

## REVISION AND PHYLOGENY OF AGROSTISTACHYS AND CHONDROSTYLIS (EUPHORBIACEAE)

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### SUMMARY

The genera *Agrostistachys* and *Chondrostylis*, subtribe Agrostistachydeae, have been revised. *Chondrostylis* comprises two species, *C. bankana* appears to be much more widespread than was assumed. *Agrostistachys* comprises six species, one of which is new (*A. staminodiatius*), while several species (e.g. *A. intramarginalis* and *A. meeboldii*) have been reduced to the now quite variable *A. borneensis*, formerly mainly known as *A. longifolia*. A phylogenetic analysis of the subtribe Agrostistachydeae shows that all four genera (also *Cyttaranthus* and *Pseudagrostistachys*) are monophyletic; however, the position of *Agrostistachys* is very weak and the genus may easily change to a paraphyletic group with the other genera nested in it. Even in spite of the weak support for *Agrostistachys* all genera are maintained in their present circumscription.

**Key words:** *Agrostistachys*, *Chondrostylis*, Euphorbiaceae, phylogeny.

### INTRODUCTION

The Southeast Asian genera *Agrostistachys* and *Chondrostylis*, together with the African genera *Cyttaranthus* and *Pseudagrostistachys* are classified in the tribe Agrostistachydeae (Webster, 1994), part of the subfamily Acalyphoideae. Webster (1994) records, among others, the following characters as typical for tribe Agrostistachydeae: mainly dioecy, shrubs or trees, indumentum simple, presence of petals in at least staminate flowers (however, absent in *Chondrostylis*), enlarged connective, pendulous anther sacs, pollen sexine coarsely reticulate; cotyledons distinctly broader than radicle.

Tribe Ampereae, comprising the two Australian genera *Amperea* and *Monotaxis*, is seemingly regarded as closely related (Webster, 1994). This tribe differs from Agrostistachydeae in the very narrow cotyledons, which are scarcely broader than the radicle, and the habit: they are herbs or at most subshrubs. These two genera are used as out-group in the phylogenetic analysis of subtribe Agrostistachydeae.

### MATERIAL AND METHODS

Characters mentioned by Webster (1994) are used, together with characters shown to be distinctive on the specific level during the revision of *Agrostistachys* and *Chondrostylis*. The following characters and character states are used in the cladistic analysis of tribe Agrostistachydeae:

1. Habit: 1 = shrub to tree; 2 = herb to subshrub.  
Overlap is caused by the fact that trees start to flower when they are still in the shrub phase.
2. Sexuality: 1 = dioecious; 2 = monoecious.  
Species with only a few specimens showing both sexes on the same plant are considered to be monoecious.
3. Fusion of stipules: 1 = free; 2 = united.  
United stipules are typical for *Pseudagrostistachys*.
4. Length of stipules: 1 = up to 1 cm; 2 = more than 1 cm.  
Long stipules are typical for *Agrostistachys hookeri*.
5. Shape of stipules: 1 = ovate; 2 = triangular; 3 = narrowly triangular; 4 = linear triangular; 5 = acicular.  
The shape of the stipule is usually very typical per species, only *Cyttaranthus* shows polymorphism.
6. Blade margin: 1 = entire to crenulate; 2 = dentate to crenulate.  
Crenulate has not been defined in such a way that it can be differentiated between laxly crenulate (as in state 1) or densely crenulate (as in state 2). This causes the apparent overlap.
7. Blade glands: 1 = absent; 2 = present.  
Glands on the blade are absent in *Chondrostylis* and *Pseudagrostistachys*.
8. Petiole glands: 1 = absent; 2 = present.  
Mainly a genus character, except for *Pseudagrostistachys*, there typical per species.
9. Inflorescence branching: 1 = unbranched; 2 = branched.  
State 2 is typical for *Chondrostylis*.
10. Inflorescence length: 1 = up to 20 cm; 2 = more than 20 cm.  
State 2 is typical for *Agrostistachys* (except *A. indica*) and *Chondrostylis*.
11. Inflorescence type: 1 = spikes or racemes; 2 = panicles; 3 = cymes; 4 = fascicles.  
State 2 is typical for *Chondrostylis*; state 3 for *Monotaxis*, and state 4 for *Amperea*.
12. Inflorescence position: 1 = terminal; 2 = axillary.  
Axillary inflorescences are typical for *Monotaxis*.
13. Sepals: 1 = imbricate; 2 = valvate.  
State 1 is typical for *Monotaxis* and *Chondrostylis*.
14. Staminate petals: 1 = imbricate; 2 = valvate.  
Petals are absent in a few genera, therefore, a question mark is noted. Valvate petals are typical for *Cyttaranthus*.
15. Petal apex: 1 = emarginate to irregular; 2 = obtuse to acuminate.  
Unknown for *Monotaxis*. State 2 is typical for *Agrostistachys indica* and *Pseudagrostistachys*.
16. Staminate disc: 1 = lobed; 2 = annular.  
An annular disc is found in *Agrostistachys hookeri* and *Pseudagrostistachys*.
17. Pistillate disc: 1 = lobed; 2 = annular.  
Typical per species in *Agrostistachys*, further typical per genus. Polymorphic in *Pseudagrostistachys ugandensis*.
18. Pistillode: 1 = absent; 2 = present.  
The presence of a pistillode is often variable per genus, and polymorphic for *Pseudagrostistachys ugandensis*.

19. Stigma: 1 = sessile; 2 = style present.  
All stigmas are sessile except those of *Agrostistachys hookeri* and *A. indica*.
20. Stamen grouping: 1 = in whorls; 2 = in a group.  
Grouped stamens are not distinctly ordered in circles (whorls).
21. Stamen number: 1 = 8–16; 2 = 20–55.  
*Chondrostylis*, *Cyttaranthus*, and *Pseudagrostistachys* have many more stamens than the other genera.
22. Connective: 1 = apically elongated; 2 = spade-like; 3 = broad, apically widened; 4 = glandular; 5 = curved and thick; 6 = shortly appendiculate.  
The shape of the connective is often very typical for a genus. The states are often difficult to compare and should perhaps be considered as different characters (e.g., state 4, the presence of a gland), though that will not change the results of the analysis.
23. Anther dehiscence: 1 = introrsely, slits not adjoining; 2 = latrorsely, slits adjoined.  
State 2 is typical for *Chondrostylis*.
24. Cotyledons: 1 = scarcely broader than radicle; 2 = distinctly broader than radicle.  
State 2 is typical for the *Agrostistachydeae*.
25. Staminodes: 1 = absent; 2 = present.

Table 1 comprises the data matrix. The genera *Amperea* and *Monotaxis* are added as outgroups; together with the monophyletic *Cyttaranthus* they are each entered in the matrix as a single (generic) entity. *Pseudagrostistachys*, which only comprises two species, is entered on the species level. Characters were checked in the literature (De Jussieu, 1824; Müller Argoviensis, 1866; Bentham, 1873; Bentham & Hooker, 1880; Pax & Hoffman, 1912; Grüning, 1913; Pax & Hoffman, 1931; Lebrun, 1934; Léonard, 1962; Airy Shaw, 1980; Radcliffe-Smith, 1987), and, when available, with herbarium specimens. Several characters could not be scored, these are entered as question marks.

The program PAUP 3.1.1 (Swofford, 1993) was used for the cladistic analysis with the options characters unordered, all characters with a weight of 1, branch-and-bound, stepwise furthest addition of taxa, and Mulpars active.

Table 1. Data matrix for the cladistic analysis of tribe *Agrostistachydeae*. *Amperea* and *Monotaxis* (tribe *Ampereae*) are the outgroups. Unknown character states or dependent character states are scored as question marks, polymorphism is indicated.

species	characters																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
<i>Amperea</i>	2	2	1	1	?	1	2	1	1	1	4	2	2	?	?	1	1	1	1	1	4	1	1	1	1
<i>Monotaxis</i>	2	2	1	1	5	1	2	1	1	1	3	1	1	1	?	1	1	1	1	1	1	5	?	1	1
<i>Agrostistachys</i>																									
<i>borneensis</i>	1	1	1	1	1&2	1	2	1	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	2	1
<i>gaudichaudii</i>	1	1	1	1	3	1	2	1	1	2	1	2	2	1	1	1	2	2	1	2	1	1	1	2	1
<i>hookeri</i>	1	1&2	1	2	3	2	2	1	1	2	1	2	2	?	?	2	2	2	2	2	1	2	1	2	1
<i>indica</i>	1	1	1	1	3	2	2	1	1	1	1	2	2	1	2	1	2	2	2	2	1	1	1	2	1
<i>sessilifolia</i>	1	1	1	1	2	1	2	1	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	2	1
<i>staminodiatus</i>	1	1	1	1	1	1	2	1	1	2	1	2	2	1	1	1	1	1	1	2	1	1	1	2	2
<i>Chondrostylis</i>																									
<i>bancana</i>	1	2	1	1	4	2	1	2	2	2	2	2	1	?	?	1	2	2	1	2	2	3	2	2	1
<i>kunstleri</i>	1	2	1	1	4	2	1	2	2	2	2	2	1	?	?	1	2	2	1	2	2	3	2	2	1
<i>Cyttaranthus</i>	1	2	1	1	?	2	2	2	1	1	1	2	2	2	1	?	1	1	2	1	2	6	1	2	1
<i>Pseudagrostistachys</i>																									
<i>ugandensis</i>	1	1	2	2	4	2	1	2	1	1	1	2	2	1	2	2	1&2	1&2	1	2	2	4	1	2	2
<i>africana</i>	1	1	2	2	4	2	1	1	1	1	1	2	2	1	2	2	1	1	1	2	2	4	1	2	2

The bootstrap analysis (Felsenstein, 1985) in PAUP was used with 500 replicates, and the same settings as in the cladistic analysis.

The Decay Index (DI) was calculated with PAUP (Bremer, 1988), again with the same settings.

RESULTS OF PHYLOGENETIC ANALYSIS

The cladistic analysis resulted in three most parsimonious cladograms, 52 steps long (4 steps for polymorphisms, see Discussion),  $ci = 0.731$ ,  $ri = 0.767$ . The strict consensus cladogram (Fig. 1) is equal to one of the cladograms obtained, it comprises one trichotomy. The two other cladograms differ in the position of *Agrostistachys borneensis*, which can form the trichotomy with *A. sessilifolia* and the clade with all other *Agrostistachys* species (Fig. 1), or it can be the sister species of *A. sessilifolia*, or it is the sister species of all other *Agrostistachys* species. However, character optimisation did not really support the latter two clades, therefore, the first cladogram, equal to the strict consensus cladogram was favoured (Fig. 1).

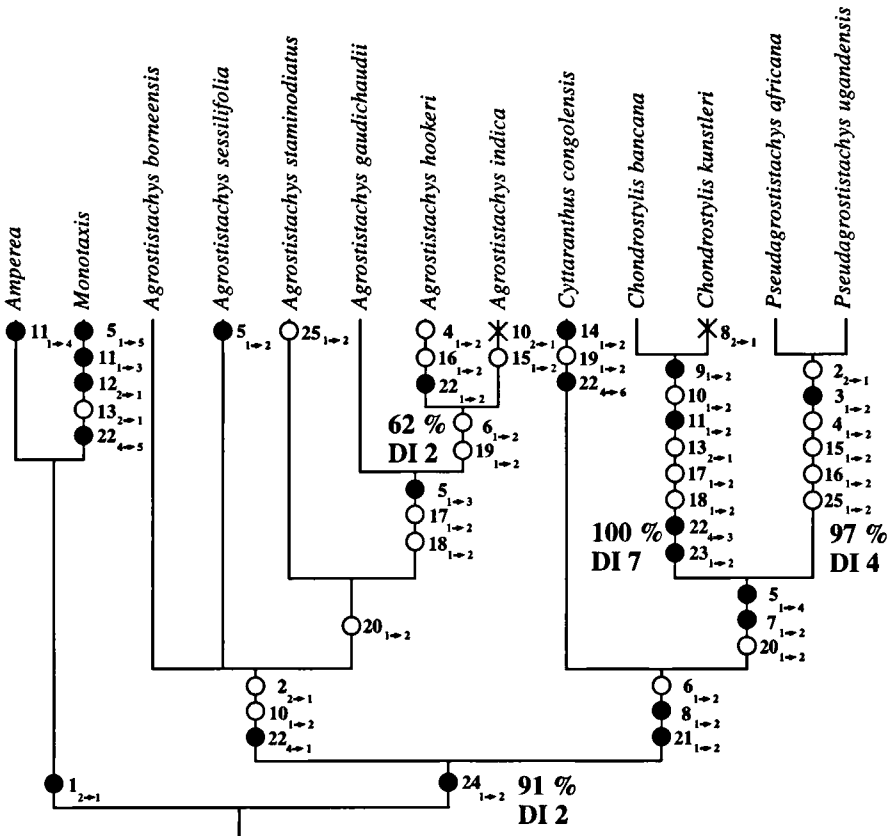


Fig. 1. Strict consensus cladogram and also one of the three most parsimonious cladograms of the tribe Agrostistachydeae. ● = apomorphy; ○ = parallel apomorphy; X = reversal; % = bootstrap values; DI = Decay Index (Bremer Support).

All cladograms show that the ingroup consists of two clades, one for *Agrostistachys* and one for *Cyttaranthus*, *Pseudagrostistachys*, and *Chondrostylis* together.

Three groups obtained a high bootstrap value (Fig. 1), *Chondrostylis* (100%), *Pseudagrostistachys* (97%), and the ingroup (91%). Two of these values are significant. Hillis & Bull (1993) have empirically shown that bootstrap values of 70% or higher correspond to a probability of 95% or more that a clade is real. This means that all three values may be regarded as highly significant. The same three groups were also supported by higher Decay Indices (Fig. 1). *Agrostistachys hookeri* and *A. indica* are not supported by a high bootstrap, only by the Decay Index.

#### DISCUSSION

All four genera in tribe Agrostistachydeae appear to be monophyletic. However, the cladogram is not stable. The main problem is the interpretation of the anthers. In the analysis the appendix of the connective of *Cyttaranthus* is considered to differ from the one of *Agrostistachys*. If both taxa are coded as possessing the same state then six cladograms are found, the former three and three new (again with varying position for *A. borneensis*) in which *Agrostistachys* is paraphyletic with the monophyletic group *Cyttaranthus*, *Chondrostylis*, and *Pseudagrostistachys* embedded in it. Thus only one character is necessary for a dramatic change in conclusions. *Agrostistachys* looks very well recognisable at first sight, but in comparison with the related taxa it does not really possess typical characters. In this analysis it is only supported by an apically elongated connective (22.1) as unique apomorphy and by two parallel synapomorphies.

Character optimisation at the base of the cladogram is difficult. In Figure 1 most characters are regarded as autapomorphies for *Amperea* and *Monotaxis*. Character 1 is regarded to be a synapomorphy for the Ampereae (herbs or subshrubs), and character 23 a synapomorphy for the Agrostistachydeae (cotyledons distinctly broader than the radicle).

*Agrostistachys hookeri* is polymorphic for character 2 (sexuality), the partly monoecious state is a reversal.

*Agrostistachys borneensis* is polymorphic for character 5 (shape of stipules), the change in this character forms a partial apomorphy for *A. borneensis*, and, in fact, this would be the only apomorphy to unite the clade of *A. borneensis* and *A. sessilifolia* for which character 4 is a good apomorphy.

*Pseudagrostistachys* is polymorphic for characters 17 (pistillate disc) and 18 (pistillode), the states disc annular and pistillode present are parallel developments shared with *Chondrostylis*.

Five characters, first used in the analysis, proved to involve too much homoplasy and they were omitted from the analysis. Among them are characters like the petiole length and the shape of the leaf base, both characters in which the two *Chondrostylis* species differ. Consequently, in the present analysis the character matrix for both has become identical.

The clade *A. hookeri* and *A. indica* is weakly supported by the presence of a dentate to crenate leaf margin (character 6.2; parallel for the clade *Cyttaranthus*, *Chondrostylis*, and *Pseudagrostistachys*) and a style (character 19.2; parallel for *Cyttaranthus*). However, geographically the clade makes sense, because the distributions are vicariant; *A. hookeri* is found in Sri Lanka, *A. indica* is present from India to W Malesia.

The analysis shows that *Chondrostylis* is a very distinct, monophyletic group supported by non-homoplasious synapomorphies like branched inflorescence (9.2), panicles (11.2), a broad, apically widening connective (22.3), and laterally opening anthers with the slits adjoined (24.2); the clade is also supported by four parallel synapomorphies (Fig. 1).

*Pseudagrostistachys* is supported by one unique apomorphy, connate stipules (3.2) and by five parallel synapomorphies. Still, this group shows a distinct and very unique combination of characters, supported by a high bootstrap value.

The clade *Chondrostylis* and *Pseudagrostistachys* is supported by two unique synapomorphies, linear triangular stipules (5.4) and glands on the blade (7.2), and a single parallel synapomorphy. Similar support is there for the clade *Cyttaranthus*, *Chondrostylis*, and *Pseudagrostistachys*, two unique synapomorphies: petiole glands (8.2) and 20–55 stamens (21.2), and a single parallel synapomorphy.

The tribe Agrostistachydeae is supported by a single synapomorphy: Cotyledons distinctly broader than radicle (23.2). The herb to subshrub habit of the Ampereae (1.2) is regarded as a synapomorphy for the latter.

#### TAXONOMIC CONSEQUENCES

*Agrostistachys* is seemingly monophyletic, but as indicated in the discussion it can easily be turned into paraphyletic and then it should be united with *Cyttaranthus*, *Chondrostylis*, and *Pseudagrostistachys* to be monophyletic. However, all four genera are easy to recognise in their present definition (see former chapter). A classical or 'Linnaean' classification can never comprise monophyletic taxa only (Van Welzen, 1997, 1998, and references therein). Therefore, it is more practical to leave the present classification as it stands and not to invoke name changes for taxa well known under their old names, thus all genera are maintained.

The Agrostistachydeae are probably a well-defined monophyletic tribe, though this analysis is too limited to certify that status.

#### TAXONOMIC TREATMENT

##### AGROSTISTACHYS

The genus *Agrostistachys* was first described by Dalzell in 1850 based on *A. indica*, and it was classified in tribe Crotoneae.

Wight (1852) described *Sarcoclinium*, a new genus with as typical character a very thick and fleshy disc, hence the generic name, fleshy bed. The type species, *Sarcoclinium longifolium*, described for the alpine forests on the western slopes of the Neilgherries, is *Agrostistachys borneensis* Becc.

Gagnepain (1950) described the supposedly new genus *Heterocalyx*, with the sole species *Heterocalyx laoticus*, based on collections made by Dr. A.F.G. Kerr in Laos in 1932. Gagnepain stated that the plant was not included in the 'Flore générale de l'Indo-Chine', and that it appeared to be related to the genera *Aleurites*, *Dimorphocalyx*, *Deutzianthus*, and *Tyrsanthera*. Duplicates of the types (Kerr 20895 and 20895A) proved that *H. laoticus* is a synonym of *Agrostistachys indica* Dalzell. It does not

have any close relationships or even superficial resemblance to any of the genera mentioned by Gagnepain (Airy Shaw, 1960b).

*Agrostistachys* is classified by Webster (1994) in tribe Agrostistachydeae, part of subfamily Acalyphoideae. Diagnostic characters of this genus are: shrub or small trees; normally dioecious; indumentum consisting of simple hairs; leaves alternate to spiral, simple, blade elliptic to obovate, base normally attenuate, with glands at the margin; inflorescences axillary or cauliflorous racemes; flowers with sepals valvate, basally connate and free petals (absent in *A. hookeri*); disc lobed to annular; stamens 8–16, filaments thread-like, anthers 2-locular, connective normally apically elongated, pistillode absent or present; pistil 3-locular, stigma sessile or with style; fruit a rhagma; seeds obovoid, base very acute, apically with a caruncle.

### **Agrostistachys Dalzell**

*Agrostistachys* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2 (1850) 41; Airy Shaw, Kew Bull. 14 (1960) 472; 26 (1972) 210; Whitmore, Tree Fl. Malaya 2 (1973) 52; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 26; 8 (1980) 23; Kew Bull. 36 (1981) 248; Alph. Enum. Euphorb. Philipp. Is. (1983) 3; G.L. Webster, Ann. Missouri Bot. Gard. 81 (1994) 69. — Type species: *Agrostistachys indica* Dalzell.

*Sarcoclinium* Wight, Icon. Pl. Ind. Orient. 5 (1852) 24. — Type species: *Sarcoclinium longifolium* Wight [= *Agrostistachys borneensis* Becc.].

*Heterocalyx* Gagnep., Notul. Syst. 14 (1950) 33. — Type species: *Heterocalyx laoticus* Gagnep. [= *Agrostistachys indica* Dalzell].

Shrub or tree, dioecious (monoecious in *A. hookeri* and *A. staminodiatus*); flowering twigs glabrous. *Indumentum* consisting of simple hairs only. *Leaves* alternate, distichous to spiral, simple; stipules ovate to narrowly triangular, margin entire or ciliate with trichomes, apex rounded to aristate, caducous to late caducous or persistent, scars up to 5 cm below the leaves; petiole reniform in transverse section, basally pulvinate; blade elliptic to obovate, symmetric, papery to coriaceous, base attenuate (emarginate to rounded in *A. sessilifolia*; sometimes obtuse to rounded in *A. borneensis*), margin entire and without glands to dentate and teeth with glands, apex rounded to caudate, upper and lower surface smooth, glabrous (sometimes the young leaves pubescent); venation raised on both sides, especially beneath, nerves 10–40 per side, at the margin looped and joined, veins and veinlets scalariform to reticulate. *Inflorescences* axillary and sometimes cauliflorous, racemes, single or up to 15 superposed above each other per axil (or growing from the same point), unbranched, glabrous to sericeous. *Bracts* alternate to spiral along rachis (overlapping each other and hiding rachis in *A. indica* and sometimes in other species when flowers still in bud), margin ciliate, sometimes with trichomes, glabrous to sericeous, sometimes covered with papillae outside, inside sometimes with glands. *Flowers* single or up to 10 per bract, actinomorphic; pedicels glabrous to sericeous; sepals 2–5, valvate, basally connate; petals 5 (absent in *A. hookeri*), free (to connate). *Staminate flowers*: disc lobes 4–7 (annular in *A. hookeri*); stamens 8–16, glabrous, filaments thread-like, anthers 2-locular, deltoid, basally deeply cleft, basifixed, opening introrsely with longitudinal slits, connective apical elongated (in *A. hookeri* spade-like with the anthers in the basal lobes); pistillode absent or present, 2- or 3-partite. *Pistillate flowers*: sepal margin ciliate, sometimes with trichomes; petal margin entire; disc lobes 5 (annular in *A. gaudichaudii*

and *A. hookeri*); pistil (2- or) 3-locular, 1 ovule per locule, ovary glabrous to sericeous, style subsericeous or absent, stigmas 3, split in upper 0.5–1 mm (not split in *A. hookeri*), upper surface with broad papillae, lower surface covered with smaller papillae. *Fruit* a rhagma, lobed, septicidal and partly apically loculicidal, smooth, glabrous (to subsericeous), wall thin, woody; column after dehiscence apically not broadened, with narrow, quite entire septal margins, sepals and styles persistent. *Seed* obovoid, base very acute, apically with a caruncle.

Distribution — S India, Sri Lanka, Thailand, Peninsular Malaysia, Sumatra, Borneo, Philippines, New Guinea.

#### KEY TO THE SPECIES

- 1a. Leaf margin dentate to crenulate, teeth ending in a gland ..... 2
- b. Leaf margin entire ..... 5
- 2a. Leaf base emarginate to rounded ..... **5. *A. sessilifolia***
- b. Leaf base attenuate ..... 3
- 3a. Inflorescences single per axil, up to 70 cm long. Stipules 2–6 by 1–2 cm .... **3. *A. hookeri***
- b. Inflorescences single or up to 15 per axil, up to 20 cm long. Stipules 0.2–2 by 0.2–0.7 cm ..... 4
- 4a. Inflorescences up to 3 cm long ..... **4. *A. indica***
- b. Inflorescences up to 20 cm long ..... **2. *A. gaudichaudii***
- 5a. Pistillode absent in staminate flowers. Stipules 2–20 by 2–7 mm. Petiole 0.5–4.5 cm. Blade papery to subcoriaceous ..... **2. *A. gaudichaudii***
- b. Pistillode present in staminate flowers. Stipules 0.5–12 by 1–8 mm (when more than 5 mm blades coriaceous). Petiole 0.2–2 cm. Blade coriaceous ..... 6
- 6a. Bracts broadly obovate to orbicular. Pistillate flowers with c. 10 staminodes inserted between disc lobes ..... **6. *A. staminodiatius***
- b. Bracts ovate to triangular (to obovate). Pistillate flowers without staminodes 7
- 7a. Blade base attenuate, sometimes obtuse to rounded; stipules 0.5–4 mm high . . . . . **1. *A. borneensis***
- b. Blade base emarginate to rounded; stipules 5–12 mm high ... **5. *A. sessilifolia***

#### 1. *Agrostistachys borneensis* Becc. — Fig. 2, 3e, f, h, Map 1

*Agrostistachys borneensis* Becc., For. Borneo (1902) 331; Airy Shaw, Alph. Enum. Euphorb. Philipp.

Is. (1983) 3. — Lectotype (proposed here): *Beccari PB 3117* (holo FI, photo L; iso K, P), Sarawak, Kuching.

*Sarcoclinium longifolia* Wight, Icon. Pl. Ind. Orient. 5 (1852) 24, pl. 1887, 1888; Müll. Arg. in DC., Prodr. 15, 2 (1866) 727. — *Agrostistachys longifolia* (Wight) Trimen, Syst. Cat. Fl. Pl. Ceylon (1885) 81, nom. illeg., later homonym, non Kurz; Benth. ex Hook.f., Fl. Brit. India 5 (1887) 407; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vi (1912) 100, f. 49 E; Whitmore, Tree Fl. Malaya 2 (1973) 53; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 27; 8 (1980) 24. — *Agrostistachys coriacea* Trimen, Handb. Fl. Ceylon 4, Suppl. (1931) 265, nom. superfl. — Type: *Wight s.n.* (n.v.), India, western slopes of the Neilgherries (see note 1).

*Agrostistachys longifolia* (Wight) Trimen var. *latifolia* Hook.f., Fl. Brit. India 5 (1887) 407. — *Agrostistachys latifolia* (Hook.f.) Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vi (1912) 100; Merr., J. Straits Branch Roy. Asiat. Soc., special number (1921) 337. — Syntypes: *King's coll.*



3459 (K, photo L), Malaysia, Perak, Larut; *King's coll.* 3523 (K, photo L), Malaysia, Perak, Larut; *Scortechini* 1985 (K, photo L), Malaysia, Perak.

*Agrostistachys meeboldii* Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vi (1912) 100. — Syntypes: *Meebold* 13048 (B<sup>+</sup>), India, Malabar coast, Udambanthola; *Meebold* 13079 (B<sup>+</sup>), India, Malabar coast, Udambanthola; *Wight* KD 2612 (K, photo L; A, L), India, Travancore, Courtallam.

*Agrostistachys leptostachya* Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vi (1912) 102; Merr., *Philipp. J. Sci.* 16 (1920) 553; *J. Straits Branch Roy. Asiat. Soc.*, special number (1921) 337; *Enum. Philipp. Fl. Pl.* 2 (1923) 428. — *Agrostistachys longifolia* (Wight) Trimen var. *leptostachya* (Pax & K. Hoffm.) Whitmore, *Gard. Bull. Straits Settlement.* 26 (1972) 52; *Tree Fl. Malaya* 2 (1973) 53. — Lectotype (proposed here): *Hose* 162 (holo K, photo L; iso L), Borneo, Sarawak (see note 2).

*Agrostistachys intramarginalis* Philcox, *Kew Bull.* 50 (1995) 119. — Type: *Waes* 1556 (holo K, photo L; iso NY, US), Sri Lanka, Sabaragamuwa Prov., Ratnapura Distr., Walankanda.

Shrub up to 7 m high; dbh up to 1.9 m; flowering twigs up to 1.5 cm thick, rather smooth to ribbed to rough. *Outer bark* green to brown to grey to black, smooth to narrowly fissured; *inner bark* yellowish to dark red to brown; *sapwood* cream to pale yellow to brown. *Leaves*: stipules ovate to triangular, 0.5–4 by 1–8 mm, late caducous to persistent, scars up to 1.5 cm below leaves, sometimes thick, margin entire, ciliate with trichomes, apex rounded to acute, glabrous to subsericeous abaxially, with trichomes at base adaxially, venation distinctly parallel; *petiole* 0–2 cm long; *blade* el-

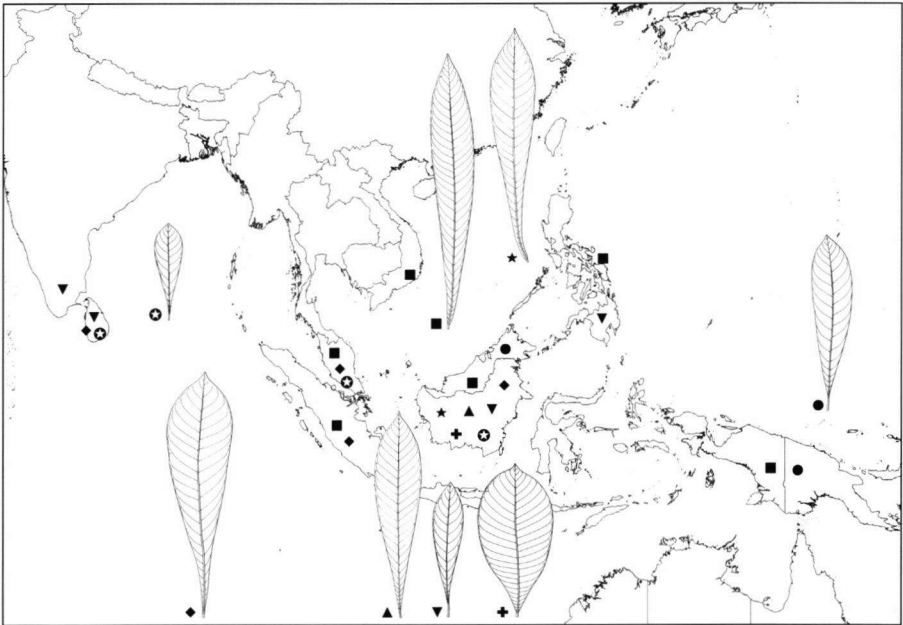
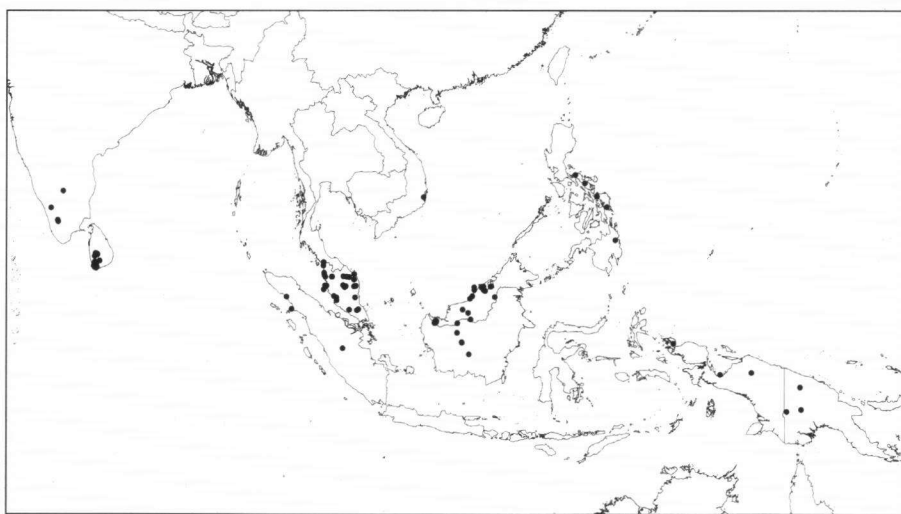


Fig. 2. The distribution of *Agrostistachys borneensis* Becc. Indicated with different symbols are the different leaf shapes, often found in the same area: note differences in size, shape, and petiole length. — [The drawn leaf shapes are based on the following material: ● = *Hoogland & Craven* 10694, L; ■ = *KEP* 104630 (*Chelliah*), L; ◆ = *KEP FRI* 3023 (*Whitmore*), L; ★ = *Mogea* 3579, NY; ▲ = *Christensen* 1242, AAU; ▼ = *Shah* MS. 1486, L; + = *S* 36648 (*Martin*), L; ⊕ = *KEP FRI* 28264 (*Suppiah*), L].

liptic to obovate, 6–70 by 2–18 cm, index 2–5.7, subcoriaceous to coriaceous, base attenuate, sometimes obtuse to rounded, margin entire, apex rounded to cuspidate; veins scalariform, veinlets scalariform to reticulate. *Inflorescences* axillary and cauliflorous, single or up to 4 together, up to 35 cm long, glabrous to sericeous. *Bracts* overlapping each other and hiding rachis when in bud, ovate (to obovate), 1–4 by 1–4 mm, margin sometimes with trichomes, apex rounded to acuminate, outside sometimes covered with papillae, inside with glands that exude white latex, glabrous to subsericeous, venation usually distinctly parallel. *Flowers* single or up to 5 together; pedicel glabrous to sericeous; disc lobes orbicular to broadly ovate, glabrous. *Staminate flowers* 2–4 by 1.5–4 mm; pedicel 1–3 mm long; sepals 2–5, 1.5–3 by 1–2 mm, apex mucronate to acuminate, venation usually distinctly parallel; petals 5, 1–2.5 by 1–2.5 mm, glabrous, margin entire, apex irregular to obcordate; disc lobes 4–6, 0.3–1 mm diam.; stamens 8–12, in two whorls, the outer whorl inserted between the disc lobes, second whorl sometimes tube-like around the pistillode, filaments free (first whorl) or shortly connate (second whorl), 2–3 mm long, connective sometimes covered with papillae; pistillode 2- or 3-partite, glabrous to subsericeous. *Pistillate flowers* 2–5 by 2–5 mm, pedicel 2–5 mm long; sericeous; sepals 5, lobes 2–3 by 1–2 mm, margin with trichomes, apex acute; petals 5, 1–2 by 1.5–2 mm, margin entire, apex irregular; disc lobes 5, 0.5–1 mm diam., sometimes incompletely divided; ovary 1–3 by 1.5–4 mm, subsericeous to sericeous, stigmas sessile, 1–2.5 mm long, split in upper 0.5–1 mm, glabrous. *Fruit* 0.5–1 by 0.5–1 cm high. *Seeds* 4–6 by 3–5 mm.

*Distribution* — S India, Sri Lanka, Peninsular Thailand, Peninsular Malaysia, Sumatra, Borneo, Philippines, New Guinea.

*Habitat & Ecology* — Primary and secondary (logged) forests, wet evergreen forests, dipterocarp forests, swamp forests, kerangas forests, montane forests, mossy forests, along forest roads, ridges, streams, on gentle to steep slopes, on rock in dry exposed areas, common in undergrowth and abundant in open areas. Soil: red, yellow sandy or



Map 1. The distribution of *Agrostistachys borneensis* Becc.

light brown clay, limestone, acid sand. Altitude 50–1980 m. Flowering and fruiting throughout the year.

Uses — Cosmetic use as tooth paste to dye the teeth black: burned wood exudes a black latex which is smeared on the teeth. Repeated treatments are needed after 3 days otherwise the colour disappears.

Vernacular names — Peninsular Malaysia: Perak: Jenjulong. Borneo: Sarawak: Gelimum, malo, malau pucuk, malau puchok, maha bu/punubéru; Brunei: Julong-julong, malau puchok. Papua New Guinea: Wagu.

Notes — 1. The combination *Agrostistachys longifolia* was already made by Kurz in 1875 (a synonym of *A. indica*). Therefore, the well-known name *A. longifolia* may not be used and the second oldest epithet on the species level, *borneensis*, has to be preferred.

2. *Beccari PB 1381* has been used as a syntype of *A. borneensis* by Beccari (1902) and as a syntype of *A. leptostachya* by Pax & Hoffmann (1912). Therefore, to prevent further confusion, *A. leptostachya* has to be lectotypified with *Hose 162*.

3. This species is very variable in the shape and size of the leaves, length of the petioles, and size of the inflorescences, not only between the different islands, but even on a single island.

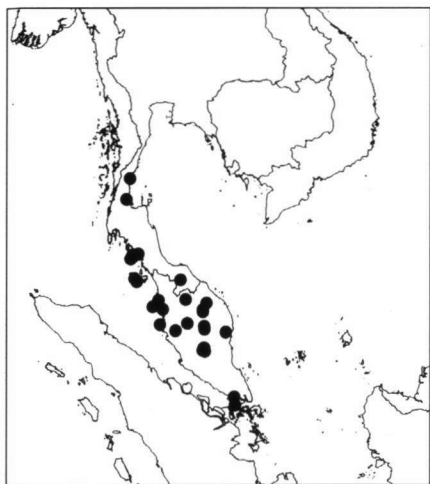
## 2. *Agrostistachys gaudichaudii* Baill. ex Müll.Arg. — Map 2

[*Sarcoclinium gaudichaudii* Baill., Étude Euphorb. (1858) 310, nom. nud.] — *Agrostistachys gaudichaudii* Baill. ex Müll.Arg., *Linnaea* 34 (1865) 144; in DC., *Prodr.* 15, 2 (1866) 725; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vi (1912) 103; Airy Shaw, *Kew Bull.* 26 (1972) 210; Whitmore, *Tree Fl. Malaya* 2 (1973) 52. — Lectotype (proposed here): *Gaudichaud 66* (holo P; iso A, P), Malaysia, Penang Island (see note under description).

*Agrostistachys maingayi* Hook. f., *Fl. Brit. India* 5 (1887) 406; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vi (1912) 105. — Type: *Maingay KD 1425 (1571)* (holo K, photo L; iso L), Malaysia.

*Agrostistachys filipendula* Hook. f., *Fl. Brit. India* 5 (1887) 407; Pax & K. Hoffm. in Engl., *Pflanzenr.* IV.147.vi (1912) 99. — Syntypes: *Hullett s.n.* (K, photo L), Singapore; *Hullett 852* (K, photo in L), Singapore; *King's coll. 4669* (K, photo L), Malaysia, Perak, Larut; *King's coll. 5736* (K, photo L, L), Malaysia, Perak, Larut.

Shrub or tree, up to 15 m high, dbh up to 33 cm; flowering twigs up to 1 cm thick, smooth. *Outer bark* reddish brown to grey; inner bark pale brown to yellow; sapwood white to cream to orange. *Leaves* alternate; stipules narrowly triangular, 2–20 by 2–7 mm, sericeous, caducous, scars up to 4.5 cm below leaves; petiole 0.5–4.5 cm long; blade (narrowly) elliptic to obovate, 14–54.5 by 4.5–22 cm, index 1.7–5.2, papery to subcoriaceous, base attenuate, margin entire to crenulate, apex acuminate to cuspidate, glossy on both sides, darker above, nerves 11–24 per side, veins scalariform, veinlets scalariform to reticulate. *Inflorescences* single or up to 15 above each other, up to 20 cm long, glabrous to subsericeous. *Bracts* alternate along rachis, overlapping each other and hiding rachis when flowers still in bud, broadly ovate, 2.5–5 by 2.5–6 mm, apex forming obtuse hood, sericeous, outside glabrous to subsericeous. *Flowers* single or up to 3(–10) together; pedicel glabrous to subsericeous; sepals longer than petals, lobes elliptic to ovate, nerves distinctly parallel; petals 5, free, obcordate, glabrous, margin entire, apex emarginate; disc glabrous, yellowish red. *Staminate flowers* 2–3 by 2.5–3.5 mm; pedicel 2–3 mm long; sepals 3, c. 2 by 1.3–2 mm, glabrous, margin



Map 2. The distribution of *Agrostistachys gaudichaudii* Baill. ex Müll. Arg.

entire, apex acute; petals 1.3–1.5 by 1.2–1.5 mm, white to yellow to pale green; disc lobes 5, orbicular to reniform, 0.4–0.5 by 0.4–1 mm; stamens 10, free, 1.5–3 mm long, anthers pale yellow; pistillode absent. *Pistillate flowers* 2–3 by 2.5–3.5 mm; pedicel 0.2–1 cm long; sepals 5, 2–3 by c. 1 mm, apex rounded to acute; petals 1.5–3 by 1.5–3 mm, reddish brown; disc annular; ovary 1–2.5 by 1.5–3 mm, sericeous; stigma sessile 3, 1.5–2 mm long, split in upper c. 0.5 mm part, glabrous. *Fruits*: 0.5–1.2 by 0.8–1.5 cm high, grey to green. *Seeds* 7–9 by 5–8 mm.

**Distribution** — Peninsular Thailand and Peninsular Malaysia (Kedah, Kelantan, Trengganu, Pahang, Malacca, Johore).

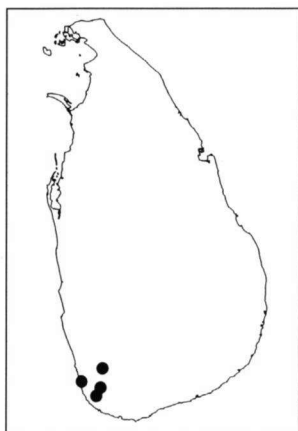
**Habitat & Ecology** — Lowland primary forests, evergreen forests, dipterocarp forests, margin of primary evergreen forests, secondary forests, bamboo forests, swampy forests, logged forests, on hills, in shades of taller trees, along streams, in cleared areas. Soil: limestone, alluvium. Altitude sea level to 50 m. Flowering: mainly Feb. to Apr., less so in June to Sept.; fruiting: Mar. to June, Oct. to Dec.

**Note** — *Helper KD 4921* was used by Müller as one of the syntypes of *A. gaudichaudii*, but he also indicated it to be the type of *A. indica* Dalzell subsp. *longifolia* Müll. Arg. (a synonym of *A. indica*). In order to solve this problem, the other syntype of *A. gaudichaudii*, *Gaudichaud 66*, has been selected as the lectotype, which makes *Helper KD 4921* the only type of subsp. *longifolia* (and var. *integra* Pax & K. Hoffm., an illegitimate name which should have repeated the subspecific name).

### 3. *Agrostistachys hookeri* (Thwaites) Benth. & Hook. f. — Map 3

*Agrostistachys hookeri* (Thwaites) Benth. & Hook. f., Gen. Pl. 3 (1883) 303; Trimen, Syst. Cat. Fl. Pl. Ceylon (1885) 81. — *Sarcoclinium hookeri* Thwaites, Enum. Pl. Zeyl. (1861) 279. — Type: *Thwaites C.P. 3429* (holo K, photo L; iso A, L, P), Sri Lanka, near Eknalagodde, Ratnapoora District.

Shrub or tree, up to 15 m high, dbh up to 23 cm; monoecious; flowering twigs up to 1.5 cm thick, rough. *Outer bark* brown to grey. *Leaves* spiral; stipules narrowly triangu-



Map 3. The distribution of *Agrostistachys hookeri* (Thwaites) Benth. & Hook. f.

lar, 2–6 by 1–2 cm, persistent to late caducous, scars up to 1 cm below leaves, glabrous, venation distinctly parallel; petiole 1–3 cm long; blade narrowly obovate, 30–65 by 6–17 cm, index 3.2–5.6, subcoriaceous to coriaceous, base attenuate, margin with small teeth ending in a gland, apex acuminate to cuspidate; nerves 20–35 per side, veins scalariform to reticulate, veinlets reticulate. *Inflorescences* single, up to 70 cm long, glabrous. *Bracts* alternate to spiral, ovate, c. 1 by 1 mm, apex rounded, glabrous. *Flowers* single or up to 3 together, white to yellow; pedicels glabrous; staminate flowers and pistillate flowers on different or same inflorescences. *Staminate flowers* 4–5 by 3–4 mm; pedicel 2–3 mm long; sepals 4, lobes ovate, margin entire, dark, apex acuminate, glabrous, nerves distinctly parallel; petals absent; disc annular, 0.5–1 mm high; stamens 10–15, filaments 2–3 mm long, inserted in holes in disc, connective spade-like with the anthers in the basal lobes; pistillode absent. *Pistillate flowers* 3–5 by 3–4 mm; pedicel 5–13 mm long, glabrous; sepals 5, lobes broadly ovate, 1–2 by c. 1 mm, free to connate, apex acute to acuminate; petals not seen; disc annular; ovary 2–2.5 by 2.5–3 mm, sericeous; style 1–1.5 mm long, subsericeous, stigmas 3, 1–2 mm long, glabrous, apically not split. *Fruit*: 1.5–2 by 2–3 cm high, black. *Seeds* 1.5–2 by 1.5–2 cm.

Distribution — Sri Lanka.

Habitat & Ecology — Primary forests, evergreen forests, secondary forests; on logging sites and wet areas, along rivers or streams, on gentle slopes, in rocky areas; sometimes in colonies. Altitude 100–500 m. Flowering: Feb.; fruiting: Apr. to May.

Uses — Leaves used for roofing.

#### 4. *Agrostistachys indica* Dalzell — Map 4

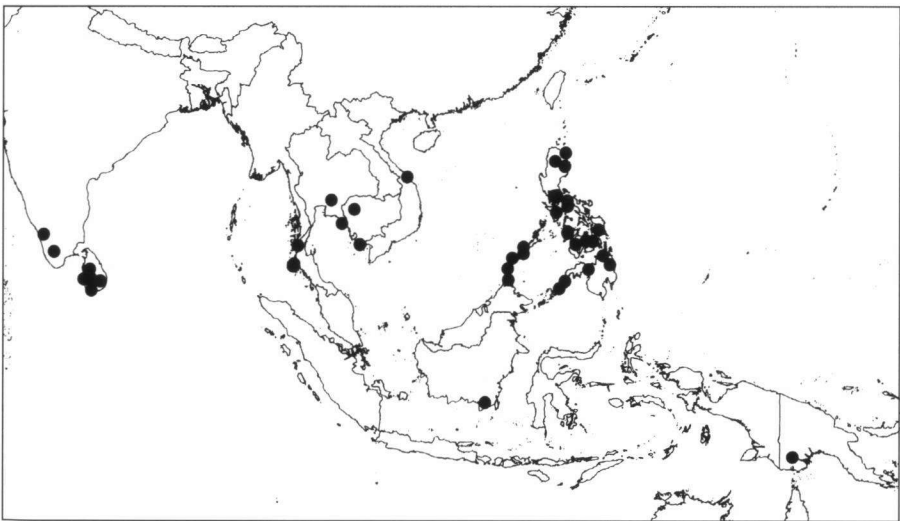
*Agrostistachys indica* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2 (1850) 41; Müll.Arg. in DC., Prodr. 15, 2 (1866) 726; Hook.f., Fl. Brit. India 5 (1887) 406; Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vi (1912) 103, f. 20 C, D; Airy Shaw, Kew Bull. 14 (1960) 472; 26 (1972) 210; 29 (1974) 312; Kew Bull. Add. Ser. 4 (1975) 26; 8 (1980) 24. — *Agrostistachys indica* Dalzell subsp. *genuina* Müll.Arg. in DC., Prodr. 15, 2 (1866) 726, nom. illeg.; Pax & K. Hoffm. in Engl., Pflanzenz. IV.147.vi (1912) 104. — Type: *Hb. Dalzell s.n.* (K, photo L), India, Bombay.

*Agrostistachys indica* Dalzell var. *longifolia* Müll.Arg. in DC., Prodr. 15, 2 (1866) 726; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vi (1912) 105. — *Agrostistachys longifolia* (Müll.Arg.) Kurz, Prelim. Rep. Forest Pegu (1875) App. A cxi, App. B 79; Forest Fl. Burma 2 (1877) 377. — *Agrostistachys indica* Dalzell var. *subintegra* Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vi (1912) 105, nom. illeg. — Type: *Helper KD 4921* (holo K, photo L; iso A, C), Myanmar, Tenasserim (see note 1 under *A. borneensis* and under *A. gaudichaudii*).

*Agrostistachys maesoana* Vidal, Revis. Pl. Vasc. Filip. (1886) 242; Merr., Enum. Philipp. Fl. Pl. 2 (1923) 428. — *Agrostistachys indica* Dalzell subsp. *longifolia* Müll.Arg. var. *maesoana* (Vidal) Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vi (1912) 105; Airy Shaw, Kew Bull. Add. Ser. 8 (1980) 24; Alph. Enum. Euphorb. Philipp. Isl. (1983) 3. — Type: *Vidal 897* (holo PNH†; iso A, L), Philippines, Luzon, Tayabas Prov., Guinayangan.

*Heterocalyx laoticus* Gagnep., Notul. Syst. 14 (1950) 33. — Syntypes: *Kerr 20895* (L, P), *Kerr 20895A* (L, P), Laos, Tawieng, Chieng-kwang.

Shrub or tree, up to 0.5 m high, dbh up to 3 cm; flowering twigs up to 3 mm thick, rather smooth, quite slender and flexible. *Outer bark* brown to yellowish green, grey mottled, smooth; inner bark yellow; sapwood white. *Leaves* alternate; stipules narrowly triangular, 4–17 by 2–4 mm, caducous, scars up to 5 cm below leaves; petiole 0.2–7 cm long; blade (narrowly) elliptic to obovate, 8–40 by 1.5–13 cm, index 2.2–5.7, papery to subcoriaceous, base attenuate, margin dentate, teeth ending in a gland, apex acute to caudate, shining on the upper surface, slightly paler beneath; venation yellowish beneath, nerves 10–27 per side, veins scalariform, veinlets scalariform to reticulate. *Inflorescences* single or up to c. 6 above each other, up to 3 cm long, subsericeous, white to dark green. *Bracts* overlapping each other and hiding rachis, also when flowers not in bud, ovate, 2–6 by 2–5 mm, yellowish green, apex acuminate, outside sericeous, venation distinctly parallel. *Flowers* single; pedicel sericeous; sepals 2–5, lobes ovate, margin ciliate, subsericeous to sericeous outside, nerves distinctly parallel; petals 5 (or 9), longer than sepals, imbricate, glabrous, margin entire, apex obtuse to acuminate, white to brownish red; disc lobes orbicular to broadly obovate, glabrous, dark brown



Map 4. The distribution of *Agrostistachys indica* Dalzell.

when dry. *Staminate flowers* 3.5–5 by 3–4 mm; pedicel 4–6 mm long; sepal lobes 3–4 by 2–3.5 mm, apex mucronate; petals ovate to narrowly obovate, 2–5 by 1–2.5 mm, cream; disc lobes 5–7(–10), 0.4–0.5 mm diam.; stamens 13–16, filaments basally united, 2.5–4 mm long; pistillode absent. *Pistillate flowers* 5–7 by c. 3 mm; pedicel c. 4 mm long; sepal lobes 3–5 by 1–2 mm, subapically mucronate, apex acute; petals orbicular to obovate, 2.5–3.5 by 1–1.5 mm, pinnate venation distinct; disc lobes 5 (or 10), 0.5–1 mm diam.; ovary 0.5–1.5 by 1–1.7 mm, sericeous; style c. 1 mm long, subsericeous; stigmas 3, 1–1.5 mm long, split in upper 0.5 mm, subsericeous below. *Fruits*: 12–13 by 8–10 mm high. *Seeds* 5–8 by 5–7 mm.

**Distribution** — S India, Sri Lanka, Myanmar, Laos, Vietnam, Thailand, Borneo, Philippines, Papua New Guinea.

**Habitat & Ecology** — Primary forests, secondary wet evergreen forests, dipterocarp forests; on low hills or ridges, frequent along dry water courses, rivers, and cascades, abundant in undergrowth. Soil: compact, clay, sand, among boulders. Altitude sea level to 400 m. Flowering: Jan., Feb., Apr. to July; fruiting: Mar. to July, Sept., Oct.

**Vernacular names** — Philippines: Haginis (Panay Bisaya); malagasaha (Kagascas, Tayabas Prov.); puso-pono (Quezon Prov., Tayabas Prov.); cacao-cacao/kakao-kakao (Bisaya); malacapé (Palawan Is.); ulam-ulam (Tagbanua); gaganis (Negros Occidental); (partly after Merrill, 1923).

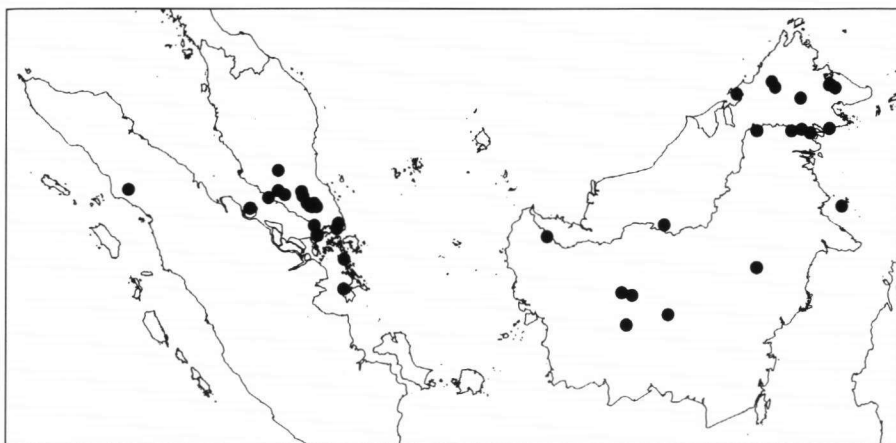
**Note** — The specimens of *A. indica* from India and Sri Lanka, (usually) have (linear) elliptic blades and long petioles; the specimens from Thailand and Vietnam obovate blades and long petioles; and the specimens from Borneo and Philippines (*A. maesoana*) obovate blades and short petioles (sometimes even indistinct).

## 5. *Agrostistachys sessilifolia* (Kurz) Pax & K. Hoffm. — Map 5

*Agrostistachys sessilifolia* (Kurz) Pax & K. Hoffm. in Engl., Pflanzern. IV.147.vi (1912) 102; Airy Shaw, Kew Bull. 20 (1966) 26; Kew Bull. Add. Ser. 4 (1975) 27; Kew Bull. 36 (1981) 249. — *Sarcoclinium sessilifolium* Kurz, Flora 33 (1875) 31. — Type: *Kurz s. n.* (K, photo L), Singapore. *Agrostistachys longifolia* (Wight) Trimen var. *malayana* Hook.f., Fl. Brit. India 5 (1887) 407. — Syntypes: *Griffith KD 4739* (C; K, photo L; L, P), Malacca; *Maingay KD 1407* (K, photo L; L), Malacca; *Wallich 7717* (K, photo L), Malaysia, Penang.

*Agrostistachys sessilifolia* (Kurz) Pax & K. Hoffm. var. *graciliflora* Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 27. — Type: *SAN 65844 (Talip)* (K; photo L), Sabah, Tawau Distr., Mt Wullersdorf.

Shrub, up to 6 m high, dbh up to c. 1.9 m; flowering twigs up to 1.5 cm thick, rather smooth. *Outer bark* grey; inner bark light brownish; sapwood yellowish. *Leaves* alternate to distichous to spiral; stipules triangular, 5–12 by 3–6 mm, late caducous, scars up to 1.5 cm below leaves, margin entire, apex aristate, venation distinctly parallel; petiole 0.2–0.5 cm long; blade obovate to linear obovate, 25–55 by 7–9.5 cm, index 3.5–5.6, coriaceous, base emarginate to rounded, margin entire to crenulate, apex acuminate to cuspidate, dark green above, light green below; nerves 15–30 per side, veins scalariform to reticulate, veinlets reticulate. *Inflorescences* axillary, single, up to 60 cm long, subsericeous. *Bracts* alternate to spiral, ovate to triangular, 2–5 by 2–3.5 mm, apex cuspidate to caudate, subsericeous outside, venation distinctly parallel. *Flowers* up to 10 together; pedicel sericeous; disc lobes orbicular to broadly ovate. *Staminate flowers* c. 4 by 2 mm; pedicel c. 3 mm long; sepals 2 or 3, 2–2.5 by c. 2 mm, margin entire, apex mucronate, glabrous; petals 5, obcordate, c. 1.5 by 1.5 mm,



Map 5. The distribution of *Agrostistachys sessilifolia* (Kurz) Pax & K. Hoffm.

white; disc lobes 5, c. 0.8 mm diam.; stamens 8–10, in two whorls, filaments basally free (outer whorl) or shortly connate (inner whorl), c. 3 mm long; pistillode 2- or 3-partite. *Pistillate flowers* c. 3 by 3 mm; pedicel c. 3 mm long; sepals 5, 2–4 by 1–1.5 mm, margin with trichomes, apex acute; petals ?, obcordate, c. 2–2.5 mm long; ovary c. 1.5 by 2.5–3 mm, sericeous; stigmas sessile, 3, 2–2.5 mm long, split in upper c. 0.5 mm part. *Fruits*: 0.5–1 by 0.5–1 cm high. *Seeds* 5–6 by 4–5 mm.

Distribution — Peninsular Malaysia, Singapore, Sumatra, Borneo.

Habitat & Ecology — Primary forests, evergreen forests, swampy forests, logged and disturbed forests; in low undulating country, on lower slopes or lower hillsides, on flat land, near the beach. In shaded area. Birds eat the fruit. Soil: acid sandy soils, and sedimentary rock. Altitude 30–150 m. Flowering and fruiting throughout the year.

Note — The specimens from N Borneo (formerly known as *A. sessilifolia* var. *graciliflora*) have smaller stipules, shorter and thinner inflorescences, and the leaves are less wide than those of the specimens from Singapore. We also found specimens with the two kinds of inflorescences together; therefore, the variety *graciliflora* cannot be accepted as a separate taxon.

## 6. *Agrostistachys staminodiatus* Sevilla, *spec. nov.* — Fig. 3a–d, g, Map 6

*Agrostistachyi borneensi* similissimus, floribus pistillatis staminodiis 10 gaudentibus differt. — Typus: *De Wilde & De Wilde-Duyfjes 19505* (holo L; iso L), North Sumatra, Aceh Prov., Gunung Leuser Nature Reserves, Sikundur Forest Reserve.

Shrub, up to c. 5 m high; monoecious; flowering twigs up to 6 mm thick, glabrous, smooth. *Leaves* alternate; stipules broadly obovate to orbicular, c. 5 by 5 mm, caducous to late caducous, scars up to 1.5 cm below leaves, margin ciliate, apex rounded to emarginate, trichomes adaxially, venation distinctly parallel; petiole 0.2–0.3 cm long; blade narrowly obovate, 32–45 by 8–11 cm, index 3–4.5, coriaceous, base attenuate, margin entire, apex acuminate to cuspidate; nerves 25–30 per side, veins scalariform, veinlets scalariform to reticulate. *Inflorescences* axillary and cauliflorous, single or



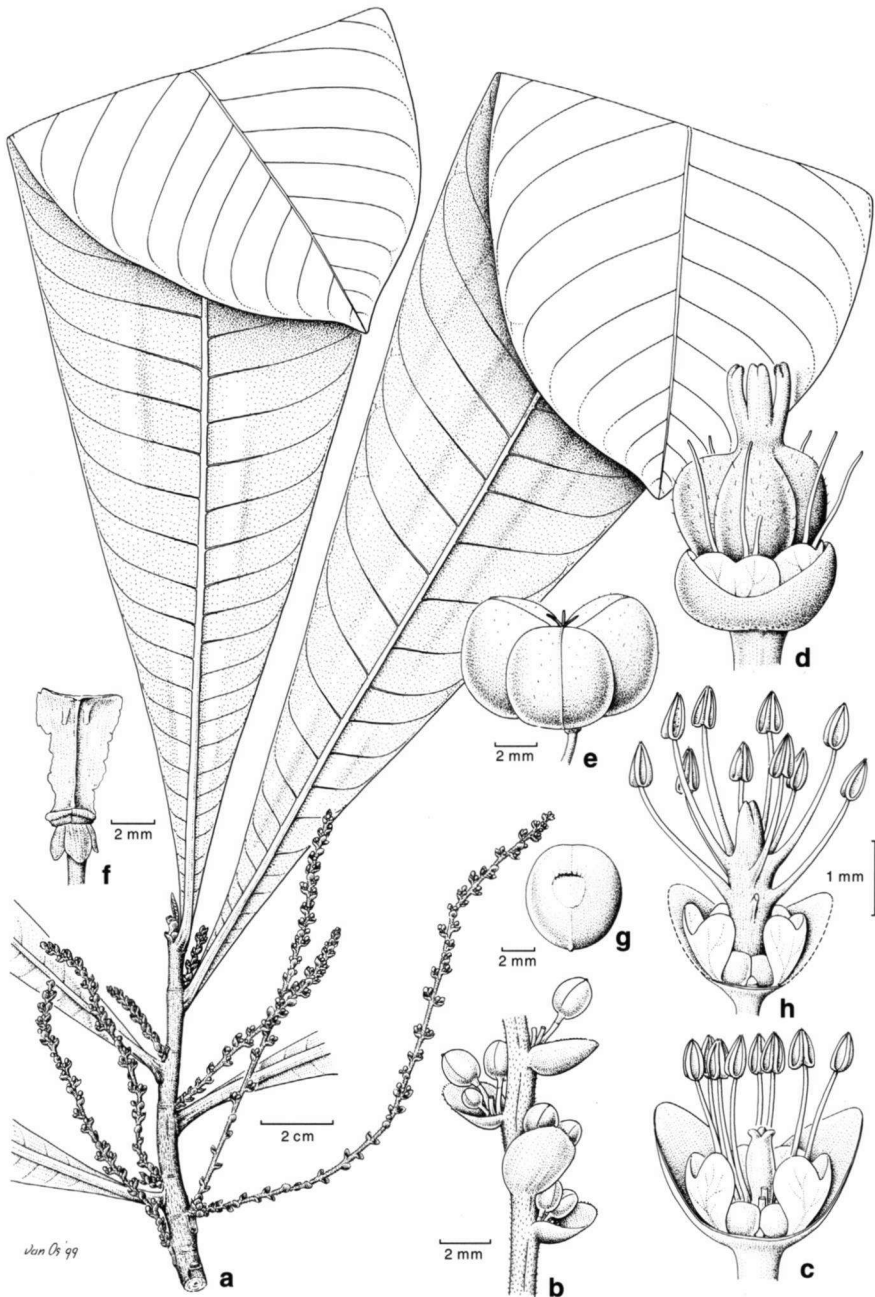
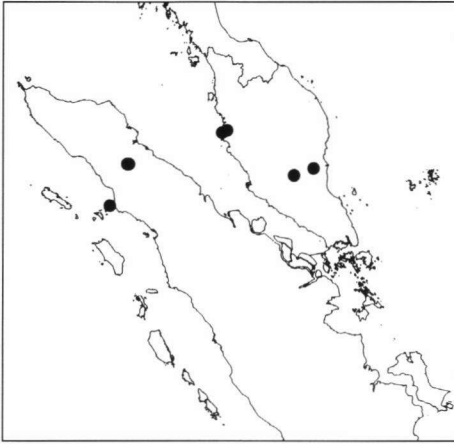


Fig. 3. *Agrostistachys* Dalzell. — a–d, g: *A. staminodiatum* Sevilla. a. Habit; b. part of staminate inflorescence with bracts; c. staminate flowers with free stamens; d. pistillate flower with staminodes; g. seed. — e, f, h: *A. borneensis* Becc. e. Fruit; f. fruit column after dehiscence; h. staminate flower with united stamens [a–c: KEP FRI 9223 (Burgess); d, g: De Wilde & De Wilde-Duyffjes 19505; e: Van Balgooy 2136; f: Kostermans 27714, h: KEP FRI 3926 (Whitmore); all L].



Map 6. The distribution of *Agrostistachys staminodiatius* Sevilla.

up to 3 above each other, up to 25 cm long, subsericeous to sericeous. *Bracts* alternate along rachis, broadly obovate to orbicular, 1–4 by 1–8 mm, margin with trichomes, apex rounded to emarginate, outside glabrous with papillae, inside with glands exuding white latex, nervation distinctly parallel. *Flowers* single or up to 8 together, staminate and pistillate flowers on same inflorescence, basally staminate, apically pistillate. *Staminate flowers* c. 3 by 3 mm; pedicel c. 1.5 mm long; sepals 2 or 3, lobes ovate, c. 1.5 by 2 mm, apex acuminate, outside glabrous, venation distinctly parallel; petals 5, c. 1.5 by 1.5–2 mm, shorter than sepals, glabrous, margin entire, apex irregular to obcordate; disc lobes 5, c. 5 mm diam.; stamens c. 10, filaments free, 2–3 mm long; pistillode present. *Pistillate flowers* 3.5–4 by 2.5–3 mm; pedicel c. 2 mm long, sericeous; sepals 2–5, lobes ovate, 1.5–2 by 1.5–2 mm, margin with trichomes; petals 5, 2–2.5 by c. 1.5 mm, margin entire, apex irregular; disc lobes 5 (sometimes incompletely divided), c. 0.5 mm high; staminodes c. 10, inserted between the disc lobes, c. 1.3 mm long; ovary c. 2 by 1.5–2.5 mm, glabrous to subsericeous; stigmas sessile, 3, 1–2 mm long, split in upper c. 0.5 mm part, glabrous. *Fruits*: c. 1.2 by 0.8 cm high. *Seeds* c. 0.5 by 0.4 mm.

Distribution — Peninsular Malaysia and Sumatra.

Habitat & Ecology — Shaded places in undisturbed dense forests; on c. 15 years old logged-over forests and recently logged-over forests. Soil: yellow sand-loam. Altitude 50–100 m. Flowering: July and Feb.; fruiting: May and Oct.

Vernacular name — Peninsular Malaysia: Jenjulung (Pahang).

#### EXCLUDED SPECIES

*Agrostistachys africana* Müll.Arg., Flora 47 (1864) 534. — Syntypes: *Mann 582* (B†), Fernando Po; *Mann 1079* (B†), St. Thomas. = *Pseudagrostistachys africana* (Müll.Arg.) Pax & K. Hoffm.

*Agrostistachys comorensis* Pax, Bot. Jahrb. Syst. 23 (1897) 523. — Syntypes: *Humboldt 382* (B†), Comores; *Humboldt 390* (B†), Comores; *Schmidt 191* (B†), Comores. = *Tannodia cordifolia* (Baill.) Baill.

*Agrostistachys pubescens* Merr., Philipp. J. Sci., Bot. 4 (1909) 274. — Type: *FB 5940* (*Curran*) (holo PNH†; iso K, US), Philippines, Luzon, Province of Bataan, Mabayo. = *Wetria insignis* (Steud.) Airy Shaw.

*Agrostistachys ugandensis* Hutch., Kew Bull. (1917) 233. — Syntypes: *Fyffe 19* (K, photo L), Uganda, Namalala Forest; *Fyffe 64* (K, photo L), Uganda, Namalala Forest. = *Pseudagrostistachys ugandensis* (Hutch.) Pax & K. Hoffm.

## CHONDROSTYLIS

This genus was described by Boerlage (1897) with the single species *Chondrostylis bancana*, a shrub, originating from the island of Bangka and grown in the Botanic Gardens of Bogor (formerly Buitenzorg). It was not possible to classify the new genus properly within the family, because only female flowers were known. However, Boerlage noted that *Chondrostylis* had points in common with a number of genera in the subtribe Acalyphaeae, whilst at the same time it showed a striking resemblance in vegetative characteristics with the genus *Agrostistachys* Dalzell, then referred to tribe Chrozophoreae.

Koorders (1904) noticed that Boerlage's type plant in the Botanic Gardens was again producing abundant female flowers, and subsequently fruits. A few days later he found the male flowers as well. Based on these, he concluded that *Chondrostylis* should be referred to subtribe Mercurialinae, close to the American genus *Bernardia*. This position was accepted for *Chondrostylis* by Pax & Hoffmann (1914, 1931), even though there really is little if anything in common in general appearance between the two genera (Airy Shaw, 1960a).

Airy Shaw (1960a) re-examined the material of Ridley's genus *Kunstlerodendron*, from Peninsular Malaysia (described from staminate plants only). He noticed its remarkable similarity in habit to *Agrostistachys* and he recalled Boerlage's remarks concerning the resemblance of his *Chondrostylis* to that genus. Further investigation showed *Kunstlerodendron* to be congeneric with *Chondrostylis*.

Webster (1994) classified *Chondrostylis* in the tribe Agrostichydeae, subfamily Acalyphoideae, together with *Agrostistachys*, *Pseudagrostistachys*, and *Cyttaranthus*. Typical characters of the genus are: monoecious shrubs to trees; indumentum consisting of simple hairs; leaves alternate, simple, petiole with glands at both sides of the apex or in the upper part, blade elliptic to obovate, base attenuate to rounded, with glands at the margin; inflorescences unisexual, axillary panicles; flowers without petals, disc hairy, lobed in staminate flowers and annular in pistillate flowers, stamens 30 or 31, filaments thread-like, anthers with 2 pairs of thecae, connective apically widening, pistillode absent; pistil 3-locular, stigmas sessile, split in upper part; fruit a rhagma, seeds obovoid with a very acute base and apically with a caruncle.

### *Chondrostylis* Boerl.

*Chondrostylis* Boerl., Icon. Bogor. 1 (1897) 71, t. 23; Koord., Ann. Jard. Bot. Buitenzorg 29 (1904) 45, pl. 4, 5; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 15; in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 104; Airy Shaw, Kew Bull. 14 (1960) 359; 26 (1972) 231; Whitmore, Tree Fl. Malaya 2 (1973) 77; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 69; Kew Bull. 36 (1981) 276; G.L. Webster, Ann. Missouri Bot. Gard. 81 (1994) 70. — Type species: *Chondrostylis bancana* Boerl.

[*Kunstlera* King ex Hook.f., Fl. Brit. India 5 (1887) 443, nom. nud., in observation]. — *Kunstlerodendron* Ridl., Fl. Malay Penins. 3 (1924) 283; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 230. — Type species: *Kunstlerodendron sublancoolata* Ridl. [= *Chondrostylis kunstleri* (King ex Hook.f.) Airy Shaw].

Shrubs to trees, monoecious; flowering twigs glabrous, rather smooth. *Indumentum* consisting of simple hairs only. *Leaves* alternate, simple; stipules linearly triangular, glabrous, base amplexicaul, margin entire, apex mucronate, venation distinctly parallel, caducous, scars up to 2 cm below the leaves; petiole reniform in transverse section, basally pulvinate, with glands at both sides of the apex or in the upper part; blade elliptic to obovate, symmetric, subcoriaceous to coriaceous, base attenuate to rounded, margin dentate to crenulate, teeth ending in a gland, apex acuminate to cuspidate, upper and lower surface smooth, glabrous, upper surface with glands; venation raised below, nerves 10–35 per side, looped at the margin, ending open or united, sometimes intramarginal veins, veins and veinlets scalariform to reticulate. *Inflorescences* unisexual, axillary panicles, single, subsericeous to sericeous, with groups of flowers per node. *Bracts and bracteoles* to the cymules keeled, thickened in the middle, ovate, margin ciliate, apex acuminate, outside glabrous to subsericeous with the central part sericeous. *Flowers* actinomorphic, white to cream to pale greenish to yellow; petals absent. *Staminate flowers*: pedicel glabrous to subsericeous; sepals 3 or 4, margin ciliate, apex acuminate to cuspidate, sericeous, outside subsericeous; disc lobes between the stamens, margin with hairs; stamens 30 or 31, glabrous, filaments free, thread-like, anthers with 2 pairs of thecae, connective broad, separating pairs of thecae, apically widening, with thecae only apically attached, opening more or less laterally, slits per pair adjoining; pistillode absent. *Pistillate flowers*: pedicel with abscission zone; sepals c. 5, bract-like, imbricate, free; disc annular, hairy; pistil 3-locular, 1 ovule per locule, ovary subsericeous, stigmas sessile, split in upper part, on upper surface with broad papillae, latter covered with smaller papillae. *Fruit* a rhagma, lobed, septical and partly apically loculicidal, smooth, glabrous to sericeous, sepals and stigmas persistent, wall thin, woody; column after dehiscence apically not broadened, with narrow, quite entire septal margins. *Seeds* obovoid, base very acute, apically with a caruncle.

Distribution — Two species, one in Peninsular Thailand, Peninsular Malaysia and Sumatra; the other in Sumatra and Borneo.

#### KEY TO THE SPECIES

- 1a. Petiole 0.2–1.5 cm long, with glands at both sides of the apex; blade narrowly obovate to linear elliptic, 16–70 by 3.5–17 cm, base emarginate to rounded . . . . . **1. C. bancana**  
 b. Petiole 2–10 cm long, sometimes with glands at the upper part; blade elliptic to narrowly elliptic, 7–45 by 2–15 cm, base attenuate . . . . . **2. C. kunstleri**

#### 1. *Chondrostylis bancana* Boerl. — Fig. 4g, h, Map 7

*Chondrostylis bancana* Boerl., Icon. Bogor. 1 (1897) t. 23; Koord., Ann. Jard. Bot. Buitenzorg 29 (1904) 45, pl. 4, 5; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 15; Airy Shaw, Kew Bull. 14 (1960) 359; 36 (1981) 276. — Lectotype (assigned here): Boerlage, Icon. Bogor. 1, t. 23, Indonesia, Bogor Botanical Garden (see note).

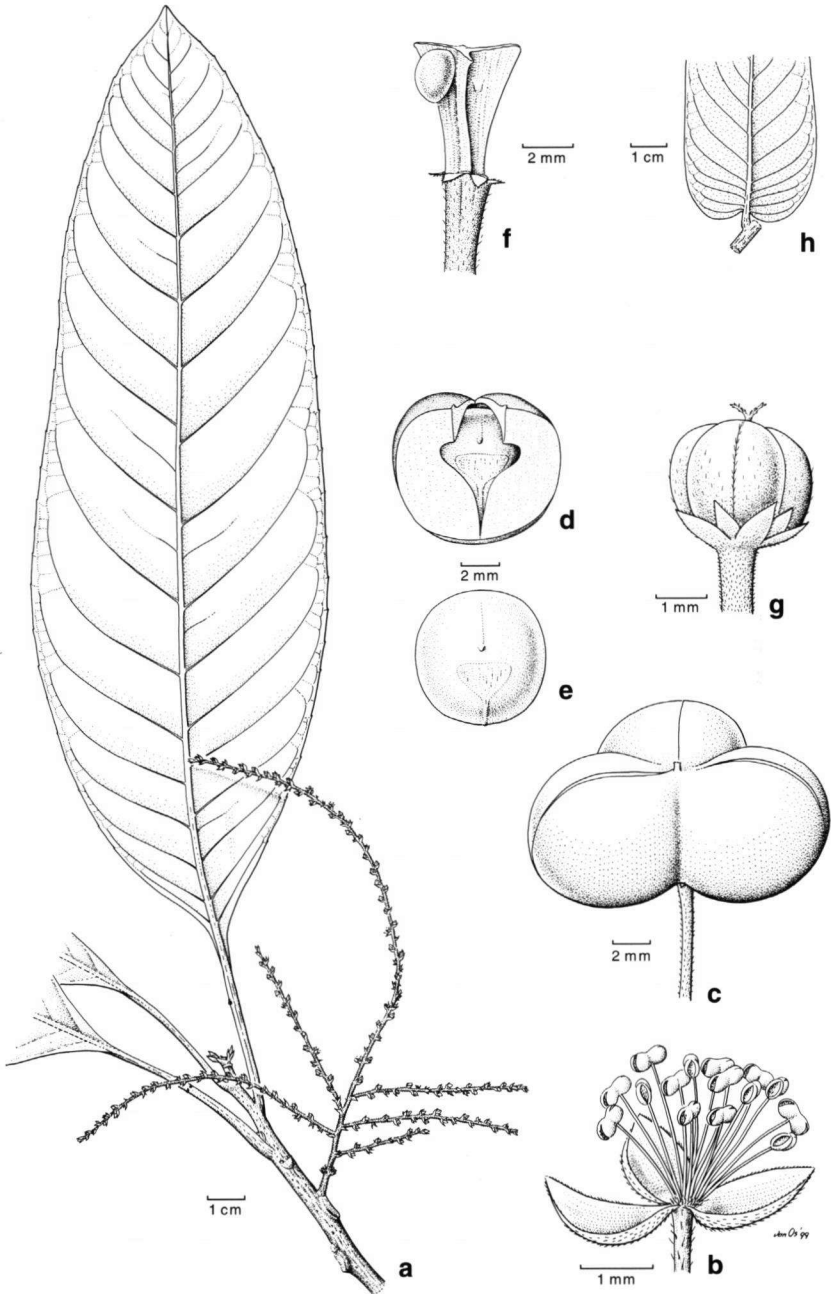
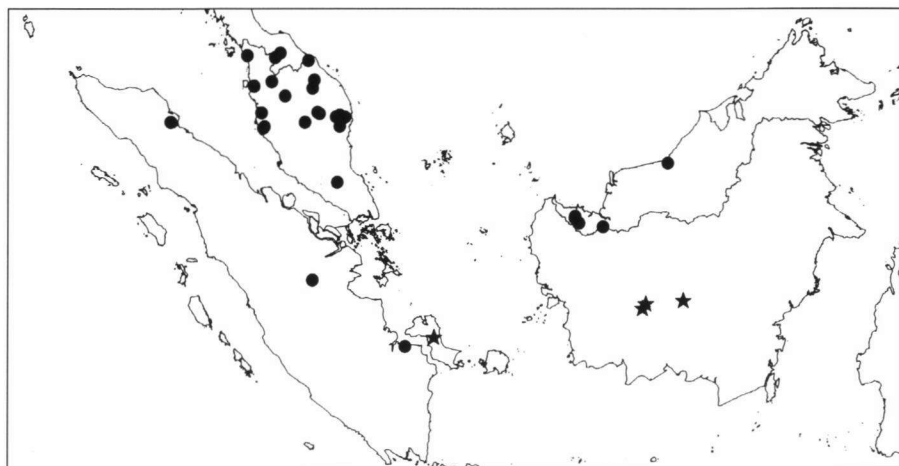


Fig. 4. *Chondrostylis* Boerl. — a–f: *C. kunstleri* (King ex Hook. f.) Airy Shaw. a. Habit, leaf base attenuate; b. staminate flower; c. fruit; d. septicidally and partly loculicidally dehiscent fruit lobe with seed; e. seed; f. fruit column. — g, h: *C. bancana* Boerl. g. Pistillate flower; h. leaf base emarginate [a: SF 30062 (Corner); b: SF 39882 (Sinclair & Kiah bin Salleh); c–e: KEP FRI 4103 (Whitmore); f: KEP 78644 (Wyatt-Smith); g, h: Mogeia 4304; all L except a: BM].



Map 7. The distribution of *Chondrostylis bancana* Boerl. (★) and *Chondrostylis kunstleri* (King ex Hook. f.) Airy Shaw (●).

Shrubs, up to 5 m high; flowering twigs up to 1 cm thick. *Outer bark* brown, smooth. *Leaves*: stipules c. 2 by 0.2 cm, scars up to 2 cm below leaves; petiole 0.2–1.5 cm long, with glands at both sides of the apex; blade narrowly obovate to linear elliptic, 16–70 by 3.5–17 cm, index 4–6, coriaceous, base emarginate to rounded; nerves 20–35 per side, almost always intercalated with smaller ones, largest nerves marginally closed. *Inflorescences* up to 30 cm long. *Bracts and bracteoles* 1–2 by 1–1.5 mm. *Flowers*: pedicels sericeous, pale greenish to yellow. *Staminate flowers* 2–3 by 1–2 mm; pedicel c. 1.5 mm long; sepals 4, 2.5–3.5 by 1–1.5 mm, nerves darker inside, disc lobes 0.2–0.5 mm high; stamens c. 31, filaments 3–4 mm long. *Pistillate flowers* 2–3 by 2–3 mm; pedicel 2–3 mm long, sepals 5, c. 1.5 by 1 mm, imbricate, free; disc not seen; ovary 1–2 by c. 2 mm, stigmas c. 1 mm long, split in upper 0.5 mm. *Fruit* c. 1 by 1.5 cm high, glabrous. *Seeds* 5–7 by 6–8 mm.

Distribution — Sumatra (Bangka), Borneo (C Kalimantan).

Habitat & Ecology — Primary forests, lowland mixed dipterocarp forests, evergreen forests, along logging areas, rivers, on hill slopes and ridges; recorded to grow on well-drained ground. Altitude 50–200 m. Flowering and fruiting: Dec. to Mar.

Note — No specimens matching Boerlage's plate, nor specimens bearing his writing or the species name could be found, therefore a plate is selected as lectotype.

## 2. *Chondrostylis kunstleri* (King ex Hook. f.) Airy Shaw — Fig. 4a–f, Map 7

*Chondrostylis kunstleri* (King ex Hook. f.) Airy Shaw, Kew Bull. 14 (1960) 359; 16 (1963) 345; 20 (1966) 27, 398; 26 (1972) 231; Whitmore, Tree Fl. Malaya 2 (1973) 77; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 69; Kew Bull. 36 (1981) 277. — *Mallotus ? kunstleri* King ex Hook. f., Fl. Brit. India 5 (1887) 443. — *Kunstleria glumacea* King ex Hook. f., Fl. Brit. India 5 (1887) 443, in observation. — *Kunstlerodendron sublancoolata* Ridl., Fl. Malay Penins. 3 (1924) 283, nom. superfl.; Pax & K. Hoffm. in Engl. & Harms, Nat. Pflanzenfam. ed. 2, 19c (1931) 230. — Lectotype (selected here): King's coll. 4252 (holo K; photo L), Malaysia, Perak, Larut.

Shrub to tree, up to 17 m high, dbh up to 11 cm; flowering twigs up to 7 mm thick. *Outer bark* fawn, dark reddish brown to greyish brown, smooth; inner bark orange to brown, granular; sapwood white to cream. *Leaves*: stipules 7–10 by 2–3 mm, scars up to 2 cm below leaves; petiole 2–10 cm long, sometimes with glands at the upper part; blade elliptic to narrowly elliptic, 7–45 by 2–15 cm, index 2.4–4.5, subcoriaceous to coriaceous, base attenuate; nerves 10–25 per side, at the margin open (few times closed, forming intramarginal vein). *Inflorescences* up to 25 cm long. *Bracts and bracteoles* 1–1.5 by c. 1 mm. *Staminate flowers* 2–3 by 2.5–3.5 mm; pedicel c. 1 mm long; sepals 3 or 4, c. 2.5 by 1 mm; stamens c. 30, filaments 2–3 mm long. *Pistillode flowers* c. 3 by 4 mm; pedicel c. 1.5 mm long; sepals c. 1.5 by 1 mm; disc 0.5 mm high; ovary 2–2.5 by 2.5–3 mm long, stigmas 2 mm long, split in upper 0.5 mm. *Fruit* 0.4–1 by 0.5–1.5 cm high, glabrous to sericeous. *Seeds* 5–12 by 4–7 mm.

Distribution — Peninsular Thailand, Peninsular Malaysia, Sumatra, Borneo (Sarawak).

Habitat & Ecology — Primary lowland mixed dipterocarp forests, evergreen forests; on hillsides and ridges, often near streams or rivers. Soil: sandy loam, clay-loam; bedrock granite. Altitude 70–2310 m. Flowering: Apr. to Aug.; fruiting: June to Nov.

Vernacular names — Peninsular Malaysia: Maloputo, lidah sapi; julong-julong (Pahang); jenjulong (Perak). Borneo (Sarawak): Malau puchok.

#### EXCLUDED SPECIES

*Kunstlerodendron cuspidata* Ridl., Fl. Malay Penins. 3 (1924) 283. — Type: Ridley 7911 (K, n.v.), Malaysia, Dindings, Telok Sera. = *Mallotus wrayi* King ex Hook.f. (see Airy Shaw, 1960a: 361).

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#### IDENTIFICATION LIST

The numbers after the collector numbers refer to the following species:

- |  |  |
|--|--|
| 1 = <i>Agrostistachys borneensis</i>   | 5 = <i>Agrostistachys sessilifolia</i>   |
| 2 = <i>Agrostistachys gaudichaudii</i> | 6 = <i>Agrostistachys staminodiatius</i> |
| 3 = <i>Agrostistachys hookeri</i>      | 7 = <i>Chondrostylis bancana</i>         |
| 4 = <i>Agrostistachys indica</i>       | 8 = <i>Chondrostylis kunstleri</i>       |

Abbe & Abbe 10142: 5 — Afriastini 1853: 1 — Alston 261: 4 — Amdjah 994: 5 — Anstead 75: 1 — Argent & Saridan 931: 5; 9327: 7 — Atkins 586: 1.



- Beccari PB 1381: 1; PB 3117: 1 — Bernardi 16095: 1 — Bernstein JHB 381: 1 — Boden Kloss 19232: 4 — Bogor Botanical Garden II.H.8: 7; II.I.8: 7 — Brass 7970: 4 — Bremer & Bremer 826: 4; 866: 1; 896: 3; 1004: 1 — Brooke 8177: 1; 9703: 1; 9712: 1; 9826: 1 — BRUN series 89: 1; 141: 1 — BS series 13205: 4; 13320: 4; 28061: 4; 28683: 4; 31144: 4; 31145: 4; 33688: 1; 34573: 1; 40983: 4; 46153: 4; 78245: 4 — Bünnemeijer 7339: 5 — Burley 2061: 8 — Burley & Tukirin et al. 1152: 8 — Buwalda 7023: 8; 7096: 8.
- Castro 993: 5 — Chew Wee-lek CWL 1376: 1 — Chin, Ahmad & Mahmud 3114: 1 — Christensen 1242: 1 — Church 415: 5 — J. Clemens & M.S. Clemens 3613: 4 — M.S. Clemens 16755a: 4 — Congdon 469: 2 — Coode 7634: 1 — Cramer 4283: 1.
- Davidse & Sumithrarachchi 8723: 1 — De Wilde & De Wilde-Duyfjes 19505: 6; 20700: 6; 20701: 1; 21117: 6 — Docters van Leeuwen 10312: 1.
- Elmer 12851: 4; 13044: 4 — Everett 8: 4.
- FB series 4135: 4; 9140: 4; 21495: 4; 27302: 4; 28127: 4; 29193: 4; 30335: 1; 30871: 4 — Fischer 2798: 4.
- Gardner 781: 4 — Gaudichaud 66: 2 — Geesink, Hattink & Phengkhilai 6496: 4 — Gentry & Tagi 33790: 8 — Gianni 246: 5; 333: 5 — Govindarajalu 9470: 1 — Griffith KD 4739: 5 — Gwynne-Vaughan 556: 8.
- Haenke 106: 4 — Hallier 557: 4; 4557: 4 — B. Hansen & Smitinand 12201: 2; 12528: 2; 12529: 2 — C. Hansen 1150: 8; 1151: 8 — Haviland 976: 1 — Haviland & Hose 2278: 1; 2278a: 1 — Helfer KD 4921: 4 — Holttum 9290: 5 — Hoogland & Craven 10694: 1; 10698: 1 — Hose 162: 1 — Hotta 13484: 1 — Hou 452: 8 — Huber 849: 1 — Hullett 852: 2.
- Jayasuriya 928: 4; 936: 4; 1127: 3; 1196: 4; 1301: 4; 1739: 4 — Jayasuriya & Burt 1127: 3 — Jayasuriya, Cramer & Balasubramaniam 790: 1 — Jayasuriya & Dassanayake 1015: 1 — Jayasuriya & Gunatilleke 2971: 1; 3133: 1.
- Kadim & Noor 160: 5 — Kanehira & Hatusima 12735: 1 — Kato, Okamoto, Ueda & Walujo B-7746: 1 — KEP series 26809: 8; 78644: 8; 93330: 8; 94699: 1; 95029: 1; 98304: 1; 99808: 2; 99809: 2; 104630: 1; 110194: 2 — KEP FRI series 33: 2; 35: 2; 625: 1; 647: 1; 671: 1; 3023: 1; 3464: 2; 3770: 1; 3841: 5; 3926: 1; 3987: 5; 4103: 8; 4166: 8; 4172: 8; 4199: 8; 4641: 1; 4734: 1; 4907: 1; 4949: 2; 4950: 2; 6045: 1; 6058: 1; 6617: 5; 6797: 2; 6948: 2; 7209: 2; 8101: 1; 8253: 8; 8337: 8; 8368: 8; 8414: 8; 8661: 5; 8700: 5; 8777: 5; 8944: 8; 9223: 6; 10689: 8; 11733: 6; 11797: 1; 11849: 8; 12031: 1; 13121: 1; 13582: 6; 13741: 1; 13757: 2; 14248: 5; 14291: 5; 15855: 5; 16669: 1; 16902: 8; 17112: 1; 17739: 2; 17955: 2; 19251: 1; 20209: 8; 20758: 2; 22043: 1; 23367: 2; 25013: 2; 25587: 5; 28042: 8; 28047: 8; 28264: 1; 34225: 1; 36465: 1; 37448: 5 — Kerr 7424: 8; 7424a: 8; 7424b: 8; 11840: 4; 12193: 2; 19076: 2; 19076a: 2; 19829: 4; 20895: 4; 20895A: 4 — Kiah 24314: 8 — King's collector 3459: 1; 3523: 1; 4252: 8; 4669: 2; 5736: 2; 8629: 2 — KL series 3172: 5; 3384: 2; 3754: 2 — Kostermans 8980: 5; 12797: 5; 13071a: 5; 23484: 4; 24016: 1; 24211: 1; 24668: 3; 24768: 3; 26750: 4; 27073: 1; 27186: 1; 27218a: 3; 27219b: 3; 27235: 1; 27495: 1; 27499: 1; 27562: 1; 27570: 1; 27574: 1; 27693: 1; 27714: 1; 27724: 1; 28033: 1; 28105: 1; 28156: 1; 28281: 1; 28446: 3; 28717: 4.
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The accepted names are in roman type, the synonyms in *italics* and the new name in **bold**. The number after each name is the number of the species with as prefix the first letter of the genus. excl. = excluded species.

## Agrostistachys Dalzell [p. 77]

- africana* Müll.Arg. A-excl.  
*borneensis* Becc. A1  
*comorensis* Pax A-excl.  
*coriacea* Trimen A1  
*filipendula* Hook.f. A2  
*gaudichaudii* Baill. ex Müll.Arg. A2  
*hookeri* (Thwaites) Benth. & Hook.f. A3  
*indica* Dalzell A4  
 subsp. *genuina* Müll.Arg. A4  
 subsp. *longifolia* Müll.Arg.  
 var. *maesoana* Pax & K. Hoffm. A4  
 var. *longifolia* Müll.Arg. A4  
 var. *subintegra* Pax & K. Hoffm. A4  
*intramarginalis* Philcox A1  
*latifolia* (Hook.f.) Pax & K. Hoffm. A1  
*leptostachya* Pax & K. Hoffm. A1  
*longifolia* (Müll.Arg.) Kurz A4

## (Agrostistachys)

- longifolia* (Wight) Trimen A1  
 var. *latifolia* Hook.f. A1  
 var. *leptostachya* (Pax & K. Hoffm.)  
 Whitmore A1  
 var. *malayana* Hook.f. A5  
*maesoana* Vidal A4  
*maingayi* Hook.f. A2  
*meeboldii* Pax & K. Hoffm. A1  
*pubescens* Merr. A-excl.  
*sessilifolia* (Kurz) Pax & K. Hoffm. A5  
 var. *graciliflora* Airy Shaw A5  
**staminodiatus** Sevilla A6  
*ugandensis* Hutch. A-excl.
- Chondrostylis Boerl. [p. 89]  
*bancana* Boerl. C1  
*kunstleri* (King ex Hook.f.) Airy Shaw C2

- Heterocalyx* Gagnep. [p. 77]  
  *laoticus* Gagnep. A4  
*Kunstlera* King ex Hook.f. [p. 90]  
  *glumacea* King ex Hook.f. C2  
*Kunstlerodendron* Ridl. [p. 90]  
  *cuspidata* Ridl. C-excl.  
  *sublanceolata* Ridl. C2  
Mallotus *kunstleri* King ex Hook.f. C2  
  *wrayi* King ex Hook.f. C-excl.
- Pseudagrostistachys africana* (Müll.Arg.)  
  Pax & K. Hoffm. A-excl.  
  *ugandensis* (Hutch.) Pax & K. Hoffm. A-excl.  
*Sarcoclinium* Wight [p. 77]  
  *gaudichaudii* Baill. A2  
  *hookeri* Thwaites A3  
  *longifolia* Wight A1  
  *sessilifolium* Kurz A5  
Tannodia *cordifolia* (Baill.) Baill. A-excl.  
Wetria *insignis* (Steud.) Airy Shaw A-excl.