murata G. et al. T-15252 : 6.1 (AAU, BKF, C); T-16503 : 7.6 (BKF); T-17295 : 3.2.1 (BKF); T-17434 : 1.6 (BKF); T-17734 : 10.1 (AAU, BKF, C, K); T-17745 : 10.1 (BKF); T-37072 : 1.6 (AAU); T-50961 : 2.1 (BKF); T-51029 : 10.1 (BKF); T-51167 : 8.1 (BKF); 51246 : 1.6 (BKF).

Nakkan D. 16 : 17.3 (BKF); 44 : 7.6 (BKF); 88 : 13.2 (K); 177 : 7.8 (BKF); 186 : 5.1 (BKF); 226 : 3.2.1 (BKF); 360 : 1.27 (BKF); 363 : 1.27 (BKF).

Nalampoon A. 20 : 4.8 (BKF); 36 : 1.14 (BKF).

Nanakorn W. et al. 27 : 12.1 (BKF, QBG); 31 : 8.1 (QBG); 44 : 6.1 (QBG); 51 : 7.7 (QBG); 55 : 1.29 (QBG); 133 : 4.3 (QBG); 139 : 15.1 (QBG); 483 : 15.1 (QBG); 525 : 11.1 (BKF); 571 : 13.2 (QBG); 586 : 8.1 (QBG); 658 : 6.1

(QBG); 725 : 8.1 (QBG); 1285 : 1.29 (BKF); 1476 : 1.18 (QBG); 2559 : 1.2 (QBG); 2790 : 18.3 (QBG); 3072 : 8.1 (QBG); 3113 : 8.1 (QBG); 3319 : 8.1 (QBG); 3333 : 1.18 (QBG); 3532 : 2.1 (QBG); 3699 : 6.1 (QBG); 3815 : 8.1 (QBG); 4056 : 1.31 (QBG); 4106 : 12.1 (QBG); 5120 : 8.1 (QBG); 5433 : 6.1 (QBG); 5668 : 7.10 (QBG); 5677 : 1.9 (QBG); 6083 : 1.19 (QBG); 6293 : 7.6 (QBG); 6403 : 8.1 (BKF); 6636 : 6.1 (QBG); 6673 : 8.1 (BKF); 6769 : 6.1 (QBG); 6938 : 8.1 (QBG); 6973 : 6.1 (QBG); 7226 : 18.1 (QBG); 7378 : 12.1 (BKF); 8060 : 8.1 (QBG); 8066 : 8.1 (QBG); 8164: 8.1 (QBG); 8951 : 4.3 (QBG); 9026 : 5.1 (QBG); 9452 : 8.1 (QBG); 9483 : 8.1 (QBG); 9950 : 7.10 (QBG); 10592 : 15.1 (QBG).

Newman M.F. 47 : 13.2 (AAU, BKF); 1027 : 7.6 (AAU, BKF); 1028 : 1.16 (BKF); 1068 : 7.3 (AAU, BKF); 1074 : 4.7 (AAU, BKF); 1077 : 1.32 (AAU, BKF, K).

Nielsen I.C. et al. 1551 : 1.26 (BKF); 1831 : 1.2 (BKF).

Nim-a-nong B. 6 : 1.19 (BKF); 13 : 1.5 (AAU, C, K); 1604 : 4.7 (BKF); 1616 : 7.7 (BKF, C, K).

Niyomdham C. 279 : 1.32 (C); 296 : 1.6 (AAU, BKF, C, K); 297 : 1.32 (AAU, C); 304 : 1.7 (AAU, BKF, C, K); 340 : 7.6 (AAU, BKF, C); 393 : 1.9 (BKF); 410 : 1.13 (BKF); 566 : 1.24 (BKF); 782 : 13.1 (AAU, BKF); 788 : 4.7 (AAU, BKF); 802 : 1.24 (AAU, BKF, C, K); 814 : 4.3 (AAU, BKF, C, K); 842 : 13.1 (AAU, BKF, C, K); 861 : 1.17 (AAU, BKF); 881 : 13.1 (AAU, BKF, C, K); 1115 : 4.7 (BKF); 1165 : 1.13 (AAU, BKF, C, K); 1320 : 7.5 (BKF, C); 1954 : 18.3 (BKF); 1994 : 1.12 (BKF); 2016 : 4.7 (BKF); 2147 : 1.14 (BKF); 2165 : 1.17 (BKF); 2182 : 1.19 (BKF); 2357 : 1.18 (BKF); 2905 : 1.9 (AAU, BKF); 3010 : 1.18 (AAU, BKF); 3279 : 1.14 (BKF); 3328 : 4.2 (BKF); 4470 : 1.27 (BKF); 4703 : 7.5 (BKF); 4762 : 9.1 (BKF); 4957 : 8.1 (BKF); 5016 : 1.16 (BKF); 5017 : 4.1 (BKF); 5024 : 13.2 (AAU, BKF); 5096 : 17.3 (AAU, BKF); 5174 : 1.6 (BKF); 5197 : 1.20 (BKF); 5286 : 4.1 (BKF, K); 5328 : 4.2 (BKF); 5670* : 4.10 (BKF); 6162 : 4.2 (AAU, BKF); 6215 : 1.29 (BKF); 6310 : 1.29 (AAU, BKF); 6510 : 1.14 (AAU, BKF); 6563 : 9.1 (BKF).

Noe 255 : 17.4 (BK, K).

Noi s.n. (BK 4429) : 10.1 (BK).

Norsangsri M. 1403 : 8.1 (QBG).

Parinya 124 : 3.2.1.

Pannell C.M. 95-657 : 1.14 (C.K.).

Patanapongpaiboon P. s.n. (BKF 82533) : 18.1 (BKF); s.n. (BKF 82534) : 18.1 (BKF); s.n. (BKF 82536) : 18.1 (BKF); s.n. (BKF 119055) : 18.1 (BKF).

Pato K. s.n (KKU 1649) : 3.2.2 (KKU).

Pennington T.D. 7992 : 1.12 (BKF).

Pharmaceutical Sciences, Faculty of : Chulalongkorn University. s.n. : 7.9 (BKF).

Phengklai C. 72 : 1.28 (BKF, C, K); 74 : 1.28 (C); 154 : 8.1 (K); 257 : 1.14 (BKF, C, K); 426 : 2.1 (BKF); 463 : 2.1 (BKF, K); 489 : 7.6 (BKF, C, K); 1041 : 17.3 (BKF, K); 1269 : 2.1 (BKF, K); 1981 : 18.3 (BKF); 1983 : 1.18 (BKF);

3080 : 2.1 (BKF, PSU); 3104 : 15.1 (BKF, K); 3528 : 17.2 (BKF, PSU); 3812 : 18.1 (BKF); 3926 : 7.10 (BKF, PSU); 4014 : 11.2 (BKF); 6026 : 18.2 (AAU); 10801 : 10.1 (BKF); 10882 : 8.1 (BKF); 10889 : 1.2 (BKF); 10940 : 1.29 (BKF); 11185 : 1.18 (BKF); 11991 : 1.18 (BKF); 12248 : 8.1 (BKF); 12620 : 7.5 (BKF); 12657 : 7.5 (AAU, BKF); 12723 : 1.6 (BKF); 12811 : 1.18 (BKF); 13075 : 1.6 (BKF); 13076 : 1.6 (BKF); 13201 : 18.3 (BKF); 13263 : 18.3 (BKF); 13431 : 4.7 (BKF); 13450 : 1.31 (BKF); 13525 : 1.12 (BKF); 13774 : 18.2 (BKF); 13786 : 1.18 (BKF); 13922 : 18.3 (BKF); 14074 : 1.27 (BKF); 14409 : 18.1 (BKF); 14525 : 7.8 (BKF); 14633 : 4.1 (BKF); 14706 : 1.14 (BKF); 15166 : 1.18 (BKF); 15271 : 1.19 (BKF); 15348 : 1.6 (BKF); 15407 : 1.12 (BKF); 15408 : 1.19 (BKF); 15409 : 13.2 (BKF); 15507 : 18.1 (BKF); 15627 : 9.1 (BKF); 15716 : 13.2 (BKF).

Phengnaren S. 128 : 2.1 (BKF); 196 : 1.14 (BKF); 220 : 1.6 (BKF); 237 : 2.1 (BKF); 241 : 17.2 (BKF); 332 : 1.28 (BKF); 375 : 17.2 (BKF); 494 : 17.2 (BKF); 512 : 1.5 (BKF); 516 : 17.1 (BKF); 552 : 17.2 (BKF); 560 : 17.1 (BKF, C); 565 : 1.6 (BKF); 575 : 5.1 (BKF); 597 : 10.1 (BKF); 600 : 17.1 (BKF); s.n. (BKF 29614) : 16.1 (BKF).

Phengnaren Sh. 180 : 17.1 (BKF); 294 : 17.1 (BKF); 387 : 10.1 (BKF); 516 : 17.3 (K); 522 : 17.2 (K); 601 : 1.6 (BKF).

Phetsupha R. s.n. (BKF 113783) : 9.1 (BKF).

Phonsena P. 4388 : 18.3 (BKF).

Phusomsaeng S. 8 : 7.6 (BKF, C, K); 27 : 1.19 (BKF, C, K); 35 : 4.6 (AAU, BKF, C, K); 44 : 2.1 (BKF, C, K); 59 : 4.8 (BKF, K); 79 : 17.2 (BKF); 81 : 7.4 (C, K); 91 : 1.5 (C); 102 : 1.1 (BKF, C, E, L, KTO, OXF, P); 110 : 7.6 (BKF, C); 160 : 1.31 (C, K); 161 : 1.5 (BKF, C, K); 167 : 15.1 (BKF); 169 : 7.7 (BKF, C); 170 : 4.7 (BKF, C, K); 175 : 7.7 (BKF, K); 178 : 1.5 (BKF, C, K); 179 : 1.5 (BKF); 194 : 1.10 (BKF); 229 : 1.5 (BKF, C, K); 234 : 7.2 (BKF, C, K); 248 : 4.8 (BKF); 267 : 4.8 (BKF); 310 : 2.1 (BKF, K); 324 : 4.8 (BKF); 329 : 4.6 (BKF); 348 : 1.5 (BKF, K); 376 : 9.1 (BKF); 418 : 7.12 (BKF, K); 420 : 4.2 (BKF, C, K); 426 : 5.1 (BKF, C, K); 450 : 1.32 (BKF); 523 : 1.7 (BKF, C, K); 1571 : 2.1 (BKF); 1586 : 7.4 (BKF, C, K); 1593 : 1.2 (BKF, C, K).

Pinnil S. 12 : 2.1 (BKF, K); 91 : 1.5 (BKF); 255 : 1.32 (BKF).

Piyakanchana T. s.n. : 10.1 (BK).

Pongamornkul W. 22 : 5.1 (QBG); 317 : 1.29 (QBG); 635 : 17.3 (QBG).

Pooma R. 100 : 17.3 (BKF); 112 : 4.4 (BKF); 163 : 3.2.1 (BKF); 186 : 8.1 (BKF); 345 : 8.1 (BKF); 356 : 7.6 (BKF); 357 : 1.2 (BKF); 387 : 1.18 (BKF); 435 : 1.29 (BKF); 483 : 5.1 (BKF); 749 : 6.1 (BKF); 831 : 10.1 (BKF); 949 : 1.6 (BKF); 1027 : 5.1 (BKF); 1119 : 10.1 (BKF); 1175 : 6.1 (BKF); 1195 : 1.27 (BKF); 1223 : 8.1 (BKF); 1392 : 1.21 (BKF); 1496 : 17.3 (BKF); 1517 : 7.6 (BKF); 1576 : 8.1 (BKF); 1632 : 17.3 (BKF); 1638 : 1.6 (BKF); 1654 : 17.3 (BKF); 1655 : 8.1 (BKF); 1667 : 1.18 (BKF); 1691 : 1.18 (BKF); 1743 : 1.22 (BKF); 2065 : 2.1 (BKF); 2418 : 10.1 (BKF); 2929 : 1.18 (BKF); 3014 : 1.14 (BKF); 3763 : 1.31 (BKF); 3957 : 6.1 (AAU, BKF); 4294 : 8.1 (AAU, BKF); 4316 : 7.6 (BKF); 6590 : 1.19 (BKF).

Prakongsai L. s.n. (BKF 26750) : 1.6 (BKF).

Praknuk S. 7 : 2.1 (BKF).

Prapat D. 4 : 1.5 (BKF); 40 : 1.30 (BKF, C, K); 43 : 1.30 (BKF, C, K); 62 : 2.1 (BKF); 118 : 1.14 (BKF); 135 : 1.32 (BKF, C, K); 499 : 1.14 (BKF); 514 : 1.6 (BKF); 816 : 1.6 (BKF); 941 : 1.14 (BKF); 964 : 1.5 (BKF).

Premrasami A. 32 : 1.24 (AAU, BKF); 67 : 2.1 (BKF); 94 : 8.1 (BKF); 305 : 17.2 (BKF).

Premrasami Th. 1 : 17.2 (BKF); 2 : 17.3 (BKF).

Promdej Ch. 10 : 15.1 (BKF); 23 : 18.1 (BKF, C, K); 268 : 18.1 (BKF).

Put P. 200 : 1.19 (BKF); 202 : 1.22 (BKF); 233 : 1.2 (BKF); 241 : 4.8 (BKF); 307 : 18.2 (BKF); 315 : 1.2 (BKF); 325 : 1.5 (BKF); 354 : 13.2 (BKF); 364 : 1.27 (BKF); 386 : 6.1 (C, K); 416 : 2.1 (BK); 524 : 7.6 (BM); 542 : 1.24 (BK, BM); 558 : 17.2 (BK, C, K); 577 : 2.1 (BK, K); 652 : 17.4 (BK, BM, K); 741 : 1.17 (BK, K); 970 : 1.18 (BK, C, K); 1146 : 1.18 (BK, BM, C); 1288 : 17.2 (BK, C, K); 1297A. : 1.20 (BK, K); 1634 : 1.19 (BK, BM, C, K); 1708 : 18.1 (BK, BM, K); 1746 : 1.12 (BK, BM, C, K); 1895 : 1.14 (BK, BM, C, K); 1988 : 1.18 (BK, BM, K); 2039 : 1.5 (BK, C, K); 2232 : 3.2.2 (BK, C, K); 2382 : 1.14 (BK, BM, C, K); 2742 : 7.8 (C); 2812 : 17.4 (BK, BM, K); 3066 : 5.2 (BK, BM, C, K); 3237 : 11.2 (BK, C, K); 3238A : 1.6 (BK, BM, C, K); 3395 : 7.5 (BM); 3506 : 17.1 (BK, K); 3629 : 4.8 (C, K); 3840 : 15.3 (BK, BM, C, K); 3841 : 2.1 (K); 3865 : 1.14 (BM, C); 3945 : 11.1 (BK, BM, C, K); 4324 : 1.14 (BK, BM, C); 4519 : 6.1 (BM, C, K); s.n. (BKF 18143) : 7.6 (BKF).

Puudjaa P. 207 : 1.14 (BKF); 267 : 1.9 (BKF); 325 : 4.2 (BKF); 444 : 8.1 (BKF); 466 : 4.9.1 (BKF); 469 : 1.9 (BKF); 485 : 1.31 (AAU, BKF); 853 : 1.2 (BKF); 1002 : 4.7 (BKF); 1248 : 7.8 (BKF); 1454 : 11.1 (BKF).

Rabil 137 : 1.19 (BK); 137A : 1.18 (K); 179 : 9.1 (BK, C); 259 : 9.1 (BK); 275 : 2.1 (BK, K).

Rock J.F. 1749 : 8.1 (K); 1867 : 4.3 (K).

Rollet s.n. (BKF 71031) : 18.1 (BKF); s.n. (BKF) 72603) : 18.2 (BKF).

Roongsuriya s.n. (BKF 139712) : 18.1 (BKF).

Saemyarm W. 98 : 2.1 (QBG).

Saifah E. s.n. 1.5 (BK).

Saman L. 65 : 18.1 (BKF).

Sa-nga s.n. : 3.2.2 (BKF).

Sangkachand B. 11 : 1.1 (BKF); 27 : 17.2 (BKF, K); 119 : 17.1 (BKF, K); 194 : 7.7 (BKF, C, K); 274 : 2.1 (BKF, C); 292 : 1.6 (BKF, C, K); 365 : 17.2 (BKF); 373 : 17.1 (BKF); 395 : 18.3 (BKF); 492 : 1.6 (BKF); 543 : 5.1 (BKF); 544 : 1.27 (C, BKF, K); 573 : 7.6 (BKF, C); 647 : 10.1 (BKF); 696 : 1.22 (BKF); 701 : 1.32 (BKF); 865 : 7.2 (C, K); 943 : 13.2 (BKF); 944 : 2.1 (BKF); 946 : 10.1 (BKF, K); 954 : 17.3 (BKF); 999 : 1.18 (BKF, K); 1017 : 4.2 (BKF, K); 1043 : 1.7 (C, K); 1159 : 7.10 (BKF); 1160 : 1.32 (BKF, C, K); 1229 :1.16 (C); 1256 : 1.16 (BKF, C, K); 1390 : 4.2 (BKF, C, K); 1484 : 7.8 (BKF, C, K); 1502 : 1.3 (AAU, BKF, C, K); 1542 : 17.3 (BKF); 1549 : 1.5 (BKF, C, K); 1564 : 15.3 (BKF, C, K); 1705 : 17.1 (BK); 1885 : 17.1 (BK); 3001 : 1.29

(BKF); 3083 : 10.1 (BKF, C, K); 3100 : 12.1 (BKF); 3122 : 2.1 (BKF); 3123 : 1.6 (BKF); 3165 : 13.2 (BKF); 3175 : 1.14 (BKF).

Sangkachand P. 188 : 15.3 (BK); 454 : 1-16 (BK); 578 : 1.26 (BK); 607 : 17.2 (BK); 632 : 1.11 (BK); 1025 : 5.2 (BKF); 1260 : 4.2 (BK); 1264 : 4.2 (BK); 1321 : 1.32 (BK); 1451 : 2.1 (BK); 1588 : 1.19 (BK); 1682 : 4.6 (BK); 1716 : 1.31 (BK); 1719 : 4.8 (BK); 1773 : 1.19 (BK); 1802 : 1.1 (BK); 1852 : 1.5 (BK); 1862 : 17.1 (BK); 1891 : 1.12 (BK); 1902 : 1.5 (BK); 1905 : 1.31 (BK); 2035 : 5.2 (BK); 2173 : 4.8 (BK); 2187 : 2.1 (BK).

Santisuk Th. 2 : 4.7 (BKF); 70 : 1.14 (BKF); 92 : 13.2 (BKF); 106 : 1.9 (BKF); 113 : 1.9 (BKF); 182 : 1.6 (BKF, C, K); 205 : 1.14 (BKF); 218 : 1.14 (BKF); 272 : 3.2.1 (BKF); 286 : 7.8 (BKF, C, K); 339 : 1.32 (BKF, PSU); 349 : 1.16 (BKF); 421 : 1.14 (BKF); 498 : 2.1 (BKF); 595 : 1.32 (AAU, BKF, K); 613 : 4.7 (BKF); 625 : 1.9 (BKF); 646 : 1.5 (AAU, BKF, C, K); 694 : 18.1 (BKF); 769 : 1.9 (BKF); 788 : 1.16 (BKF); 818 : 17.2 (BKF, PSU); 820 : 17.1 (BKF, PSU); 821 : 1.16 (BKF, PSU); 829 : 4.7 (BKF, PSU); 987 : 17.3 (BKF); 1091 : 1.14 (BKF); 1158 : 1.7 (BKF, PSU); 1186 : 1.32 (BKF); 1293 : 1.1 (BKF); 1433 : 8.1 (AAU); 3479 : 1.4 (BKF); 6667 : 8.1 (BKF); 6670 : 2.1 (BKF); 6688 : 7.6 (BKF); 6690 : 7.2 (BKF); 6888 : 7.6 (BKF); 6914 : 2.1 (BKF); 6940 : 4.3 (BKF); 6996 : 5.1 (BKF); 8611 : 6.1 (BKF); s.n. (BKF 36108) : 18.2 (BKF); s.n. (BKF 85533) : 15.1 (BKF); s.n. (BKF 85540) : 15.3 (BKF); s.n. (BKF 85570) : 5.1 (BKF); s.n. (BKF 88557) : 5.1 (BKF); s.n. (BKF 99499) : 1.28 (BKF); s.n. (BKF 99575) : 7.6 (BKF); s.n. (BKF 96206) : 8.1 (BKF); s.n. (BKF 100135) : 1.27 (BKF); s.n. (BKF 100201) : 17.1 (BKF); s.n. (BKF 100213) : 18.3 (BKF); s.n. (BKF 114063) : 1.6 (BKF); s.n. (125342) : 2.1 (BKF).

Sawai KKU 12032 : 10.1 (KKU).

Schmidt J. 3 : 18.3 (C); 36 : 18.1 (C); 355 : 18.2 (C); 478 : 4.7 (C); 559 : 1.18 (C); 810 : 1.18 (C); 833 : 17.2 (C); 875 : 1.18 (C); 876 : 7.5 (C).

Serm 44 : 15.1 (QBG); 87 : 8.1 (QBG).

Shimizu T. T-14709 : 1.32 (AAU, BKF); T-18770 : 8.1 (BKF); T-19547 : 1.6 (AAU, BKF); T-19823 : 7.2 (BKF); T-22121 : 7.6 (BKF); T-22173 : 10.1 (BKF); T-23278 : 1.6 (BKF); T-23581 : 7.5 (BKF); T-26033 : 2.1 (BKF); T-26476 : 1.7 (BKF, C); T-26664 : 7.2 (BKF); T-26719 : 7.2 (BKF); T-27450 : 4.8 (BKF); T-27455 : 4.8 (BKF); T-28498 : 1.14 (BKF); T-29046 : 1.20 (BKF); T-29068 : 4.7 (BKF); T-29197 : 18.1 (BKF); T-29211 : 18.1 (BKF).

Shomburgk R. s.n. : 13.2 (K).

Sidisunthorn P. 498 : 1.5 (BKF); 537 : 7.12 (BKF); 1158 : 2.1 (BKF); 1175 : 1.1 (BKF); 1257 : 4.7 (BKF); 1280 : 1.22 (BKF); 1292 : 9.1 (BKF); 1456 : 1.22 (BKF).

Singha-kam K. 23 : 5.1 (BKF).

Singhasatit S. 387 : 15.1 (BKF); 427 : 8.1 (BKF).

Siriphum S. 1-19-11-97 : 4.3 (QBG).

Sirirugsa P. 515 : 9.1 (PSU); 909 : 4.10 (PSU); 1246 : 9.1 (PSU).

Sithipong Th. 56 : 1.14 (BKF).

Smitinand T. 183 : 4.6 (BKF); 327 : 15.1 (BKF); 394 : 4.4 (BKF); 469 : 1.2 (BKF); 508 1.5 (BKF); 529 : 8.1 (BKF); 756 : 4.6 (BKF); 847 : 1.5 (BKF); 859 : 1.32 (BKF); 949 : 1.19 (BKF); 1161 : 1.12 (C); 1199 : 1.20 (BKF, C, K); 1578 : 11.1 (BKF); 2284 : 18.3 (BKF); 3159 : 15.1 (BKF); 3288 : 16.1 (AAU, BKF, K); 3316 : 1.10 (BKF); 3325 : 1.14 (BKF, C, K); 3328 : 1.2 (BKF); 4113 : 1.1 (BKF); 4708 : 1.2 (BKF); 4808 : 11.1 (BKF); 4820 : 5.1 (BKF); 5491 : 3.2.2 (BKF); 5591 : 1.8 (BKF); 6255 : 1.2 (BKF); 7019 : 6.1 (BKF); 7242 : 2.1 (BKF); 7506 : 1.6 (BKF, C, K); 7569 : 5.1 (BKF); 8094 : 17.3 (BKF); 8377 : 10.1 (K); 8537 : 1.18 (BKF); 8804 : 11.1 (BKF); 8831 : 1.20 (BKF); 8869 : 1.14 (BKF); 8927 : 9.1 (BKF); 10039 : 4.8 (BKF); 10056 : 1.14 (BKF); 10234 : 12.1 (BKF, BK); 10350 : 17.1 (BKF, C, K); 10516 : 1.14 (BKF); 10590 : 1.8 (BKF); 10651 : 1.18 (BKF); 10688 : 8.1 (BKF); 10803 : 1.28 (BKF, C, K); 10840 : 17.2 (BKF); 10868 : 17.2 (BKF); 10869 : 17.2 (BKF); 10991 : 1.12 (BKF); 11346 : 1.25 (BKF); 11552 : 15.1 (C, K); 11980 : 1.9 (C); 11991 : 9.1 (BKF); 12247 : 9.1 (BKF); 90-8 : 1.18 (BKF); 91-3 : 8.1 (BKF); 92-23 : 4.7 (BKF); s.n. (BKF 12831) : 15.1 (BKF); s.n. (BKF 38071) : 13.2 (BKF); s.n. (BKF 62305) : 9.1 (BKF); s.n. (64944) : 1.9 (BKF); s.n. (BKF 92736) : 8.1 (BKF); s.n. (BKF 94766) : 18.3 (BKF); s.n. (BKF 102383) : 1.2 (BKF); s.n. (BKF 118613) : 17.1 (BKF); s.n. (123241) : 1.8 (BKF); s.n. (BKF 123263) : 1.14 (BKF).

Soejarto D.D. 5885 : 13.2 (BKF); 5958 : 7.7 (BKF); 6026 : 1.6 (BKF).

Song-see 52 : 15.1 (PSU).

Songrat T. 6 : 1.18 (C).

Sono P. 14 : 10.1 (BKF).

Sookchaloem D. s.n. : 17.3 (BKF).

Sorensen Th. 334 : 15.1 (C, K); 536 : 18.1 (C); 557 : 3.2.1 (C); 1341 : 1.18 (C); 2179 : 16.1 (C, K); 2445 : 11.1 (C); 3008 : 2.1 (C); 3009 : 2.1 (K); 3016 : 2.1 (K); 3026 : 1.14 (C); 3252 : 11.1 (BKF, C); 3312 : 6.1 (C); 3392 : 17.4 (BKF, C); 3469 : 2.1 (C); 4886 : 2.1 (C); 5009 : 2.1 (C, K); 5372 : 17.3 (C); 5741 : 17.3 (C); 5830 : 17.3 (C); 6016 : 7.3 (C); 6966 : 10.1 (C); 7824 : 18.2 (C).

Srisanga P. 176 : 8.1 (QBG); 280 : 8.1 (QBG); 322 : 4.3 (QBG); 532 : 8.1 (QBG); 533 : 8.1 (QBG); 669 : 4.3 (QBG); 672 : 1.7 (QBG); 678 : 4.3 (QBG); 718 : 3.2.1 (QBG); 719 : 3.2.2 (QBG); 764 : 8.1 (QBG); 820 : 5.1 (QBG); 916 : 2.1 (QBG); 1283 : 4.3 (QBG); 1461 : 1.31 (QBG); 1973 : 8.1 (QBG); 2577 : 1.28 (QBG); 2744 : 8.1 (QBG); 2745 : 4.3 (QBG); 2748 : 7.7 (QBG); 2749 : 1.29 (QBG).

Suddee S. 2603 : 1.6 (QBG); 2604 : 17.1 (QBG); 2606 : 17.1 (QBG); 2669 : 2.1 (QBG).

Suksakorn S. 899 : 3.2.2 (K).

Suksathan P. 1590 : 3.2.2 (QBG); 2265 : 10.1 (QBG).

Suthison S. 168 : 1.18 (BK); 452 : 3.2.1 (BK); 483 : 17.2 (BK); 900 : 18.3 (BK); 1219 : 4.7 (BK); 1268 : 1.3 (BK); 1953 : 17.1 (BK); 2002 : 1.6 (BK); 2136 : 3.2.2 (BK); 2191 : 4.1 (BK); 2297 : 17.1 (BK); 2311 : 1.10 (BK); 2602 : 1.9 (BK); 3406 : 9.1 (BK); 5267 : 17.2 (BK).

Suvanakoses P. 143 : 1.19 (BKF); 167 : 7.12 (BKF); 205 : 1.32 (BKF); 293 : 7.2 (BKF); 295 : 7.2 (BKF); 374 : 2.1 (BKF); 407 : 1.15 (BKF); 425 : 5.1 (BKF); 530 : 1.19 (BKF); 561 : 1.8 (BKF); 633 : 1.27 (BKF); 636 : 1.5 (BKF); 681 : 1.14 (BKF); 684 : 1.7 (BKF); 703 : 1.19 (BKF); 704 : 4.7 (BKF); 793 : 9.1 (BKF); 870 : 1.2 (BKF); 1117 : 17.3 (BKF, K); 1369 : 17.3 (BKF); 1468 : 17.3 (BKF, K); 1482 : 3.2.2 (BKF); 1745 : 4.6 (BKF); 1788 : 1.19 (BKF); 1866 : 2.1 (BKF); 1875 : 17.3 (BKF, K); 1877 : 9.1 (BKF); 2129 : 1.28 (BKF); 2143 : 7.10 (BKF, C, K).

Suvanasudhi K. 82 : 7.6 (BKF); 100 : 6.1 (BKF); 184 : 7.6 (BKF); 247 : 10.1 (BKF); 378 : 5.1 (BKF); 538 : 5.1 (BKF); 811 : 1.21 (BK); s.n. (BKF 4126) : 7.6 (BKF).

Tagawa M. T-1936 : 6.1 (BKF, K).

Pierre L. 872 : 3.2.2 (K).

Teparak T. 4 : 13.2 (BK).

Thawon S. 25 : 7.2 (BKF); 26 : 7.2 (BKF); 52 : 9.1 (BKF); 291 : 1.6 (BKF); 301 : 1.9 (BKF); 305 : 17.1 (K); 418 : 1.3 (BKF); 432 : 1.13 (BKF); 434 : 1.32 (BKF); 506 : 1.9 (BKF); 579 : 1.22 (BKF); 604 : 1.19 (BKF); 626 : 1.11 (BKF); 771 : 1.4 (BKF); 776 : 1.32 (BKF); 780 : 1.32 (BKF); 985 : 7.9 (BKF); s.n. (BKF 18304) : 1.32 (BKF).

Thonanon N. 15 : 1.2 (BKF).

Thongkam S. 2 : 1.28 (BKF).

Thongson P. 29 : 6.1 (QBG); 90 : 8.1 (BKF).

Thuntana P. s.n. (KKU. 1692) : 3.2.1 (KKU).

Tiaviboon S. s.n. (BKF 99168) : 2.1 (BKF); s.n. : 7.4 (BKF).

Tippayasri P. 984 : 1.10 (BKF).

Tubtimthong P. s.n.. (KKU 7451) : 10.1 (KKU).

Uboncholakhet A. 215 : 18.3 (AAU).

Vacharapong 223 : 2.1 (BK); 338 : 17.3 (BK); 348 : 15.3 (BK).

Vacharee 27 : 3.2.1 (BK); 468 : 3.2.2 (BK).

Vanpruk 3 : 17.3 (BKF); 14 : 18.2 (BKF); 110 : 2.1 (BKF); 116 : 17.2 (K); 120 : 17.2 (K); 121 : 17.4 (K); 161 : 10.1 (K); 164 : 10.1 (BKF); 205 : 5.2 (BKF, K); 220 : 15.1 (BKF, K); 241 : 13.2 (BKF); 358 : 7.6 (BKF, K); 417 : 10.1 (BKF, K); 421 : 3.2.2 (BKF, C, K); 429 : 17.4 (BKF); 482 : 16.1 (BKF, K); 483 : 3.2.1 (K); 506 : 7.6 (C); 509 : 17.2 (K); 684 : 7.8 (C, K); 722 : 18.2 (BKF, K); 723 : 18.1 (BKF); 781 : 1.18 (BKF); 784 : 1.41 (BKF, K).

Vatanasuvakul C. s.n. (BKF 8561) : 18.1 (BKF).

Veesommai U. s.n. : 17.3 (BKF).

Vidal J.E. 5266 : 8.1 (BKF); 6305 : 6.1 (BKF).

Vongdao L. 34 : 3.2.2 (BKF).

Vanakit S. 117 : 1.28 (BKF).

Wannarak A. 18 : 7.6 (C); 81 : 17.1 (K).

Watthana S. 100 : 4.3 (QBG); 213 : 2.1 (QBG).

Widmer M. 7 : 3.2.2 (BKF).

Willius D.S. 388 : 1.5 (C).

Winit 22 : 17.2 (K); 61 : 1.5 (BKF); 83 : 8.1 (BKF); 92 : 17.4 (BM, K); 128 : 17.4 (BM, K); 129 : 15.1 (BM, K); 130 : 1.18 (BM, K); 252 : 15.3 (BKF); 448 : 11.1 (K); 585 : 1.18 (BKF, K); 619 : 1.2 (BKF, C, K); 634 : 17.2 (K); 781 : 1.18 (K); 1136 : 4.3 (BKF, K); 1398 : 16.1 (BK, BKF, C, K); 1414 : 11.1 (BK, BKF, K); 1452 : 17.2 (BK, BKF); 1497 : 7.6 (BKF, C, K); 1612 : 1.28 (BK, BKF, C, K); 1676 : 1.14 (BK, BKF, C, K); 1699 : 1.28 (BK, C, K); 1836 : 17.2 (BK, BKF, K); 1838 : 1.28 (BK, BKF, C, K); 1891 : 17.2 (BK, BKF, K); 1915 : 17.2 (BK, BKF, K).

Wirawan N. 334 : 1.17 (C).

Wongprasert Th. 94-6-s.n. (BKF 99503) : 2.1 (BKF); 96-4-6 : 17.1 (BKF); 98-2-1 : 8.1 (BKF); 98-5-1 : 4.7 (BKF); 98-5-1a : 8.1 (BKF); 98-5-2 : 8.1 (BKF); 98-5-s.n. : 1.14 (BKF); 98-6-1 : 3.2.1 (BKF); 98-6-2 : 18.3 (BKF); 98-6-3 : 18.3 (BKF); 98-7-1 : 18.3 (BKF); 98-8-s.n. : 3.2.2 (BKF); 99-4-5 : 18.3 (BKF); 99-4-8 : 18.3 (BKF); 99-7-116 : 1.27 (BKF); 99-7-118 : 4.6 (BKF); 01-3-03 : 4.1 (BKF); 01-4-05 : 1.14 (BKF); 01-7-22 : 2.1 (BKF); 03-6-16 : 17.3 (BKF); 03-8-01 : 1.27 (BKF); 03-10-27 : 8.1 (BKF); 04-1-10 : 2.1 (BKF); 04-1-40 : 7.8 (BKF); 04-3-17 : 7.3 (BKF); 04-5-7 : 8.1 (BKF); 04-6-13 : 1.14 (BKF); 04-6-18 : 1.19 (BKF); 04-6-77 : 2.1 (BKF); 04-6-108 : 1.12 (BKF); 06-4-23 : 1.22 (BKF); 06-12-1 : 5.1 (BKF); 07-1-1 : 1.31 (BKF); 07-1-2 : 13.2 (BKF); 07-2-2 : 3.2.2 (BKF); 07-2-3 : 5.1 (BKF); 07-2-4 : 9.1 (BKF); 07-2-5 : 13.2 (BKF); 07-2-7 : 18.2 (BKF); 07-2-8 : 18.1 (BKF); 07-2-9 : 17.2 (BKF); 07-2-10 : 9.1 (BKF); 07-2-12 : 1.24 (BKF); 07-2-14 : 15.1 (BKF); 07-3-1 : 3.2.2 (BKF); 07-3-4 : 10.1 (BKF); 07-3-7 : 3.1 (BKF); 07-3-8 : 10.1 (BKF); 07-3-14 : 5.1 (BKF); 07-3-16 : 8.1 (BKF); 07-3-18 : 1.5 (BKF); 07-3-20 : 1.17 (BKF); 07-3-21 : 1.21 (BKF); 07-1-1 : 1.16 (BKF); 07-4-1 : 14.1 (BKF); 07-4-2 : 1.22 (BKF); 07-4-3 : 7.5 (BKF); 07-4-4 : 7.10 (BKF); 07-4-5 : 1.22 (BKF); 07-5-1 : 9.1 (BKF); 07-5-2 : 11.1 (BKF); 07-5-4 : 18.1 (BKF); 07-5-5 : 18.2 (BKF); 07-5-6 : 1.22 (BKF); 07-6-1 : 5.1 (BKF); 07-6-2 : 11.1 (BKF); 07-6-4 : 1.27 (BKF); 07-6-5 : 6.1 (BKF); 07-6-16 : 8.1 (BKF); 07-6-20 : 5.1 (BKF); 07-6-21 : 8.1 (BKF); 07-6-23 : 5.1 (BKF); 07-6-24 : 17.2 (BKF); 07-6-25 : 8.1 (BKF); 07-6-40 : 15.1 (BKF); 07-6-64 : 6.1 (BKF); 07-6-66 : 6.1 (BKF); 07-6-68 : 2.1 (BKF); 07-6-71 : 17.3 (BKF); 07-6-72 : 4.3 (BKF); 07-6-75 : 15.1 (BKF); 07-6-78 : 4.7 (BKF); 07-6-79 : 1.16 (BKF); 07-6-80 : 7.7 (BKF); 07-6-85 : 1.27 (BKF); 07-7-2 : 2.1 (BKF); 07-7-3 : 2.1 (BKF); 07-7-5 : 15.1 (BKF); 07-7-6 : 2.1 (BKF); 07-7-7 : 7.6 (BKF); 07-7-8 : 2.1 (BKF); 07-7-9 : 2.1 (BKF); 07-7-10 : 2.1 (BKF); 07-7-14 : 15.1 (BKF); 07-7-15 : 17.3 (BKF); 07-7-17 : 1.19 (BKF); 07-7-18 : 2.1 (BKF); 07-7-19 : 2.1 (BKF); 07-7-20 : 2.1 (BKF); 07-7-23 : 17.2 (BKF); 07-7-25 : 7.6 (BKF); 07-7-26 : 1.19 (BKF); 07-7-27 : 1.6 (BKF); 07-7-28 : 10.1 (BKF); 07-7-29 : 2.1 (BKF); 07-7-30 : 2.1 (BKF); 07-7-33 : 8.1 (BKF); 07-7-34 : 13.2 (BKF); 07-7-38 : 5.1 (BKF); 07-7-39 : 5.1 (BKF); 07-7-43 : 5.1 (BKF); 07-7-44 : 2.1 (BKF); 07-7-45 : 14.1 (BKF); 07-8-8 : 5.1 (BKF); 07-8-10 : 1.6 (BKF); 07-8-13 : 2.1 (BKF); 07-8-14 : 2.1 (BKF); 07-8-16 : 1.8 (BKF); 07-8-17 : 1.27 (BKF); 07-8-18 : 1.32 (BKF); 07-8-25 : 1.31 (BKF); 07-8-26 : 1.32 (BKF); 07-8-31 : 1.17 (BKF); 07-8-32 : 1.9 (BKF); 07-8-37 : 1.32 (BKF); 07-8-41 : 2.1 (BKF); 07-8-46 : 1.1 (BKF); 07-8-

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Worawoot 29 : 17.3 (BKF).

Yasothon Ch. 17 : 1.14 (BKF); 38 : 15.3 (BKF).

Yonebayashi C. 93054 : 5.1 (BKF).

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