

Reorganization of the
Cercideae (Fabaceae: Caesalpinioideae)

By RICHARD WUNDERLIN,
KAI LARSEN & SUPEE SAKSUWAN LARSEN



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Synopsis

The Cercideae includes the genera *Cercis* L. (6 species), *Brenierea* Humbert (1 species), *Adenolobus* (Harv. ex Benth.) Torr. & Hillc. (2 species), *Griffonia* Baill. (4 species), and *Bauhinia* L. (ca. 300 species). *Bauhinia* is subdivided into subgenera *Bauhinia*, *Elayuna*, *Barklya*, and *Phanera*. Subgenus *Bauhinia* is subdivided into sections *Bauhinia*, *Pauletia*, *Amaria*, *Alvesia*, *Micralvesia*, *Telestria*, *Pseudophanera*, *Afrobauhinia*, and *Gigasiphon*; subgenus *Piliostigma* is subdivided into sections *Piliostigma* and *Benthamia*; subgenus *Barklya* is monotypic; subgenus *Phanera* is subdivided into sections *Phanera Lasiobema*, *Austrocercis*, *Palmatifolia*, *Lysiphyllum*, *Tubicalyx*, *Tylosema*, *Semla*, *Schnella*, *Caulotretus*, and *Pseudobauhinia*. Several sections of subgenera *Bauhinia* and *Phanera* are further subdivided into subsections and series. The reorganization results in 23 new combinations and 32 new infrageneric names. A key to subtribes, genera, and subgenera is given. A description of the tribe, each genus, and each infrageneric taxon is provided. Synonymy, typification, distribution, number of species, and representative or additional species are also given for each genus and infrageneric taxon.

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Key Words:

Taxonomy, Leguminosae, Cercideae (Caesalpinioideae), *Adenolobus*, *Bauhinia*,
Brenierea, *Cercis*, *Griffonia*.

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Introduction

The taxonomy of the leguminous tribe Cercideae has been in a state of flux since its establishment by Bronn (1822). Attempts by subsequent workers to organize the tribe at the generic and infrageneric level have been less than satisfactory. Treatments were often based on limited knowledge of the tribe and were often systems of convenience rather than phylogeny, frequently becoming unworkable as additional data became known. The purpose of this work is to propose a reorganization of the tribe into what is believed to be a phylogenetic system and one which will provide a solid systematic framework upon which to base future studies. This work amplifies and expands an overview of the tribe presented by Wunderlin, Larsen, and Larsen (1981). It is also hoped that the proposed classification will stimulate interest in the tribe.

The authors have examined specimens deposited in the major United States, tropical Asian, and European herbaria. Nearly all species of the tribe have been studied. In addition, a large number of the species have been seen in the field.

Well over half of the species have been examined palynologically, most with the aid of the scanning electron microscope (Ferguson & Pearce, 1986; Larsen, 1975; Larsen and Larsen, 1983). The palynological terminology mainly follows Erdtman (1969, 1971) supplemented by Faegri and Iversen (1974), Nilsson (1967), and Pragłowski and Punt (1973).

Certain morphological terms used in the systematic section and discussion may need clarification and are defined here.

Hypanthium: Used here in the broad sense and more or less synonymous with floral-tube, receptacle, or calyx-tube of other authors. This structure is probably of compound origin, consisting of fused torus, stamen filaments, and perianth bases. It may

or may not secrete nectar from the inner wall, thus nectar-tube is not appropriate.

Intrastipular trichomes: Small excrescences originating in a pectinate structure located between the stipules and the stem. The adpetiolar one may form a subulate projection or curved spine in some species of *Bauhinia*. Similar structures occur in association with the bracts and bracteoles, but are never spinescent.

Fertile stamen: A normally developed stamen.

Reduced stamen: A poorly developed stamen bearing a diminutive anther which may on occasion contain a few normal-sized pollen grains.

Staminode: A small filament without anthers and sometimes greatly modified.

Disc: A nectar-secreting structure arising from the mouth of the hypanthium. It is continuous or may be broken at the point where the gynophore arises from the abaxial wall of the hypanthium. This structure is found only in *Bauhinia* subgenus *Phanera* section *Lasiobema*. Similar appearing structures rarely reported for species outside this group are not believed to be homologous in origin.

Geographic names used for distributional statements pertaining to the eastern hemisphere are as follows.

Malesian Area: Malaysia, Indonesia, Philippines, New Guinea, peninsular Thailand south of the Isthmus of Kra, and Singapore.

Indochinese Peninsula: Burma, Thailand, Cambodia, Laos, and Viêt-Nam.

Southern Asia: India, Nepal, Bangladesh, Bhutan, Sri Lanka, and the Indochinese Peninsula.

Southern China: The Chinese provinces mainly south of the Yangtse Kiang River.

Malay Peninsula: West Malaysia, peninsular Thailand south of the Isthmus of Kra, and Singapore.

Historical Account

The first to deal with the assemblage was Bronn (1822) who erected the tribe Cercideae and placed in it the single genus *Cercis*. Simultaneously, he erected the tribe Cassieae and included 26 genera within its generous bounds, including *Bauhinia*.

Bentham (1840), apparently unaware of Bronn's work, established the tribe Bauhinieae and included in it five genera: *Bauhinia*, *Cercis*, *Casparia*, *Schnella*, and *Etaballia*. The tribe Bauhinieae, with the inclusion of *Cercis*, is thus contribal with *Cercideae*. Most authors, until recently, have used Bentham's tribal name, apparently unaware of Bronn's earlier name as was Bentham. Bentham (1865) later reduced the number of genera in his Bauhinieae to three: *Bauhinia*, *Cercis*, and a newly erected genus, *Bandieraea* (= *Griffonia*). *Etaballia* was placed in synonymy under *Inocarpus* in the Dalbergieae. Within *Bauhinia*, Bentham recognized nine sections: *Pauletia*, *Casparia*, *Piliostigma*, *Phanera*, *Lysiphyllum*, *Loxocalyx*, *Lasiobema*, *Adenolobus*, and *Schnella*.

Baillon (1870) essentially followed Bentham (1865) and recognized *Cercis*, *Griffonia*, and *Bauhinia*, the latter with 11 sections: *Pauletia*, *Amaria*, *Piliostigma*, *Lysiphyllum*, *Adenolobus*, *Schnella*, *Perlebia*, *Phanera*, *Casparia*, *Loxocalyx*, and *Lasiobema*.

Taubert (1892) followed Bentham and Baillon for the most part and also recognized *Cercis*, *Griffonia*, and *Bauhinia*. In *Bauhinia* he recognized 11 sections: *Pauletia*, *Amaria*, *Piliostigma*, *Lysiphyllum*, *Adenolobus*, *Schnella*, *Loxocalyx*, *Phanera*, *Lasiobema*, *Tylosema*, and *Casparia*.

Hutchinson (1964) differed from earlier workers by not recognizing tribes within the Caesalpiniaceae. Instead, he proposed five artificial groups of genera. This arrangement resulted in a fractionation of the *Cercideae*; viz. *Bauhinia* and *Griffonia* were placed in his "group two" and *Cercis* in his "group three".

More recently, Yakovlev (1972) briefly treated

the Fabaceae and placed *Bauhinia*, *Griffonia*, and *Barklya* in the tribe *Bauhinieae* and retained only *Cercis* in the *Cercideae*. The monotypic *Barklya* had previously been placed in the Sophoreae (Papilionoideae) on the basis of petal aestivation by Bentham (1864, 1865). Hutchinson (1964) similarly referred it to the papilionoids (Cadieae). On the basis of seed morphology, Corner (1976) suggested that it may be congeneric with *Bauhinia*. Wunderlin (1979) concurred with Corner and reduced it to synonymy under *Bauhinia*.

Wunderlin (1979) recognized only the *Cercideae* with two subtribes. The subtribe *Cercidinae* contained *Cercis*, *Griffonia*, and *Adenolobus* while *Bauhiniinae* contained only *Bauhinia*.

Finally, Wunderlin, Larsen, and Larsen (1981), slightly modified Wunderlin's treatment by including the overlooked and misplaced monotypic Madagascan genus *Brenierea* in *Bauhiniinae* with *Bauhinia*. This increased the number of genera in the tribe to five.

There has been little disagreement concerning the systematics of *Cercis*, *Brenierea*, and *Griffonia*, all small and distinctive genera.

Adenolobus was originally considered as a section of *Bauhinia* by Bentham (1865), Baillon (1870), and Taubert (1892), but was elevated to generic rank by Torre and Hillcoat (1955) and is now accepted as a small, distinct genus by most recent authors.

On the other hand, *Bauhinia* has been variously interpreted. Twenty-six segregate genera were created during its tortuous history (Wunderlin, 1976) although not all were recognized by any one author. In Africa, the segregate genera *Piliostigma*, *Tylosema*, and *Gigasiphon* have usually been upheld; e.g. Flora of West Tropical Africa (Hutchinson and Dalziel, 1958) and the Flora of Tropical East Africa (Brenan, 1967). Most authors of other recent African Floras have followed the treatments used in

these two major works. In Asia, Baker (1878) and Prain (1897) followed Bentham and considered *Bauhinia* a single large genus. However, de Wit (1956) disagreed with these workers and in his revision of the Malaysian Bauhinieae, recognized six segregate genera in addition to *Bauhinia*: *Lysiphyllum*, *Gigasiphon*, *Piliostigma*, *Bracteolanthus*, *Lasiobema*, and *Phanera*. Most later workers, on the other hand, have not followed de Wit, e.g. Larsen and Larsen (1973) and Larsen, Larsen, and Vidal, (1984) for Thailand, and Larsen, Larsen, and Vidal (1980) for Cambodia, Laos, and Viêt-Nam. In Australia, Bentham (1864) and Larsen and Larsen (1983) recognized the single genus *Bauhinia*. The true affinities of the Australian *Bauhinia syringifolia* were not fully known to Bentham who maintained this species in *Barklya* and referred it to the papilionoid tribe Sophoreae. In America, Britton and Rose (1930) departed from the then current trend of systematists. In their revision of the North Amer-

ican species (including Mexico, Central America, Panama, and the Antilles) they recognized *Alvesia*, *Caspereopsis*, *Casparia*, and *Schnella* as genera distinct from *Bauhinia*. Unfortunately, they erroneously adopted Kunth's concept of *Casparia*, placed in it the type species of *Bauhinia* L. and redefined *Bauhinia* in the sense of *Pauletia* Cav. This view was not followed by later workers who treated *Bauhinia* in the broad sense, e.g. Standley and Steyermark (1946) for Guatemala, Schery (1951) and Wunderlin (1976a) for Panama, and Wunderlin (1983) for Middle America (Mexico, Central America, Greater Antilles, and northern Lesser Antilles). In South America, *Bauhinia* has usually been maintained as a single large genus, e.g. Bentham (1870) for Brazil and Macbride (1943) for Peru. However, Britton and Killip (1936) recognized *Schnella*, *Amaria*, and *Caspereopsis* in addition to *Bauhinia* in a treatment of the group for Colombia.

Proposed Reclassification of the Cercideae

The authors propose the following reclassification of the Cercideae. The synoptic key to subtribes, genera, and subgenera is adapted from Wunderlin, Larsen, and Larsen (1981). A detailed description of the tribe, each genus, and each subgenus is provided. Descriptions of sections and lesser infrageneric taxa include just the characteristics which serve to distinguish them. Synonymy (including orthographic variants), typification, distribution, number of species, and representative or additional species are also given for each genus and infrageneric taxon.

Tribe Cercideae Bronn, De Formis Pl. Legum. 131. 1822. Type: *Cercis* L.

Trees or shrubs (sometimes semiscandent) with or without intrastipular spines (rarely shrubs with tendrils or thorns) or lianas (rarely vines) with (rarely without) simple tendrils; branches terete or angled, rarely modified into cladodes; leaves alternate, simple or bifoliate, blades entire or bilobed, usually with a small mucro at apex or between lobes of blade or leaflets; stipules deciduous or persistent; intrastipular trichomes variously developed, sometimes adpetiolar enlarged and spinescent, greatly reduced, glandular, or absent; flowers terminal or subterminal and axillary or cauliflorous, solitary, geminate, or in racemes, panicles, or corymbs, bisexual or unisexual (polygamous or dioecious), slightly to greatly zygomorphic; bracts usually small, deciduous or persistent; bracteoles minute to large, deciduous or persistent; hypanthium nearly absent to greatly elongate; calyx united, limb open or closed at apex before anthesis; petals (0-) 5 (-6); stamens slightly to greatly declinate, in alternate whorls of 5 each of 2 different lengths; filaments partly connate (monadelphous or diadelphous) or free; anthers ovate to linear, versatile, opening by a

longitudinal slit or a central pore in each theca; reduced stamens or staminodes sometimes present; eurypalynous; ovary 1- to many-ovulate; gynophore free or adnate to abaxial wall of hypanthium; style filiform, stout, or apparently absent; stigma peltate, capitate or little differentiated from style; fruits flattened or turgid, suborbicular to broadly elliptic, obovate or linear, thin-valved or woody, dehiscent (often explosively) or indehiscent, continuous, filled, or septate within; seeds orbicular to elliptic or pyriform, more or less compressed, hilum circular or crescentic, with or without 2 funicular aril-lobes usually adnate to testa, endosperm present or absent; $2n=14, 24, 26, 28$ (42, 56).

5 genera; 4 tropical, 1 in warm temperate northern hemisphere.

Synoptic Key to the Subtribes, Genera, and Subgenera of the Cercideae

1. Seeds with circular hilum; funicular aril-lobes absent I. subtribe Cercidinae
2. Fruits with dorsal wing; corolla pseudo-papilionaceous; temperate northern hemisphere 1. *Cercis*
2. Fruits without dorsal wing; corolla only slightly zygomorphic; tropical Africa.
 3. Gynophore free from abaxial wall of hypanthium; fruit with gynophore and persistent style appearing confluent with dorsal margin (semilunate), valves thin; shrubs or small trees 2. *Adenolobus*
 3. Gynophore connate with abaxial wall of hypanthium; fruit with gynophore and persistent style obliquely attached, valves thick; scandent shrubs or lianas 3. *Griffonia*
1. Seeds with crescentic hilum; funicular aril-lobes present II. subtribe Bauhiniinae

- 4. Branches modified into cladodes; petals absent 4. *Brenierea*
- 4. Branches not modified into cladodes; petals (1-) 5 (-6) 5. *Bauhinia*
- 5. Trees or shrubs (rarely semiscandent), sometimes with intrastipular spines, rarely with thorns, never with tendrils.
- 6. Calyx spathaceous or dividing to mouth of hypanthium into 2-5 lobes 5A. subgenus *Bauhinia*
- 6. Calyx lobed only in upper part.
- 7. Calyx closed and irregularly splitting at anthesis 5B. subgenus *Piliostigma*
- 7. Calyx open before anthesis 5C. subgenus *Barklya*
- 5. Lianas (rarely shrubs or vines) with tendrils (without in sect. *Pseudobauhinia*, sect. *Semla*, and some species in sect. *Lysiphylum* subsect. *Bracteolanthus* series *Australes*), never with intrastipular spines or thorns 5D. subgenus *Phanera*

I. Subtribe Cercidinae

Trees or shrubs, unarmed, without tendrils, rarely with hooked branches below inflorescence; fruits with narrow dorsal wing or semilunate with gynophore and persistent style confluent with dorsal margin or oblique with lateral gynophore and persistent style; seeds with circular hilum, funicular aril-lobes absent.

3 genera; 1 warm temperate northern hemisphere, 2 African.

- 1. *Cercis* Linnaeus, Sp. Pl. 374. 1753. Type: *Cercis siliquastrum* L. Lectotype designated by Britton and Schafer (1908).
Siliquastrum Duhamel du Monceau, Traité Arbres Arbust. 2: 263. 1755. ≡ *Cercis* L.

Trees or shrubs; leaves entire or emarginate, midrib with well developed secondary veins; stipules scale-

like, deciduous; intrastipular trichomes numerous, well developed; flowers cauliflorous in short fasciculate racemes or racemose, bisexual; hypanthium short, broadly cupulate, unilaterally inflated, shallowly 5-dentate; petals 5, purple or white, pseudopapilionaceous; fertile stamens 10, free, moderately declinate; anthers elliptic, small, opening by a longitudinal slit; pollen in monads, small to medium, 3-colporate, subspherical, sexine reticulate-foveolate; ovary few-ovulate; gynophore short, free, obliquely arising from base of hypanthium; style elongate; stigma small, little differentiated from style; fruits flat, thin-valved, with dorsal wing, tardily dehiscent; seeds ovate, endosperm present; 2n=14.

6 species; warm temperate northern hemisphere.

- 2. *Adenolobus* (Harvey) Torre & Hillcoat in Exell & Mendonça, Bol. Soc. Brot., ser. 2. 29: 37. 1956.
Bauhinia (without rank) *Adenolobus* Harvey in Harvey & Sonder, Fl. Cap. 2: 275. 1862. Type: *Bauhinia garipensis* E. Mey. [= *Adenolobus garipensis* (E. Mey.) Torre & Hillc.].
Bauhinia sect. *Adenolobus* (Harvey) Benthham in Benthham & Hooker f., Gen. Pl. 1: 576. 1865.

Shrubs or small trees; leaves shallowly 2-lobate, midrib with moderately developed secondary veins; stipules sagittate, deciduous; intrastipular trichomes minute; flowers in elongate racemes or on short lateral shoots and cauliflorous, bisexual; hypanthium short, subcampanulate; calyx 5-lobate to 1/2 its length; petals 5, yellow to reddish, subequal, erect; fertile stamens 10, free, slightly declinate; anthers elliptic, small, opening by a longitudinal slit; pollen in monads, 3-colporate, sexine finely rugulose; ovary few-ovulate; gynophore long, free; style elongate; stigma small, little differentiated from style; fruits flat, semilunate, gynophore and persistent style appearing confluent with dorsal margin, tardily dehiscent; seeds pyriform, endosperm present; 2n=28.

2 species in Namibia and Angola.

3. *Griffonia* Baillon, *Adansonia* 6: 188. 1865 (7. Oct.); non Hooker f., 1865 (ca. 19 Oct.) (Chrysobalanaceae). Type: *Griffonia physocarpa* Baill.
- Schotia* sect. *Schotiaria* de Candolle, *Prodr.* 2: 508. 1825. Type: *Schotia simplicifolia* Vahl ex DC. [= *Griffonia simplicifolia* (Vahl ex DC.) Baill.].
- Bandeiraea* Welwitsch ex Bentham in Bentham & Hooker f., *Gen. Pl.* 1: 577. 1865 (ca. 19 Oct.). Type: *Bandeiraea speciosa* Benth. [= *Griffonia simplicifolia* (Vahl ex DC.) Baill.]. Lectotype here redesignated. *Bandeiraea simplicifolia* (Vahl ex DC.) Benth. ex Oliv. was cited as the lectotype by Wunderlin (1976). However, this designation is rejected under Article 10, ICBN (Voss et al., 1983) since that species was not cited in the protolog.

Scandent shrubs or lianas, occasionally with hooked branches (tendrils?) below inflorescence; leaves entire, midrib with well developed secondary veins; stipules small, deciduous; intrastipular trichomes small; flowers in aggregate, pyramidal racemes, bisexual; hypanthium elongate, gradually enlarging towards mouth; calyx campanulate, shallowly 5-dentate; petals 5, reddish-orange, subequal, erect; fertile stamens 10, slightly declinate; anthers elliptic, small, opening by a longitudinal slit; pollen in monads, small to medium, 3-colporate, subspherical, sexine reticulate-foveolate; ovary few-ovulate; gynophore long, adnate with abaxial wall of hypanthium; style short; stigma small, little differentiated from style; fruits inflated or compressed, woody, dehiscent, with persistent style and gynophore obliquely attached; seeds orbicular, endosperm present; $2n=28$.

4 species; tropical west Africa.

II. Subtribe Bauhiniinae (Bentham) Wunderlin, *Phytologia* 44: 326. 1979.

Tribe Bauhiniace Bentham, *J. Bot. (Hooker)* 2: 74. 1840. Type: *Bauhinia* L.

Trees or shrubs (sometimes semiscandent), unarmed or with intrastipular spines (rarely shrubs with tendrils or thorns) or lianas (rarely vines) with (rarely without) simple tendrils; fruits flat, woody to thin-valved, dehiscent or indehiscent, never with dorsal wings, nor semilunate with gynophore appearing confluent with dorsal margin, nor oblique with lateral gynophore and persistent style; seeds with crescentic hilum, funicular aril-lobes present.

2 genera; 1 Madagascar, 1 pantropical.

4. *Brenierea* Humbert, *Compt. Rend. Hebd. Seances Acad. Sci.* 249: 1599. 1959. Type: *Brenierea insignis* Humbert.

Trees or shrubs, unarmed, without tendrils; branches modified into cladodes; leaves 2-foliolate; stipules deciduous; intrastipular trichomes minute; flowers in short, axillary, congested spikes, bisexual; hypanthium nearly absent; calyx closed at apex, 5-dentate in upper part; petals absent; fertile stamens 5, filaments free, slightly declinate, anthers ovate, opening by a longitudinal slit; pollen in monads, medium, 3-colporate, subspherical, sexine reticulate; staminodes 5, petaloid; gynophore short, free; style obsolete; stigma capitate; fruits flat, suborbicular, woody, dehiscent, continuous within, 2-seeded; seeds suborbicular-triangular, endosperm present; $2n=?$.

1 species; Madagascar.

5. *Bauhinia* Linnaeus, *Sp. Pl.* 374. 1753; non Kunth, 1824; nec Rafinesque, 1838. Type: *Bauhinia divaricata* L. Lectotype designated by Hitchcock and Green (1929).

Bauhina Corth., *Disp.* 22. 1790, orthographic error.

Bauhinia Wats., Proc. Amer. Acad. Arts 25: 147.
1890, orthographic error.

Trees or shrubs (sometimes semiscandent), unarmed or with intrastipular spines (rarely shrubs with tendrils or thorns) or lianas (rarely vines) with (rarely without) simple tendrils; branches terete or angled; leaves entire, 2-lobate, or 2-foliolate, midrib with weakly to strongly developed secondary veins; stipules various, deciduous or persistent; intrastipular trichomes variously developed, sometimes adpetiolar enlarged and forming a spine; flowers solitary or few to many in terminal or subterminal and axillary racemes, corymbs, or panicles (rarely cauliflorous), bisexual or rarely unisexual (polygamous or dioecious); hypanthium short-cupulate to long-tubular; calyx open or closed at apex, spathaceous or irregularly divided to mouth of hypanthium into 2-5 lobes or 5-lobed or -dentate in upper part; petals (1-) 5 (-6), white, various shades of red to purple, or yellow, subequal to greatly unequal; fertile stamens 0-10; filaments connate (monadelphous or diadelphous) or free, strongly to weakly declinate; anthers ovate to linear, opening by a longitudinal slit or a central pore in each theca; pollen in monads (rarely tetrads), (small), medium to large, inaperturate, 3- to 7-colpate, 3-7 porate, 3-7 colpate, 3- pororate or 3- to 7-colporoidate, prolate to spheroidal to oblate, sexine various; reduced stamens or staminodes often present; ovary 1- to many-ovulate; gynophore adnate with abaxial wall of hypanthium or free; style elongate or obsolete; stigma peltate, capitate or little differentiated from style; fruits flat, suborbicular to broadly elliptic or obovate to linear, woody or thin-valved, dehiscent (often explosively) or indehiscent, continuous, filled, or septate within, seeds suborbicular to elliptical, endosperm present or absent; $2n=24, 26, 28$ (42, 56).

Ca. 300 species; pantropical.

5A. Subgenus *Bauhinia*

Trees or shrubs (sometimes semiscandent) unarmed or with intrastipular spines; leaves entire, 2-lobate, or 2-foliolate, midrib with weakly to strongly developed secondary veins; stipules deciduous; intrastipular trichomes more or less well developed, sometimes adpetiolar enlarged and spinescent; flowers solitary or few to many in terminal or subterminal and axillary racemes or panicles, rarely cauliflorous, bisexual or rarely unisexual (occasionally polygamous or dioecious); hypanthium short-cupulate to long-tubular; calyx spathaceous or irregularly connate at apex and splitting at base or divided into 2-5 lobes; petals 1-5, subequal; fertile stamens 0-10, free or connate (monadelphous or diadelphous); anthers elliptic to linear, opening by a longitudinal slit; pollen in monads or rarely tetrads, medium to large, oblate to spherical to prolate-spherical, inaperturate, 3- to 7-colpate, 3-7-porate 3- to 7-colporoidate, or 3-7-colporate, sexine various; ovary few- to many-ovulate; gynophore adnate with the abaxial wall of hypanthium or free; style elongate; stigma peltate, capitate or little differentiated from style; fruits flat, elliptic-oblong to linear, woody, dehiscent (usually explosively) or rarely indehiscent; seeds suborbicular to elliptical, funicular aril-lobes variable, endosperm present or absent; $2n=24, 26, 28$ (42, 56).

Ca. 140 species; pantropical.

5A(1.0) Section *Bauhinia*

Trees or shrubs, unarmed; leaves entire, 2-lobate, or 2-foliolate, midrib with weakly developed secondary veins; inflorescences terminal or subterminal axillary racemes or panicles, leaves usually not reduced toward ends of branches; hypanthium cupulate to short-turbinate; calyx spathaceous; petals (1-) 5; fertile stamens 1 or 3, usually short-connate with staminodes; staminodes connate; pollen in monads, 3-colporate or 3-colporoidate, sexine striate, rarely striato-reticulate, occasionally with

supratectal processes; gynophore short adnate with abaxial wall of hypanthium; stigma peltate or sometimes oblique and little differentiated from style; fruits dehiscent; seeds with short funicular arillobes, endosperm present.

17 species; Mexico, adjacent United States (Texas), northern Central America, Greater Antilles, and northeastern Brazil.

5A(1.0a) Series *Bauhinia*

Casparia Kunth, Ann. Sci. Nat. (Paris) 1: 85. 1824 (? Jan.). Type: *Casparia pes-caprae* (Cavanilles) Kunth [= *Bauhinia pes-caprae* Cav.].

Bauhinia sect. *Casparia* (Kunth) de Candolle, Prodr. 2: 512. 1825.

Mandarus Rafinesque, Sylva Tellur. 122. 1838. ≡ *Bauhinia* L.

Casperea Kunth, Nov. Gen. Sp. 6: 317. 1824 (24 Apr.), orthographic variant.

Petals 5, obovate to narrowly elliptic, clawed; fertile stamen 1.

10 species; Mexico, adjacent United States (Texas), northern Central America, and the Greater Antilles.

Representative species: *B. lunarioides* A. Gray ex S. Wats., *B. macranthera* Benth. ex Hemsl., and *B. pringlei* S. Wats.

5A(1.0b) Series *Dipetalae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia dipetala* Hemsl.

Petala 1-4, linear-filiformia; stamen fertile 1.

Petals 1-4, linear-filiform; fertile stamen 1.

5 species; Mexico and Belize.

Representative species: *B. chapulhuacania* Wunderlin, *B. jucunda* Brandeg., and *B. fryxellii* Wunderlin.

5A(1.0c) Series *Coulterae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia coulteri* Macbr.

Petala 5, obovata, sessilia; stamina fertilia 3.

Petals 5, obovate, sessile; fertile stamens 3.

1 species; Mexico.

5A(1.0d) Series *Remotae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia pinheiroi* Wunderlin.

Petala 5, elliptica, unguiculata; stamina fertilia 3.

Petals 5, elliptic, clawed; fertile stamens 3.

1 species, northeastern Brazil.

5A(2.0) Section *Pauletia* (Cavanilles) de Candolle, Prodr. 2: 512. 1825.

Pauletia Cavanilles, Icon. 5:5. 1799. Type: *Pauletia inermis* Cav. [= *Bauhinia unguolata* L.]. Lectotype designated by de Wit (1956).

Trees or shrubs (sometimes semiscandent), unarmed or with intrastipular spines; leaves entire, 2-lobate, or rarely 2-foliolate, midrib with weakly developed secondary veins; inflorescences terminal or subterminal axillary pairs or solitary, leaves often reduced toward ends of flowering branches; hypanthium turbinate to tubular; calyx spathaceous or lobes irregularly connate at apex and splitting to base, becoming partly free; petals 5; fertile stamens 5 or 10, connate at base with reduced stamens or staminodes; pollen inaperturate, 3- to 7-colpate, 3- to 7-colporoidate, or 5-7-porate sexine reticulate, often with supratectal processes; gynophore partly adnate with abaxial wall of hypanthium; stigma peltate; fruits dehiscent or indehiscent; seeds with short or long funicular arillobes, endosperm present.

Ca. 70 species; tropical America and 2 species in Southern Asia, South China, and Malesian Area.

5A(2.0a) Series *Cansenia* (Rafinesque) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Cansenia*

Rafinesque, Sylva Tellur. 122. 1838. Type: *Can- senia ungulata* (L.) Raf. [= *Bauhinia ungulata* L.].
Lectotype designated by Wunderlin (1976).

Bauhinia Kunth, Ann. Sci. Nat. (Paris) 1: 85. 1824; non Linnaeus, 1753; nec Rafinesque, 1838.
Type: *Bauhinia aculeata* L. Lectotype designated by Britton & Rose (1930).

Bauhinia Rafinesque, Sylva Tellur. 121. 1838; non Linnaeus, 1753; nec Kunth, 1824. Type: *Bauhinia aculeata* L. Lectotype designated by Wunderlin (1976).

Armed with intrastipular spines or unarmed; calyx spathaceous or with lobes irregularly connate at apex and splitting at base, becoming partly or entirely free; petals linear; fertile stamens 10; pollen 3- to 7-colpate, or 3- to 7-colporoidate, sexine reticulate, often with supracteal processes; fruits dehiscent.

Ca. 50 species; tropical America.

Representative species: *B. bombaciflora* Ducke, *B. mollis* (Bong.) D. Dietr., and *B. pulchella* Benth.

5A(2.0b) Series *Acuminatae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia acuminata* L.

Spinae intrastipulares absentes; calyx spathiformis; petala lata; stamina fertilia 10; pollen inaperturatum, sexinum reticulatum processibus supractealibus; fructus dehiscens.

Intrastipular spines absent; calyx spathaceous; petals broad; fertile stamens 10; pollen inaperturate, sexine reticulate with supracteal processes; fruits dehiscent.

2 species; Southern Asia, South China, and Mal- esian Area.

Additional species: *B. hirsuta* Weinm.

5A(2.0c) Series *Perlebia* (Martius) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Perlebia* Martius in Spix & Martius, Reise Bras. 2: 555. 1828; non de Candolle, 1829 (Apiaceae). Type:

Perlebia bauhinioides Mart. [= *Bauhinia bauhinioides* (Mart.) Macbr.].

Bauhinia sect. *Perlebia* (Martius) Baillon, Hist. Pl. 2: 119. 1870.

Armed with intrastipular spines; calyx spathaceous or lobes irregularly connate at apex and splitting at base, becoming partly free; petals linear to filiform; fertile stamens 5; pollen 3- to 7-colpate, sexine reticulate with supracteal processes; fruits indehiscent.

1 species; Paraguay and adjacent Brazil and Argentina.

5A(2.0d) Series *Pentandrae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia pentandra* (Bong.) Vog. ex Dietr.

Spinae intrastipulares; calyx spathiformis vel lobi apice irregulariter connati et basi secedentes, librescentes in parte; petala linearia vel filiformia (raro anguste ellipto-spatulata); stamina fertilia 5 aut si 10 nunc alterna brevissima; pollen 3- to 7-colporatum, sexinum reticulatum processibus supractealibus; fructus dehiscentes.

Armed with intrastipular spines; calyx spathaceous or lobes irregularly connate at apex and splitting at base, becoming partly free; petals linear to filiform (rarely narrowly elliptic-spatulate); fertile stamens 5 or if 10 then alternate much shorter; pollen 3- to 7-colporate, sexine reticulate with supracteal processes; fruits dehiscent.

7 species; northern South America to Mexico.

Representative species: *B. rusbyii* Britt., *B. pauletia* Pers., and *B. hagenbeckii* Harms.

5A(2.0e) Series *Ariaria* (Cuervo Marquez) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Ariaria* Cuervo Marquez, Estud. Arq. Etno. Amer. 1: 141. 1920. Type: *Ariaria superba* C. Marq. [= *Bauhinia tarapotensis* Benth.].

Unarmed; calyx irregularly splitting to base in 2-5 lobes; petals linear-lanceolate; pollen 5-7-porate or 5-7-colpate, sexine reticulate with infratectal processes; fertile stamens 10; fruits dehiscent.

7 species; tropical America.

Representative species; *B. eilertsii* Pulle, *B. multinervia* (Kunth) DC., and *B. pichinchensis* Wunderlin.

5A(3.0) Section *Amaria* (S. Mutis) Endlicher, Gen. Pl. 1318. 1840. *Amaria* S. Mutis, Semanario Nueva Granada 2: 25. 1810. Type: *Amaria petiolata* S. Mutis ex DC. [= *Bauhinia petiolata* (S. Mutis ex DC.) Triana ex Hook. f.]. Lectotype designated by Britton & Killip (1936).

Trees or shrubs, unarmed; leaves entire, 2-lobate, or 2-foliolate, midrib with weakly developed secondary veins; inflorescences terminal or subterminal axillary racemes, leaves not reduced toward ends of branches; hypanthium turbinate; calyx spathaceous; petals 5; fertile stamens 3, 5, or 10, connate at base with reduced stamens or staminodes; pollen in monads, 3-colpate or 3-porate sexine reticulate with infratectal processes; gynophore partly adnate to abaxial wall of hypanthium; stigma peltate; fruits dehiscent; seeds with short or long funicular aril-lobes, endosperm present.

Ca. 15 species; northern South America to Mexico.

5A(3.0a) Series *Decandrae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia petiolata* (S. Mutis ex DC.) Triana ex Hook. f.

Stamina fertilia 10.

Fertile stamens 10.

Ca. 13 species; northern South America to Mexico.

Representative species: *B. beguinotii* Cuf., *B. cookii* Rose, and *B. seleriana* Harms.

5A(3.0b) Series *Triandrae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia pansamalana* Donn. Sm.

Stamina fertilia 3, omnis staminodia separato.

Fertile stamens 3, each separated by a staminode.

1 species; Mexico and Guatemala.

5A(3.0c) Series *Stenanthae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia stenantha* Diels

Stamina fertilia 5.

Fertile stamens 5.

1 species; Ecuador.

5A(4.0) Section *Alvesia* (Welwitsch) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Alvesia* Welwitsch, Anais Cons. Ultramar. Parte Não Off. ("Apont."), ser. 1. 1858: 587. 1859, nom. rej. vs. *Alvesia* Welwitsch, 1869 (Lamiaceae). Type: *Alvesia bauhinioides* Welw. [= *Bauhinia tomentosa* L.].

Shrubs or small trees, unarmed; leaves 2-lobate, midrib with weakly developed secondary veins; inflorescences subterminal axillary pairs or solitary, leaves not reduced toward ends of branches; hypanthium turbinate; calyx spathaceous; petals 5; fertile stamens 10, free; pollen in monads, 4- to 5-colpate, sexine consisting of closely spaced macroclavae; gynophore partly adnate to abaxial wall of hypanthium; stigma capitate; fruits dehiscent; seeds with short funicular aril-lobes, endosperm present.

Ca. 6 species; southern Africa, South China, Southern Asia, and Malesian Area.

Representative species: *B. kаланtha* Harms, *B. taitensis* Taub., and *B. mombassae* Vatke.

5A(5.0) Section *Micralvesia* Wunderlin, Larsen, et Larsen, sect. nov. Type: *Bauhinia viridescens* Desv.

Frutices vel arbores parvae, spinae intrastipulares absentes; folia 2-lobata, costa venis secundariis paulum evolutis; inflorescentiae racemi subterminales axillares, folia in extremitatibus ramulorum non reducta; hypanthium turbinatum; calyx spathiformis; petala 5, stamina fertilia 10, libera; pollen in monadibus, 3-colpatum vel 3-colpor(oid)atum, sexinum reticulatum vel striato-reticulatum; gynophorum liberum; stigma a stylo parum separatum; fructus dehiscentes; semina lobis arillorum funicularibus parvis, endospermio instructa.

Shurbs or small trees, usually unarmed; leaves 2-lobate, midrib with weakly developed secondary veins; inflorescences subterminal axillary racemes, leaves not reduced toward ends of branches; hypanthium turbinate; calyx usually spathaceous; petals 5, fertile stamens 10, free; pollen in monads, 3-colpate or 3-colpor(oid)ate, sexine reticulate or striato-reticulate; gynophore free; stigma little differentiated from style; fruits dehiscent; seeds with short funicular aril-lobes, endosperm present.

9 species; Africa, Southern Asia, South China, and Malesian Area.

5A(5.1) Subsection *Viridescentes* Wunderlin, Larsen, et Larsen, subsect. nov. Type: *Bauhinia viridescens* Desv.

Flores dioeci (raro polygami); fructus dehiscentes. Flowers dioecious (rarely polygamous); fruits dehiscent.

Ca. 4 species: Southern Asia, South China, and Malesian Area.

Representative species: *B. saccocalyx* Pierre, *B. brachycarpa* Wall. ex Benth., and *B. prainiana* Craib.

5A(5.2) Subsection *Racemosae* Wunderlin, Larsen, et Larsen, subsect. nov. Type: *Bauhinia racemosa* Lam.

Flores perfecti (raro polygami), fructus non dehiscentes.

Flowers perfect (rarely polygamous); fruits indehiscent.

2 species; Africa and Southern Asia.

Additional species: *B. rufescens* Lam.

5A(6.0) Section *Telestria* (Rafinesque) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Telestria* Rafinesque, Sylva Tellur. 122. 1838. Type: *Telestria purpurea* (L.) Raf. [= *Bauhinia purpurea* L.]. Lectotype designated by Wunderlin (1976).

Trees, unarmed; leaves 2-lobate, midrib with weakly developed secondary veins; inflorescences short terminal or subterminal racemes, leaves not reduced toward ends of branches; hypanthium turbinate; calyx spathaceous; petals 5; fertile stamens 1, 3, or 5 (rarely 4), short connate at base and with reduced stamens or stamens all free; pollen in monads, 3-colporoidate, sexine striate to striato-reticulate; gynophore free or essentially so; stigma peltate; fruits dehiscent; seeds with short funicular aril-lobes; endosperm present or absent.

3 species; Southern Asia.

5A(6.0a) Series *Purpureae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia purpurea* L.

Stamina fertilia 3 vel 5 (raro 4); semina endospermio nullo.

Fertile stamens 3 or 5 (rarely 4); seeds without endosperm.

2 species; Southern Asia.

Additional species: *B. variegata* L.

5A(6.0b) Series *Monoteles* (Rafinesque) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Monoteles* Rafinesque, Sylva Tellur. 122. 1838. Type: *Monoteles paradoxa* Raf., nom. illeg. [= *Bauhinia monandra* Kurz].

Caspareopsis Britton & Rose, N. Amer. Fl. 23: 217. 1930. Type: *Caspareopsis monandra* (Kurz) Britt. & Rose [= *Bauhina monandra* Kurz].

Fertile stamen 1; seeds with endosperm.
1 species; Burma (?).

5A(7.0) Section *Pseudophanera* Wunderlin, Larsen, et Larsen, sect. nov. Type: *Bauhinia pottsii* G. Don.

Frutices semiscandentes, spinae intrastipulares absentes; folia 2-lobata, costa venis secundariis paulum evolutis; inflorescentiae racemi terminales parvi, folia in extremitatibus ramulorum non reducta; hypanthium longe tubiforme; lobi calycis ad apicem irregulariter connati et basi secedentes, liberescens in parte; petala 5; stamina fertilia 3 (raro 4-5) liberi; pollen in tetradibus, 3-colporatum, sexinum foveolatum; gynophorum parieti abaxiali hypanthii adnatum; stigma capitatum; fructus dehiscentes; semina lobis arillorum funicularibus parvis, endospermio nullo.

Semiscandent shrubs, unarmed; leaves 2-lobate, midrib with weakly developed secondary veins; inflorescences short terminal racemes, leaves not reduced toward ends of branches; hypanthium long-tubular; calyx-lobes irregularly connate at apex and splitting at base, becoming partly free; petals 5; fertile stamens 3 (rarely 4-5), free; pollen in tetrads, 3-colporate, sexine foveolate; gynophore adnate with abaxial wall of hypanthium; stigma capitate; fruits dehiscent; seeds with short funicular aril-lobes, endosperm absent.

2 species; Southern Asia and Malesian Area.
Additional species: *B. phoenicea* Heyne.

5A(8.0) Section *Gigasiphon* (Drake del Castillo) Harms, Bot. Jahrb. Syst. 55: 55. 1917. *Gigasiphon* Drake del Castillo in Grandidier, Hist. Phys. Madagascar 30(1): 88.1902. Type: *Gigasiphon*

humblotianum (Baill.) Drake del Cast. [= *Bauhinia humblotiana* Baill.].

Trees, without intrastipular spines; leaves entire, midrib with strongly developed secondary veins; inflorescences terminal racemes, leaves not reduced toward ends of branches; hypanthium long-tubular; calyx irregularly more or less connate and becoming partly free or totally free; petals 5; fertile stamens 10, free; pollen in monads, 3-colporate, sexine rugulose or perforate to foveolate, occasionally with undulate tectum; gynophore adnate with abaxial wall of hypanthium; stigma little differentiated from style; fruits dehiscent; seeds with long funicular aril lobes, endosperm absent.

Ca. 5 species; Africa, Madagascar, and Malesian Area.

Representative species: *B. ampla* Spanog., *B. dolichocalyx* Merrill, and *B. schlechteri* Harms.

5A(9.0) Section *Afrobauhinia* Wunderlin, Larsen, et Larsen, sect. nov. Type: *Bauhinia petersiana* Bolle.

Frutices vel arbores parvae, spinae intrastipulares absentes; folia 2-lobata vel 2-foliolata, costa venis secundariis paulum evolutis; inflorescentiae racemi terminales vel subterminales axillares; hypanthium longe tubiforme; calyx spathiformis; petala 5; stamina fertilia 1, 3, 5, 8, vel 10, raro 4 vel 6, liberi; pollen in monadibus, 3-4-colpatum vel 3-colporatum, sexinum rugulosum, perforatum vel striatum gynophorum parieti abaxiali hypanthii adnatum; stigma a stylo paulum separatum; semina lobis arillorum funicularibus parvis, endospermio nullo.

Trees or shrubs (sometimes semiscandent), unarmed; leaves 2-lobate or 2-foliolate, midrib with weakly developed secondary veins; inflorescence terminal or subterminal axillary racemes; hypanthium long-tubular; calyx spathaceous; petals 5; fertile stamens 1, 3, 5, 8, or 10, rarely 4 or 6, free; pollen in monads, 3-4-colpate or 3-colporate, sexine rugulose, perforate or gynophore adnate to abaxial

wall of hypanthium; stigma little differentiated from style; fruits dehiscent; seeds with short funicular aril-lobes, endosperm absent.

Ca. 13 species; southern Africa and Madagascar.

5A(9.0a) Series *Galpinae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia galpinii* N. Br.

Stamina fertilia 3.

Fertile stamens 3.

1 species; South Africa.

5A(9.0b) Series *Porosae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia porosa* Boiv.

Stamen fertile 1.

Fertile stamen 1.

1 species; Madagascar.

5A(9.0c) Series *Aurantiacae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia aurantiaca* Boj.

Stamina fertilia 5.

Fertile stamens 5.

Ca. 9 species; southern Africa and Madagascar.

Representative species: *B. grevei* Drake del Cast.,

B. madagascariensis Desv., and *B. urbaniana* Oliv.

5A(9.0d) Series *Perplexae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia grandidieri* Baill.

Stamina fertilia 8 (5 grandia, 3 parva).

Fertile stamens 8 (5 large, 3 small).

1 species; Madagascar.

5A(9.0e) Series *Aboriginae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia hildebrandtii* Vatheke.

Stamina fertilia 10.

Fertile stamen 10.

1 species; Madagascar.

5B. Subgenus *Elayuna* (Rafinesque) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Elayuna* Rafinesque, Sylva Tellur. 145. 1838, nom. rej. vs. *Piliostigma* Hochstetter, 1946. Type: *Elayuna biloba* Rafinesque, nom. illeg. (*Bauhinia tamarindacea* Delile) [= *Bauhinia reticulata* DC.].

Trees or shrubs, unarmed or with thorns; leaves 2-lobed, midrib with weakly developed secondary veins; stipules deciduous; intrastipular trichomes small; flowers few to many in short to elongate, subterminal racemes or panicles, unisexual (dioecious) or bisexual; hypanthium short-turbinate; calyx 2-to 5-lobed or -dentate in upper part; petals 5, yellow, white, or pink, subequal; fertile stamens 0 or 10, free; anthers oblong, opening by a longitudinal slit; pollen in monads, medium, spheroidal, 3-porate or 3(4)-colporoidate, sexine microreticulate to microrugulose and usually with conspicuous spinules; ovary few- to many-ovulate; gynophore free or essentially so, slightly acentric; style elongate, short, or obsolete; stigma large, peltate; fruits linear-oblong, woody, indehiscent or dehiscent; seeds suborbicular, 1 funicular aril-lobe long, other short, endosperm present; $2n=24, 26, 28 (42)$.

Ca. 6 species; southeastern tropical America, Africa, Southern Asia, Malesian Area, and Australia.

5B(1.0) Section *Piliostigma* (Hochstetter) Benth in Benth & Hooker f., Gen. Pl. 1: 576. 1865. *Piliostigma* Hochstetter, Flora 29: 589. 1846. Type: *Piliostigma reticulatum* (DC.) Hochst. [= *Bauhinia reticulata* DC.]. Lectotype designated by Keay (1954).

Bauhinia (without rank) *Griponeura* Korthals, Verh. Nat. Gesch. Ned. Bezitt. Bot. 84. 1841. Type: *Bauhinia reticulata* DC.

Locellaria Welwitsch, Anais Cons. Ultramar. Parte Não Off. (»Apont.«), ser. 1: 1858: 588. 1859. Type: *Locellaria bauhinioides* Welw. [= *Bauhinia thonningii* Schumach.].

Pileostigma Benth. in Benth. & Hook. f., Gen. Pl. 1: 576. 1865, orthographic variant.

Plants unarmed; style short or absent; fruits indehiscent or tardily dehiscent.

4 species; Africa, Southern Asia, and Australia. Additional species: *B. malabarica* Roxb., *B. foveolata* Dalz., and *B. thonningii* Schumach.

5B(2.0) Section *Benthamia* Fortunato & Wunderlin, Parodiana 3: 319. 1985. Type: *Bauhinia glaziovii* Taub.

Plants armed with thorns; style elongate; fruits dehiscent.

2 species; southeastern tropical America. Additional species: *B. uruguayensis* Benth.

5C. Subgenus *Barklya* (F. von Mueller) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Barklya* F. von Mueller, J. Proc. Linn. Soc., Bot. 3: 158. 1859. Type: *Barklya syringifolia* F. v. Muell. [= *Bauhinia syringifolia* (F. v. Muell.) Wunderlin].

Trees, unarmed; leaves entire, midrib with moderately developed secondary veins; stipules deciduous; intrastipular trichomes minute; flowers in terminal or subterminal and axillary paniculate racemes, bisexual; hypanthium short-cupulate, calyx 5-dentate; petals 5(-6), orange-yellow, subequal; fertile stamens 10, free; anthers ovate-sagittate, opening by a longitudinal slit; pollen in monads, small, subprolate or prolate, 3-colporate, sexine perforate with undulate tectum; ovary few-ovulate; gynophore free; style short, slender; stigma small, not much differentiated from style; fruits thin-valved, tardily dehiscent; seeds oblong, funicular aril-lobes short, endosperm present; $2n=26$.

1 species, Australia.

5D. Subgenus *Phanera* (Loureiro) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Phanera* Loureiro, Fl. Cochinch. 37. 1790. Type: *Phanera coccinea* Lour. [= *Bauhinia coccinea* (Lour.) DC.].

Lianas, semiscandent shrubs, or rarely trees, with (rarely without) tendrils; leaves entire, 2-lobed, or 2-foliolate, midrib with weakly to strongly developed secondary veins; stipules deciduous or sometimes persistent; intrastipular trichomes minute, often represented by minute glands or apparently absent; flowers in terminal or subterminal corymbose or elongated racemes or panicles; hypanthium more or less elongate, sometimes dilated at base, or turbinate, open or solid; bracts and bracteoles usually small, rarely enlarged or occurring at the top of the pedicel and nearly enclosing the bud; calyx divided to mouth of hypanthium into 2-5 lobes or connate into 2-5 lobes above, closed or open at top before anthesis; nectiferous disc present or absent; petals subequal or unequal; fertile stamens 2, 3, or 10 (rarely 4); free; anthers oblong or sometimes linear, opening by a longitudinal slit or by a pore in the center of each theca; pollen in monads, medium to large, oblate to spherical to prolate, 3-colporate, 3-porate, or 3-pororate, sexine various; ovary few-to many-ovulate; gynophore free or adnate with abaxial wall of hypanthium; style elongate; stigma peltate or not well differentiated from style; fruits more or less flattened, suborbicular, linear, or linear-spatulate, woody or thin-valved, dehiscent or indehiscent; seeds suborbicular to elliptic, funicular aril-lobes long or short, endosperm present or absent; $2n=24, 26, 28$.

Ca. 150 species; pantropical, most abundant in Southern Asia, Malesian Area, and South America.

5D(1.0) Section *Phanera* (Loureiro) Wunderlin, Larsen, et Larsen, comb. nov. Basionym *Phanera* Loureiro, Fl. Cochinch. 37. 1790; autonymically established by de Wit (1956). Type: *Phanera coccinea* Lour. [= *Bauhinia coccinea* (Lour.) DC.] *Phanera* subg. *Phanera* sect. *Meganthera* de Wit, Rein-

wardtia 3: 440. 1956. Type: *Phanera semibifida* (Roxb.) Benth. [= *Bauhinia semibifida* Roxb.]

Lianas with tendrils; leaves entire or 2-lobate, midribs with weakly to moderately developed secondary veins; hypanthium turbinate to long-tubular; Calyx irregularly split in upper part or to mouth of hypanthium into 2-5 lobes; nectiferous structure rarely present, if present then tubular, arising from margin of hypanthium; fertile stamens 3 (rarely 2); reduced stamens or staminodes large to minute; anthers elliptic to linear, opening by a longitudinal slit; pollen 3-porate or 3-colporate, sexine perforate with undulate tectum, verrucose to clavate, rugulose, microreticulate to microrugulose with supracteal spines or foveolate to reticulate; gynophore adnate with abaxial wall of hypanthium; stigma peltate or little differentiated from style; fruits dehiscent or tardily dehiscent, woody or thin-valved; seeds with short funicular aril-lobes, endosperm present.

Ca. 55 species; Southern Asia, Malesian Area, and South China.

5D(1.1) Subsection *Phanerosiphon* (de Wit) Wunderlin, Larsen, et Larsen, comb. et stat. nov. Basionym: *Phanera* subg. *Phanera* sect. *Phanerosiphon* de Wit, Reinwardtia 3: 438. 1956. Type: *Phanera sylvanii* de Wit [= *Bauhinia sylvanii* (de Wit) Cusset].

Hypanthium 5-10 cm long; anthers ca. 1 cm long; pollen 3-colporate, sexine with undulate tectum.

1 species; Borneo.

5D(1.2) Subsection *Fulvae* (de Wit) Wunderlin, Larsen, et Larsen, comb. nov. Basionym *Phanera* subg. *Phanera* sect. *Micranthera* subsect. *Fulvae* de Wit, Reinwardtia 3: 475. 1956. Type: *Phanera fulva* (Bl. ex Miq.) Benth. [= *Bauhinia fulva* Bl. ex Miq.]

Phanera subg. *Phanera* sect. *Micranthera* de Wit, Rein-

wardtia 3: 470. 1956. Type: *Phanera integrifolia* (Roxb.) Benth. [= *Bauhinia integrifolia* Roxb.]

Hypanthium up to 3.5 cm long; anthers 1-3 mm long; pollen 3-porate or 3-colporate, sexine verrucose to clavate, microreticulate to microrugulose with supracteal spines, foveolate to reticulate, or rugulose or syncolpate, sexine verrucose to clavate.

Ca. 28 species; Southern Asia, Malesian Area, and South China.

5D(1.2a) Series *Fulvae* (de Wit) Wunderlin, Larsen, et Larsen, comb. et stat. nov. Basionym: *Phanera* subg. *Phanera* sect. *Micranthera* subsect. *Fulvae* de Wit, Reinwardtia 3: 475. 1956. Type: *Phanera fulva* (Bl. ex Miq.) Benth. [= *Bauhinia fulva* Bl. ex Miq.]

Phanera subg. *Phanera* sect. *Micranthera* subsect. *Ses-siles* de Wit, Reinwardtia 3: 483. 1956. Type: *Phanera glabrifolia* Benth. [= *Bauhinia glabrifolia* (Benth.) Baker].

Hypanthium shorter than or equalling sepals; calyx closed in bud; claw of petal shorter than blade; reduced stamens or staminodes not forming a digitate, fleshy structure.

Ca. 15 species; Southern Asia, Malesian Area, and South China.

Representative species: *B. endertii* Larsen & Larsen, *B. oranata* Kurz, and *B. khasiana* Baker.

5D(1.2b) Series *Corymbosae* (de Wit) Wunderlin, Larsen, et Larsen, comb. et stat. nov. Basionym: *Phanera* subg. *Phanera* sect. *Micranthera* subsect. *corymbosae* de Wit, Reinwardtia 3: 487. 1956. Type: *Phanera corymbosa* (Roxb. ex DC.) Benth. [= *Bauhinia corymbosa* Roxb. ex DC.].

Bauhinia sect. *Symphyopoda* de Candolle, Prodr. 2: 215. 1825. Type: *Bauhinia corymbosa* Roxb. ex DC. Lectotype here designated.

Hypanthium longer than or equalling sepals; calyx

closed in bud; claw of petal shorter than blade; reduced stamens or staminodes forming a digitate, fleshy structure; pollen syncolpate.

Ca. 6 species; Southern Asia, Malesian Area, and South China.

Representative species: *B. glauca* (Wall. ex Benth.) Benth., *B. lakhonensis* Gagnep., and *B. clemensiorum* Merr.

5D(1.2c) Series *Chloroxantheae* (de Wit) Wunderlin, Larsen, et Larsen, comb. et stat. nov. Basionym: *Phanera* subg. *Phanera* sect. *Micranthera* subsect. *Chloroxantheae* de Wit, Reinwardtia 3: 471. 1956. Type: *Phanera involucellata* (Kurz) de Wit [= *Bauhinia involucellata* Kurz].

Hypanthium shorter than or equalling sepals; calyx closed in bud; claw of petals longer than blade; reduced stamens or staminodes not forming a digitate, fleshy structure.

5 species; Indochinese Peninsula and Malesian Area.

Representative species: *B. similis* Craib, *B. bassacensis* Pierre ex Gagnep., and *B. bracteata* (Grah. ex Benth.) Baker.

5D(1.2d) Series *Loxocalyx* (Bentham) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Bauhinia* sect. *Loxocalyx* Bentham in Bentham & Hooker f., Gen. Pl. 1: 576. 1865. Type: *Phanera macrostachya* Benth. (*Bauhinia macrostachya* (Benth.) Baker. 1878, nom. illeg.; non Benth., 1840 [= *Bauhinia wallichii* Macbr.]).

Hypanthium shorter than or equalling sepals; calyx open in bud; claw of petal shorter than blade; reduced stamens or staminodes forming a digitate, fleshy structure.

2 species; Southern Asia, South China, and Japan.

Additional species: *B. japonica* Maxim.

5D(1.3) Subsection *Clavatae* (de Wit) Wunderlin, Larsen, et Larsen, comb. nov. Basionym *Phanera*

subg. *Phanera* sect. *Meganthera* subsect. *Clavatae* de Wit, Reinwardtia 3: 445. 1956. Type: *Phanera semibifida* (Roxb.) Benth. [= *Bauhinia semibifida* Roxb.]

Hypanthium up to 3.5 cm long; anthers (4-) 8-25 mm long; pollen 3-colporate, sexine coarse rugulose with minute pitting to microrugulose toward poles.

Ca. 25 species; Southern Asia and Malesian Area.

5D(1.3a) Series *Clavatae* (de Wit) Wunderlin, Larsen, et Larsen, comb. et stat. nov. Basionym: *Phanera* subg. *Phanera* sect. *Meganthera* subsect. *Clavatae* de Wit, Reinwardtia 3: 445. 1956. Type: *Phanera semibifida* (Roxb.) Benth. [= *Bauhinia semibifida* Roxb.].

Petals tardily caducous; stigma large, peltate.

Ca. 22 species; Southern Asia and Malesian Area.

Representative species: *B. coccinea* (Lour.) DC., *B. aherniana* Perk., and *B. excelsa* (Bl. ex Miq.) Larsen & Larsen.

5D(1.3b) Series *Insignes* (de Wit) Wunderlin, Larsen, et Larsen, comb. et stat. nov. Basionym: *Phanera* subg. *Phanera* sect. *Meganthera* subsect. *Insignes* de Wit, Reinwardtia 3: 440. 1956. Type: *Phanera praesignis* (Ridley) de Wit [= *Bauhinia praesignis* Ridley].

Petals early caducous; stigma small, little differentiated from style or capitate. 3 species; Malay Peninsula and Borneo.

Additional species: *B. audax* (de Wit) Cusset and *B. glabristipes* (de Wit) Cusset.

5D(2.0) Section *Lasiobema* (Korthals) Bentham in Bentham & Hooker f., Gen. Pl. 1: 576. 1865. *Bauhinia* (without rank) *Lasiobema* Korthals, Verh. Nat. Gesch. Ned. Bezitt. Bot. 84. 1841. Type: *Lasiobema anguinum* (Roxb.) Miq. [=

Bauhinia scandens L.]. Lectotype here redesignated. *Lasiobema scandens* (L.) de Wit, designated by de Wit (1956) as the lectotype of the genus is rejected under Article 10, ICBN (Voss et al., 1983) because that species was not cited in the protolog. Although attributed to Korthals by Miquel (1855) as a section and by de Wit (1956) as a subgenus of *Bauhinia*, Korthals actually published the name without rank. Bentham was the first to publish the name at a definite infrageneric rank.

Lasiobema (Korthals) Miquel, Fl. Ind. Bat. 1(1): 71. 1855.

Lianas with tendrils; leaves 2-lobate or rarely 2-foliate, midrib with weakly to moderately developed secondary veins; hypanthium turbinate; calyx remaining entire or splitting irregularly in upper part or to hypanthium into 2-5 lobes; nectiferous disc present; fertile stamens 3; staminodes minute; anthers elliptic, opening by a longitudinal slit; pollen 3-colporate, sexine rugulose to perforate, rarely microreticulate to microrugulose with supracteal spines; gynophore adnate with abaxial wall of hypanthium; stigma little differentiated from style; fruits dehiscent or tardily dehiscent, thin-valved or woody; seeds with short funicular aril-lobes, endosperm (?) absent.

Ca. 15 species; Southern Asia, Malesian Area, and South China.

5D(2.1) Subsection *Scandentes* Wunderlin, Larsen, et Larsen, subsect. nov. Type: *Bauhinia scandens* L.

Flores parvi, in racemos graciles dispositi; calyx remanens integer vel in superiore parte secedens; discus nectarifer omnino vel fere laevis. Fructus parvi, non dehiscentes.

Flowers small, in slender racemes; calyx 5-dentate, remaining cupshaped or only splitting irregularly in upper part; nectiferous disc smooth or nearly so; fruits small, indehiscent.

1 species; Southern Asia, Malesian Area, and South China.

5D(2.2) Subsection *Pullae* Wunderlin, Larsen, et Larsen, subsect. nov. Type: *Bauhinia pulla* Craib.

Flores mediocres, in racemos pyramidales dispositi; calyx ad os hypanthii fere secedens, lobi patentés; discus nectarifer irregulariter manifesto lobatus. Fructus magni, dehiscentes.

Flowers moderate-sized, in pyramidal racemes; calyx splitting nearly to mouth of hypanthium into 5 lobes, lobes spreading; nectiferous disc with distinctly irregular-lobed surface; fruits large, dehiscent.

1 species, Thailand and Cambodia.

5D(2.3) Subsection *Championae* Wunderlin, Larsen, et Larsen, subsect. nov. Type: *Bauhinia championii* Benth.

Flores parvi ad mediocres, in racemos graciles dispositi; calyx ad os hypanthii secedens in lobos 2-5 reflexos; discus nectarifer laevis vel fere sic. Fructus parvi, dehiscentes.

Flowers small- to moderate-sized in slender racemes; calyx splitting to mouth of hypanthium or nearly so into 2-5 lobes, lobes reflexed; nectiferous disc smooth or nearly so; fruits small, dehiscent.

Ca. 13 species; Southern Asia, Malesian Area, and South China.

Representative species: *B. calycina* Pierre ex Gagnep., *B. harmsiana* Hoss., and *B. penicilliloba* Pierre ex Gagnep.

5D(3.0) Section *Austrocercis* (de Wit) Wunderlin, Larsen, et Larsen, comb. et stat. nov. Basionym: *Phanera* subg. *Austrocercis* de Wit, Reinwardtia 3: 527. 1956. Type: *Phanera williamsii* (F. v. Muell.) de Wit [= *Bauhinia williamsii* F. v. Muell.].

Lianas with tendrils; leaves entire or emarginate, midribs with strongly developed secondary veins; hypanthium cupulate; calyx bilabiate, upper lobes of 2 fused sepals, ultimately splitting into separate sepals, recurved, lower lobe of 3 fused sepals; digitate fleshy body formed on adaxial rim of hypanthium; nectiferous disc absent; fertile stamens 3; staminodes 2, minute; anthers short, broad, opening by a longitudinal slit; pollen 3-colporate, sexine ungulose to perforate; gynophore adnate with abaxial wall of hypanthium; stigma little differentiated from style; fruits dehiscent, woody; seeds with short funicular aril-lobes, endosperm (?).

1 species; New Guinea.

5D(4.0) Section *Palmatifolia* (de Wit) Wunderlin, Larsen, et Larsen, comb. nov. Basionym: *Phanera* subg. *Biporina* sect. *Palmatifolia* de Wit, Reinwardtia 3: 492. 1956. Type: *Phanera bidentata* (Jack) Benth. [= *Bauhinia bidentata* Jack].

Phanera subg. *Biporina* de Wit, Reinwardtia 3: 490. 1956. Type: *Phanera foraminifera* (Gagnep.) de Wit [= *Bauhinia foraminifer* Gagnep.].

Phanera subg. *Biporina* sect. *Bifoliola* de Wit, Reinwardtia 3: 491. 1956. Type: *Phanera foraminifera* (Gagnep.) de Wit [= *Bauhinia foraminifer* Gagnep.].

Phanera subg. *Biporina* sect. *Cinnamomifolia* de Wit, Reinwardtia 3: 519. 1956. Type: *Phanera kochiana* (Korth.) Benth. [= *Bauhinia kochiana* Korth.].

Lianas with tendrils; leaves entire, 2-lobate, or 2-foliolate, midrib with weakly to strongly developed secondary veins; hypanthium turbinate to tubular; calyx irregularly split to mouth of hypanthium into 2-5 lobes; nectiferous disc absent; fertile stamens 3; reduced stamens or staminodes large to minute; anthers elliptic, opening by a central pore in each theca; pollen 3-porate, sexine perforate; gynophore adnate with abaxial wall of hypanthium; stigma peltate; fruits dehiscent, woody or thin-valved; seeds with short funicular aril-lobes, endosperm present.

Ca. 18 species; Malesian Area.

Representative species: *B. finlaysoniana* (Grah. ex Benth.) Baker, *B. elmeri* Merr., and *B. moultonii* Merr.

5D(5.0) Section *Lysiphyllum* Benth in Benth & Hooker f., Gen. Pl. 1: 576. 1865. Type: *Lysiphyllum cunninghamii* (Benth.) de Wit, [= *Bauhinia cunninghamii* (Benth.) Benth.]. Lectotype designated by de Wit (1956) as type of genus.

Lysiphyllum (Benth) de Wit, Reinwardtia 3: 431. 1956.

Lianas with tendrils or semiscandent shrubs with or without tendrils; leaves entire or 2-foliolate; hypanthium tubular or turbinate; calyx regularly split in upper part or to mouth of hypanthium into 3-5 lobes; nectiferous disc absent; fertile stamens 10; anthers elliptic to linear, opening by a longitudinal slit; pollen 3-colporate, sexine perforate with undulate tectum or rugulose or with irregularly shaped processes; gynophore free or adnate with abaxial wall of hypanthium; stigma peltate or capitate; fruits woody, dehiscent or indehiscent; seeds with short funicular aril-lobes, endosperm present.

9 species; Southern Asia, Malesian Area, Australia, and tropical east Africa.

5D(5.1) Subsection *Bracteolanthus* (de Wit) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Bracteolanthus* de Wit, Reinwardtia 3: 415. 1956. Type: *Bracteolanthus dipterus* (Bl. ex Miq.) de Wit. [= *Bauhinia diptera* Bl. ex Miq.].

Flowers small (petals up to 3 cm long); calyx splitting regularly only in upper part or to mouth of hypanthium into (3-) 5 lobes; pollen 3-colporate, sexine perforate with undulate tectum or rugulose.

6 species; Southern Asia, Malesian Area, and Australia.

5D(5.1a) Series *Australes* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia cunninghamii* (Benth.) Benth.

Frutices subscandentes vel arbusculae cirrhis carentes; calyx tantum in parte superiore regulatim fissus; gynophorum liberum; fructus non dehiscentes.

Semiscandent shrubs or small trees without tendrils; calyx splitting regularly only in upper part; gynophore free; fruits indehiscent.

2 species; Australia.

Additional species: *B. carronii* F. v. Muell.

5D(5.1b) Series *Hookerae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia hookeri* F. v. Muell.

Frutices subscandentes vel arbusculae cirrhis praediti vel carentes; calyx ad os hypanthii in (3-) 5 lobos fissus; gynophorum adnatum parieti abaxiali hypanthii; fructus indehiscens.

Semiscandent shrubs or small trees with or without tendrils; calyx splitting to the mouth of hypanthium into (3-) 5 lobes; gynophore adnate with abaxial wall of hypanthium; fruits tardily dehiscent.

2 species; Thailand, Malesian Area, and Australia.

Additional species: *B. binata* Blanco.

5D(5.1c) Series *Dipterae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia diptera* Bl. ex Miq.

Frutices altiscandentes cirrhis praediti; fructus dehiscentes.

Lianas with tendrils; calyx splitting more or less to the mouth of hypanthium into (3-) 5 lobes; gynophore free; fruits dehiscent.

2 species; Borneo.

Additional species: *B. dewitii* Larsen & Larsen.

5D(5.2) Subsection *Tournaya* (Schmitz) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Tournaya* Schmitz, Bull. Jard. Bot. Nat. Belg. 43: 397. 1973. Type: *Tournaya gossweileri* (Baker f.) Schmitz [= *B. gossweileri* Baker f.].

Flowers large (petals over 5 cm long); calyx splitting to mouth of hypanthium into (3-) 5 lobes; pollen 3-colporate, sexine consisting of irregularly shaped processes.

3 species; east Africa, Burma, and Thailand.

5D(5.2a) Series *Africanae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia gossweileri* Baker f.

Folia integra; fructus dehiscentes.

Leaves entire; fruit dehiscent.

1 species; east Africa.

5D(5.2b) Series *Winitae* Wunderlin, Larsen, et Larsen, ser. nov. Type: *Bauhinia winitii* Craib.

Folia 2-foliolata; fructus indehiscentes.

Leaves 2-foliolate; fruit indehiscent.

2 species; Burma and Thailand.

Additional species: *B. diphylla* Ham. ex Symes.

5D(6.0) Section *Tubicalyx* Wunderlin, Larsen, et Larsen, sect. nov. Type: *Bauhinia tubicalyx* Craib.

Frutices altiscandentes cirrhis praediti; folia integra, costa venis secundariis paulum evolutis; hypanthium turbinatum; calyx campanulatus, 5-dentatus, apertus ad apicem ante anthesin; discus nectarifer absens; stamina fertilia 3, antherae ellipticae apertae rimis longitudinalibus; pollen 3-colporatum, sexinum perforatum tecto undulato; gynophorum parieti abaxiali hypanthii adnatum; stigma capitatum; fructus lignosi, dehiscentes; sem-

ina lobis arillorum funicularibus parvis, endospermio praedita.

Lianas with tendrils; leaves entire, midrib with strongly developed secondary veins; hypanthium turbinate; calyx campanulate, 5-dentate, open at top before anthesis; nectiferous disc absent; fertile stamens 3, anthers elliptic, opening by a longitudinal slit; pollen 3-colporate, sexine perforate with undulate tectum; gynophore adnate to abaxial wall of hypanthium; stigma capitate; fruits woody, dehiscent; seeds with short funicular aril-lobes, endosperm present.

4 species; Indochinese Peninsula and Malay Peninsula.

Additional species: *B. cardinalis* Pierre ex Gagnep., *B. strychnoidea* Prain, and *B. strychnifolia* Craib.

5D(7.0) Section *Semla* Wunderlin, Larsen, et Larsen, sect. nov. Type: *Bauhinia semla* Wunderlin.

Arbores sine cirrhis; folia 3-lobata ad emarginata, costa venis secundariis moderate evolutis; hypanthium turbinatum; calyx ad os hypanthii irregulariter secedens in 2-4 lobos, discus nectarifer pulviniformis ex margine hypanthii orientus; stamina fertilia 3; pollen 3-colporatum, sexinum microrugulosum vel subtiliter perforatum processibus supractealibus; gynophorum parieti abaxiali hypanthii adnatum; stigma a stylo paulum distinctum; fructus dehiscentes; semina ignota.

Trees without tendrils; leaves 2-lobate to emarginate, midrib with moderately developed veins; hypanthium turbinate; calyx splitting irregularly to mouth of hypanthium into 2-4 lobes; nectiferous disc arising from margin of hypanthium, cushion-shaped; fertile stamens 3; pollen 3-colporate, sexine microrugulose or finely perforate with supracteal processes, gynophore adnate to abaxial wall of hypanthium; stigma little differentiated from style; fruits dehiscent; seeds unknown.

1 species; India, Pakistan, and Nepal.

5D(8.0) Section *Tylosema* Schweinfurth, Reliq. Kotsch. 17. 1868. Type: *Bauhinia fassoglensis* Kotschy ex Schweinfurth.

Tylosema (Schweinfurth) Torre & Hillcoat in Exell & Mendonça, Bol. Brot., ser. 2, 29: 38. 1955.

Trailing or climbing herbaceous or woody vines with or without tendrils; leaves 2-lobate, midrib with weakly developed secondary veins; hypanthium turbinate; calyx split to mouth of hypanthium into 2-5 lobes; nectiferous disc absent; upper petal smaller and bicallose at base; fertile stamens 2; anthers oblong, opening by a longitudinal slit; pollen 3-colporate, sexine perforate with undulate tectum; staminodes 8, unequal, some petaloid; gynophore adnate to abaxial wall of hypanthium; stigma small; fruits dehiscent, woody; seeds with short funicular aril-lobes with bifid apices, endosperm (?).

4 species; tropical western and central Africa.

Additional species: *B. argentea* Chiov., *B. humifusa* Pichi-Serm. & Roti-Mich., and *B. esculenta* Burch.

5D(9.0) Section *Schnella* (Raddi) Bentham in Bentham & Hooker f., Gen. Pl. 1: 576. 1865.

Schnella Raddi, Mem. Nat. Fis. Soc. Ital. Sci. Modena, St. Mem. Fis. 18: 411. 1820. Type: *Schnella macrostachya* Raddi [= *Bauhinia radiata* Vell.]. Lectotype designated by Britton and Rose (1930).

Lacara Sprengel, Neue Entdeck. Pflanzenk. 3: 56. 1822. Type: *Lacara triplinervia* Spreng. [? = *Bauhinia smilacina* (Schott) Steud.].

Caulotretus Richard ex Schott in Sprengel, Syst. Veg. 4(2): 406. 1827. Type: *Caulotretus smilacinus* Schott [= *Bauhinia smilacina* (Schott) Steud.].

Caulotretus sect. *Eucaulotretus* Endlicher, Gen. Pl. 1317. 1840, nom. illeg.

Lianas with tendrils; leaves entire or 2-lobate, midrib with weakly to moderately developed secondary veins; hypanthium turbinate; calyx irregularly 2-lobed or -dentate in upper part; nectiferous

disc absent; fertile stamens 10; anthers oblong, opening by a longitudinal slit; pollen 3-colporate, sexine perforate to microrugulose with supracteal processes; gynophore free; stigma peltate; fruits thin-valved, indehiscent or tardily dehiscent; seeds with short funicular aril-lobes, endosperm (?).

8 species; tropical America.

Representative: *B. microstachya* Macbr., *B. flexuosa* Moric, and *B. maximiliani* Benth.

5D(10.0) Section *Caulotretus* de Candolle, Prodr. 2: 516. 1825. Type: *Bauhinia glabra* Jacq. Lectotype here designated.

Lianas with tendrils; leaves entire, 2-lobate, or 2-foliolate, midrib with weakly developed secondary veins; hypanthium turbinate; calyx divided in upper part into 2-5 lobes; nectariferous disc absent; fertile stamens 10; anthers elliptic, opening by a longitudinal slit; pollen 3-colporate, sexine finely perforate with undulate tectum or coarsely rugulose-verrucose; stigma peltate or little differentiated from style; fruits woody and dehiscent or thin-valved and indehiscent; seeds with short funicular aril-lobes, endosperm (?).

Ca. 31 species; tropical America.

5D(10.1) Subsection *Binaria* (Rafinesque) Wunderlin, Larsen, et Larsen, stat. nov. Basionym: *Binaria* Rafinesque, Sylva Tellur. 122. 1838. Type: *Binaria cumanensis* (Kunth) Raf. [= *Bauhinia glabra* Jacq.].

Bauhinia sect. *Tylotaea* Vogel, Linnaea 13: 312. 1839. Type: *Bauhinia kunthiana* Vogel [= *Bauhinia glabra* Jacq.]. Lectotype here redesignated. The designation of *Bauhinia rubiginosa* Bong. as the lectotype by Vas (1979) is rejected under Article 10, ICBN (Voss et al., 1983) because the species was not cited in the protolog.

Caulotretus sect. *Tylotaea* (Vogel) Endlicher, Gen. Pl. 1317. 1840.

Cardenasia Rusby, Mem. New York Bot. Gard. 7: 257. 1927. Type: *Cardenasia setacea* Rusby [= *Bauhinia glabra* Jacq.].

Fruits woody, dehiscent.

Ca. 30 species; tropical America.

Representative species: *B. guianensis* Aubl., *B. hymenaeifolia* Triana ex Hemsl., and *B. siqueiraei* Ducke.

5D(10.2) Subsection *Latisiliquae* Wunderlin, Larsen, et Larsen, subsect. nov. Type: *Bauhinia herrerae* (Britt. & Rose) Standl. & Steyerl.

Fructus valvis gracilibus, indehiscentes.

Fruits thin-valved, indehiscent.

1 species; tropical America.

5D(11.0) Section *Pseudobauhinia* Wunderlin, Larsen, et Larsen, sect. nov. Type: *Bauhinia bohniana* Chen.

Fructus sine cirrhis; folia 2-lobata, costa venis secundariis paulum evolutis; calyx ad os hypanthii secedens in 2-4 lobos; discus nectarifer absens; stamina fertilia 3; pollen 3-colporatum, sexinum ruguloso-perforatum; gynophorum parieti abaxiali hypanthii adnatum; stigma parvum capitatum; fructus et semina ignota.

Shrubs, without tendrils; leaves 2-lobate, midrib with weakly developed secondary veins; hypanthium turbinate; calyx splitting to mouth of hypanthium into 2-5 lobes; nectariferous disc absent; fertile stamens 3; pollen 3-colporate, sexine rugulose-perforate; gynophore adnate with abaxial wall of hypanthium; stigma small, capitate; fruits and seeds unknown.

1 species; South China.

Discussion

The system proposed here is conservative in that only five of the 31 genera previously proposed for the Cercideae (Wunderlin, 1976) are recognized: *Adenolobus*, *Bauhinia*, *Brenierea*, *Cercis*, and *Griffonia*. It treats the *Cercideae* in a concept similar in many respects to that of Bentham (1865), Baillon (1870), and Taubert (1892). What we propose here is an expanded version of that presented by Bentham, Baillon, and Taubert in light of additional information (e.g. pollen morphology). Several of the sections recognized in *Bauhinia* in this treatment were recognized by Bentham over 100 years ago. This is a credit to Bentham's clear insight and understanding of the group which has confused later workers as evidenced by the many attempts to subdivide the genus. The relationship of our treatment of the genus to that of Bentham's may be due in part to our considerable combined experience with the tribe, which not unlike Bentham's, spans three decades.

The Cercideae is apparently an early offshoot of the ancestral stock of the Caesalpinioideae. The floral morphology of some species of Cercideae is similar to some present day Sophoreae of the Papilionoideae on one hand and to the Detarieae and Caesalpinieae of the Caesalpinioideae on the other. Further evidence of the basal position of the Cercideae is that *Cercis* is a relictual paleodiploid; it is the only genus in the Fabaceae retaining the postulated basic chromosome number of $x = 7$ (Goldblatt, 1981; Polhill, Raven, and Stirton, 1981). In contrast to apparent similarities of the Cercideae with the Papilionoideae and Caesalpinioideae, the Cercideae possess several characters (e.g. seed structure and gynophore attachment) which make it distinct from either subfamily. Leguminous seeds normally have three apertures, the micropyle, hilum, and lens in that order. However, in the Cercideae, the seed is unique in having the lens

above the micropyle. The Cercideae also appear to lack the characteristic hypodermal "hour-glass" cells found in seeds of other legumes (Polhill, Raven, and Stirton, 1981). When the gynophore is attached to the hypanthium wall, it is attached abaxially in the Cercideae while in the remainder of the Caesalpinioideae and the Papilionoideae it is attached adaxially. The peculiar bilobed leaf of the Cercideae, which has fascinated many workers (see van der Pijl, 1951 and Cusset, 1966 for review), is believed to have arisen through neotony (cf. Duke and Polhill, 1981; Polhill, Raven, and Stirton, 1981).

The ancestral stock of the Cercideae probably consisted of moderate-sized trees with bifoliolate compound leaves as found in the present day Detarieae. The moderate-sized showy flowers were disposed in terminal paniculate or racemose inflorescences. The calyx was campanulate and pentamerous with short lobes. The hypanthium was moderately developed. The pentamerous corolla consisted of subequal, slightly clawed petals. The plants had ten free, slightly declinate stamens with the alternate ones slightly shorter. The pollen was 3-colporate with a perforated or reticulated sexine. The ovary was stipitate with the gynophore slightly acentric abaxially and free to the base or only slightly adnate at the base with the abaxial wall of the hypanthium. The fruit was an unspecialized woody, dehiscent legume with seeds containing abundant endosperm, a circular or elliptic hilum, and the funiculus without aril-lobes. The base chromosome number was $x = 7$. No single living species or species group resembles the proposed Cercideae ancestral stock; all are a mixture of primitive and derived characteristics. *Cercis*, with its pseudopapilionaceous corolla and dorsally winged fruits, *Bauhinia*, with its various stages of reduction in number of fertile stamens, floral nectary

discs, and often scandent, tendrilled habit, and *Brenierea* with its branches forming flattened cladodes and its apetalous flowers, certainly place them somewhat above *Adenolobus* and *Griffonia*. However, these two latter genera are themselves highly derived and probably bear little resemblance to the tribal progenitor.

Assuming the ancestral Caesalpinioideae evolved in the Late Cretaceous (before 65 m.y. BP), it reasonably follows that the Cercideae evolved, began to diversify, and spread from its probably site of origin in Africa to South America and southern Eurasia in the Paleogene. During the Paleogene, South America and Africa were perhaps only 800 kilometers apart and possibly linked by volcanic islands in the midatlantic. This could easily have provided a bridge facilitating migration from the Old to the New World. Since connections between Africa and Southern Asia probably existed until the Neogene when they were severed by uplifting and spreading aridity of the African continent, the constituent member of the tribe could easily have spread to the north (Raven and Axelrod, 1974). Of the five extant genera, two (*Adenolobus* and *Griffonia*) are restricted to Africa, one (*Brenierea*) to Madagascar, one (*Cercis*) to the warm temperate northern hemisphere, and one (*Bauhinia*) is pan-tropical.

The Cercideae can readily be divided into two subtribes, the Bauhiniinae and Cercidinae, on the basis of several characters of which seeds are particularly diagnostic. The seeds of the Cercidinae have a circular hilum and the funiculus is without aril-lobes while those of the Bauhiniinae have a crescentic hilum and the funiculus has aril-lobes. The Cercidinae consist of three small distinctive genera, *Adenolobus*, *Griffonia*, and *Cercis*, while the Bauhiniinae consists of the monotypic genus *Brenierea* and the large, diverse genus *Bauhinia*.

Cercis, a genus of six species and now restricted to the warm temperate northern hemisphere, probably originated in the Mediterranean area during the Paleogene and from there spread to Asia and North America as part of the widespread Arctotertiary

flora. The distinctive pseudopapilionaceous corolla probably evolved to enable the species to take advantage of the numerous established insect pollinators of the papilionoid legumes. It apparently was much more widespread; its distribution is now relictual. Its nearest relative appears to be the African genus *Adenolobus* which it resembles in several fruit and floral characters. *Cercis* and *Adenolobus* exhibit cauliflory which also occurs in some species of *Bauhinia*. However, it is probable that this feature arose independently in the three genera.

Adenolobus, a genus of two species, is now restricted to Angola and Namibia. The flowers are only slightly zygomorphic in contrast to the distinct pseudopapilionaceous ones of *Cercis*. This indicates the more primitive nature of the *Adenolobus* flower as compared to *Cercis*. The fruit is semilunate with the persistent style and gynophore appearing confluent with the dorsal margin. The dorsal margin is not winged as in *Cercis*. However, the general appearance of the thin-valved, tardily dehiscent fruits of these two genera is non-the-less fairly similar. These two genera probably share an ancestral line in the Cercideae, but diverged quite early in their evolutionary history and are now both relic genera widely separated morphologically and geographically.

Griffonia is a distinct genus of four species restricted to tropical Africa. Its entire, pinnately-nerved leaves and often inflated fruits with the gynophore and persistent style obliquely attached, make it readily separable from the other Cercidinae. Its gynophore adnate to the abaxial wall of the hypanthium and the scandent habit are both derived characters unique in the subtribe. Its distinctive fruit, leaf, and floral morphology indicate that it separated quite early from the main evolutionary line of the Cercidinae.

Brenierea also is unique in the Cercideae. In this monotypic genus, the branches are modified into cladodes and its flowers are apetalous. This seemingly anomalous genus could only be placed with certainty within the Caesalpinioideae by Humbert (1959). However, the distinctive cres-

centic hilum of the seed clearly indicates its true affinity with *Bauhinia*. The genus is apparently an early offshoot of the main Bauhiniinae line as evidenced by its highly derived floral morphology and its xerophytic adaptations.

Bauhinia is a large (ca. 300 species) and diverse pantropical genus. When confronted with the diverse array of species, taxonomists have been first inclined to subdivide it into a number of smaller genera, especially if working on regional studies. These systems often utilized single characters (e.g. stamen number, habit, pollen, calyx types, or fruit types). However, there exists a unifying, reticulate relationship among the species within the group. This is amply evident once one has a clear concept of the full range of species. When distantly related species are encountered for the first time, they are assigned to the genus with little difficulty and it would serve no practical purpose to recognize a number of small segregate genera. There is little question in our opinion that the group is a natural assemblage of species for which recognition of segregate genera is unwarranted. Because of the size and diversity of the genus, an extensive infrageneric classification would be of much use to place species with their close relatives and to put them in perspective within the genus.

Two main phyletic lines are proposed for *Bauhinia*, one giving rise to subgenera *Bauhinia*, *Elayuna*, and *Barklya*, while the second to subgenus *Phanera*. Subgenera *Bauhinia*, *Elayuna*, and *Barklya* are characteristically trees or shrubs (rarely semiscandent), often with the adpetiolar intrastipular trichomes becoming enlarged and forming spines or rarely with thorns (subgenus *Elayuna*), but never with tendrils. In contrast, subgenus *Phanera* consists of lianas (rarely shrubs, trees, or herbaceous vines) with tendrils (rarely without) and never with intrastipular spines or thorns.

In the first phyletic line, the monotypic subgenus *Barklya* appears to represent an early divergence from the main group. It retains a number of primitive floral characters reminiscent of the Sophoreae, although the leaf form is derived. It is

notable that the calyx is open at the top before anthesis, which is believed to be a primitive character in the genus and is otherwise found only in some sections of subgenus *Phanera*. *Barklya* has often been placed in the papilionoid tribe Sophoreae or Caecieae, but on the basis of seed morphology, its affinity is obviously with *Bauhinia*.

Subgenus *Elayuna*, a small group of six species, is more recently separated from the main evolutionary line, but still is of antiquity as evidenced by its wide distribution (tropical America, Africa, and Southern Asia). Hochstetter (1846) erected *Piliostigma* as a genus on the basis of its dioecious condition, sessile stigma, tubular four- to five-lobed calyx, and indehiscent fruit, all characters he considered anomalous in *Bauhinia*. *Piliostigma* was subsequently reduced to a section of *Bauhinia* by Bentham (1865), but later restored to generic status by Milne-Redhead (1947) and has since been recognized as a distinct genus by several authors. The dioecious condition much emphasized by various workers does not hold up. The South American *B. glaziovii* and *B. uruguayensis* have perfect flowers. Of further note on this matter, many species of subgenus *Bauhinia* are known to have a significant number of unisexual flowers on an individual and some (e.g. *B. saccocalyx* and *B. viridescens*) are essentially dioecious. The indehiscent nature of the fruits used to distinguish *Piliostigma* from *Bauhinia* as a distinct genus breaks down on two accounts under critical examination. First, similar fruits are known in subgenera *Bauhinia* and *Phanera*. Secondly, not all species otherwise readily assigned to *Piliostigma* have indehiscent fruits (e.g. *B. glaziovii* and *B. uruguayensis*). The sessile stigma believed to be characteristic of *Piliostigma* is also not a consistent feature. For example, *B. glaziovii* and *B. uruguayensis* have definite elongate styles. The remaining character used to separate *Piliostigma* from *Bauhinia*, that of the calyx which splits only part way to the hypanthium does hold up. However, this is clearly a derived character, having its basis in *Bauhinia*. Thus, in our opinion, the recognition of *Piliostigma* at the generic level is unwarranted and we prefer to

recognize it as a subgenus of *Bauhinia* (subgenus *Elayuna*).

Subgenus *Elayuna* is subdivided into two sections, the Paleotropical *Piliostigma* and the Neotropical *Benthamia*. The former is distinguished by the lack of thorns, short or obsolete styles, and indehiscent or tardily dehiscent fruits. In contrast, *Benthamia* has thorns, elongate styles, and dehiscent fruits.

Subgenus *Bauhinia*, the largest in the phyletic line, consists of about 140 species and is best represented in the American tropics. In this subgenus, the hypanthium is well developed, often becoming long-tubular. The calyx-lobes are split to the mouth of the hypanthium or the calyx is spathaceous (or nearly so) with its tips remaining attached (at least at first). The pantropical distribution of the subgenus and the relictual distribution of some of its sections suggests antiquity. Subgenus *Bauhinia* consists of nine sections which will be discussed later.

The second phyletic line consists of only subgenus *Phanera*, a group of about 150 species. The subgenus is of pantropical distribution although best represented in Southern Asia and the Malesian Area. In this subgenus the hypanthium is variously developed, being very shallow to long-tubular. The calyx is also highly variable in that it may be open at the top before anthesis in some species, splitting only in the upper part in some, or dividing to the mouth of the hypanthium in others. In the latter situation, it superficially resembles the condition in subgenus *Bauhinia*, but differs in that the lobes split fully to the apex from the beginning rather than remaining attached at the tips. The pantropical distribution of the subgenus and the relictual distribution of some of its sections again indicates a group of some antiquity. Subgenus *Phanera* consists of 11 sections which will be discussed later.

Subgenus *Bauhinia* is subdivided into nine sections as previously noted. Three alliances are recognized. The first consists of sections *Bauhinia*, *Pauletia*, and *Amaria*; the second of *Alvesia*, *Micralvesia*, *Telestria*, *Pseudophanera*, and *Afrobauhinia*; and the third of *Gigasiphon*.

In the first alliance, section *Pauletia* has the leaves reduced towards the ends of the flowering branches and the flowers are usually large. In sections *Bauhinia* and *Amaria*, the leaves are usually not much reduced toward the ends of the branches and the flowers are generally small, often disposed in condensed racemes. The pollen of section *Pauletia* has round-clavate supratectal processes except for series *Ariaria* which has blunt-cylindric infratectal processes like those found in section *Amaria*. Section *Bauhinia* may rarely have supratectal processes.

Section *Bauhinia* is basically Mexican in distribution with a few species extending into northern Central America, the Greater Antilles, southwestern United States, and one disjunct to northeastern Brazil. It is distinguished by its flowers having a single fertile stamen, except for two monotypic series (*Coulterae* and *Remotae*) which have three fertile stamens.

Section *Bauhinia* is subdivided into four series: *Bauhinia*, *Dipetalae*, *Coulterae*, and *Remotae*. Series *Bauhinia* and *Dipetalae* are characterized by having a single fertile stamen while *Coulterae* and *Remotae* each have three fertile stamens. Series *Bauhinia* is distinguished from *Dipetalae* on the basis of petal number and shape. Series *Bauhinia* has five obovate to narrowly elliptic petals while *Dipetalae* has one to four linear-filiform petals. The five species in series *Dipetalae* are apparently chiropterophilous while all others in the section are believed to be psychophilous. Although the monotypic series *Coulterae* and *Remotae* share the triandrous condition, they are not closely related. The central Mexican *B. coulteri* of series *Coulterae* has broad sessile petals while the northeastern Brazilian *B. pinheiroi* of series *Remotae* has narrow clawed petals. The pollen of *B. pinheiroi* and that of *B. erythrocalyx* and *B. jenningsii* of series *Bauhinia* differs from that of the other species in the section by being compressed-oblate. Although the three species share this pollen character which indicates a probable close relationship, we choose to place *B. pinheiroi* in a series of its own because of its number of fertile stamens. The pollen of *B. coulteri*, by contrast, and that of the remainder of series

Bauhinia is oblate or spheroidal. The pollen of species in series *Dipetalae* have elongated verrucate supracteal processes not found in the other species of section *Bauhinia*. These processes are probably an adaptation to bat pollination.

Section *Pauletia*, the largest section in the alliance and the subgenus, contains about 70 species. This section is further divided into five series: *Cansenia*, *Ariaria*, *Acuminatae*, *Perlebia*, and *Pentandrae*. All Series are Neotropical except for *Acuminatae*. The monotypic series *Perlebia* is characterized by having five fertile stamens and indehiscent fruits. It is apparently derived from series *Pentandrae*, a group of seven species with dehiscent fruits of which some have five fertile stamens. The main distinction between series *Pentandrae* and *Perlebia* is that the latter has indehiscent fruits. Many species of series *Cansenia* are distinguished by being armed with intrastipular spines. However, many additional species of series *Cansenia* approach those of series *Ariaria* in having much reduced spines. The main distinction between these two is their pollen morphology. The pollen of series *Cansenia* is 3-to 7-colpate, or 3- to 4-colporoidate and the sexine is reticulate, often with clavate supracteal processes. The pollen of series *Ariaria* is 5-7-colpate or 5-7-porate and the sexine reticulate with infracteal processes. The pollen of series *Ariaria* is similar to that found in section *Amaria*, but the latter differs in being 3-colpate or 3-porate. However, the floral morphology of series *Ariaria* relates the species of series *Ariaria* to the other species in section *Pauletia* rather than section *Amaria*. For this reason, we prefer to treat the group as a series of *Pauletia*. The remaining series, *Acuminatae*, resembles some species of *Cansenia* in their spathaceous calyx, but lack spines. The pollen in series *Acuminatae* is inaperturate. Pollen of some species of *Cansenia* have been reported as inaperturate (Wunderlin, 1983) and may very well be, but some materials examined recently reveal weakly developed colpi. This may represent convergent evolution in the two series and not an indication of close relationship.

Section *Amaria* is subdivided into three series

based on the number of fertile stamens. Members of series *Decandrae* have ten stamens, *Stenantherae* have five, and *Triandrae* have three. *B. stenantha* (series *Stenantherae*) has bright red, imbricate petals forming a tube-shaped corolla and is ornithophilous, which is rare in the genus. Series *Tiandrae* resembles section *Bauhinia* series *Coulterae* and *Remotae* in having three fertile stamens abaxially disposed. Although the triandrous condition is found in several Paleotropical species of subgenus *Bauhinia* and is common in Paleotropical species of subgenus *Phanera*, this condition is found only in three species in the Neotropics. The two species in section *Bauhinia* differ from the one in section *Amaria* in a significant way. *B. coulteri* (series *Coulterae*) and *B. pinheiroi* (series *Remotae*) have their three fertile stamens adjacent while *B. pansamalana* (series *Triandrae*), has the three fertile stamens separated by a staminode.

The second alliance consists of five sections: *Alvesia*, *Pseudophanera*, *Micralvesia*, *Telestria*, and *Afrobauchinia*. All sections are Paleotropical as previously stated and are relatively small (2 to ca. 13 species). The five sections have stamens which are free or essentially so, in contrast to those in previously discussed sections which have connate stamens (monadelphous or diadelphous), although sometimes shortly so.

Section *Alvesia* consists of about six species, each with nine or ten stamens and a spathaceous calyx. The most widespread and variable of these is *B. tomentosa* which is native to Africa, South China, Southern Asia, and Malesian Area.

Section *Micralvesia*, which consists of nine species, also has ten fertile stamens and usually a spathaceous calyx. They differ from those in *Alvesia* in that the small flowers (hence the name *Micralvesia*) are usually dioecious (in subsection *Viridescetes*) or the fruits are indehiscent (subsection *Ramosae*). In addition, *Micralvesia* has pollen 3-colpate or 3-colpor(oid)ate with a reticulate or striate-reticulate sexine while that of *Alvesia* has pollen 4- to 5-colpate with a macroclavate sexine. *B. prainiana*, placed here on morphological grounds, differs in that the pollen is inaperturate and the sexine re-

ticulate with supracteal processes like those of *B. acuminata* and *B. hirsuta* of section *Pauletia* series *acuminatae*. Its systematic position needs to be investigated further.

Section *Pseudophanera* consists of two closely related species, *B. phoenicea* and *B. pottsii*. These species are more or less scandent, hence the sectional name which alludes to subgenus *Phanera*. The scandent habit is obviously derived from the predominant arboreous type as tendrils are absent. They have three (rarely four or five) fertile stamens which is also evidence of their derived nature. Palynologically, they are distinguished from all other *Bauhinia* species in that the pollen occurs in tetrads rather than monads. Why this character occurs in these two species and no where else in the genus is a fascinating question. It is undoubtedly derived from the prevailing monad type and quite likely has some relationship to the pollination ecology.

Section *Afrobauhinia* consists of about 13 species in southern Africa and Madagascar. It resembles section *Pseudophanera* in having a well developed hypanthium and spathaceous calyx, but differs in having its pollen in monads. In addition, the pollen sexine is rugulose or finely striato-reticulate in contrast to the distinctive foveolate sexine in section *Pseudobauhinia*. It is subdivided into five series based on the number of fertile stamens; series *Galpiniae* has three fertile stamens, series *Porosae* has one, series *Afrobauhiniae* have five, series *Perplexae* has eight, and series *Aboriginiae* has ten.

Section *Telestria* consists of a group of three species in Southern Asia. It is subdivided into series *Purpureae* and *Monoteles*. Series *Purpureae* contains only two species, *B. purpurea* with three fertile stamens and *B. variegata* with five. These two species are fairly closely related. It is believed that the commonly cultivated *B. blakeana*, the "Hong Kong Orchid Tree", is a sterile hybrid between these two species. Series *Monoteles* contains only the single species, *B. monandra*, and is characterized by a single fertile stamen. This species is known only from cultivation, but is believed to be native to

Burma, although credited to tropical America or Madagascar by some workers. The monandrous condition probably is a case of convergent evolution and not an indication of close relationship to the monandrous species of section *Bauhinia* (series *Dipetalae* and *Bauhinia*) in tropical America and section *Afrobauhinia* (series *Porosae*) in Madagascar.

The last section of subgenus *Bauhinia*, section *Gigasiphon*, consists of about five relictual species which at first appear to be scattered discordant elements in Africa, Madagascar, and the Malesian Area. Most recent workers have considered this group as a segregate genus, *Gigasiphon*. However, when considered in respect to the rest of *Bauhinia*, there can be found no valid reason for maintaining it as a distinct genus. The long-tubular hypanthium often used to characterize the group is nearly equally developed in several other groups of *Bauhinia*, e.g. subgenus *Bauhinia* section *Pseudophanera* and section *Afrobauhinia*. It is also found in the distantly related subgenus *Phanera* section *Meganthera* subsection *Phanerosiphon*. The entire leaves, also used by some workers to characterize the group, are found sporadically throughout *Bauhinia* and are not at all unique. Finally, the "calyx-tip nectaries" first emphasized by de Wit (1956) are of questionable existence and apparently identical structures can be found in a number of other *Bauhinia* species. However, the particular combination of characters seems to warrant that the group be recognized at the sectional level. *B. gossweleri*, a tendrilled liana placed in this group with reservations by previous workers, is best moved to subgenus *Phanera* section *Lysiphyllum*. This then leaves section *Gigasiphon* with two species in tropical east Africa and Madagascar and three in the Malesian Area. Although its exceptionally well developed tubular hypanthium is obviously derived, in most respects it is the least specialized of the sections of subgenus *Bauhinia*.

Turning now to subgenus *Phanera*, 11 sections are recognized. With few exceptions, they are all tendrilled lianas. Three sections are distinguished by having ten fertile stamens, a condition which is

considered primitive within the subgenus. These are the two Neotropical sections, *Schnella* and *Caulotretus*, and one Paleotropical section, *Lysiphyllum*. *Schnella* has a five-nerved or inconspicuously-nerved calyx, pollen with a sexine with conspicuous supracteal processes, stigma usually peltate or capitate, and an indehiscent, thin-valved fruit while *Caulotretus* has a conspicuously 10- or 15-nerved calyx, pollen with sexine merely rugulose or perforate, stigma usually oblique, and a dehiscent, woody fruit. Section *Caulotretus* is subdivided into subsections *Binaria* and *Latisiliquae*. *B. herrerae*, the only species placed in subsection *Latisiliquae* differs in most characters which otherwise distinguish sections *Caulotretus* and *Schnella*. This species has a peltate stigma and indehiscent, thin-valved fruit as found in section *Schnella*. However, the distinctive calyx and pollen characters clearly place it in section *Caulotretus*. In spite of the differences between the two sections, it is probable that they evolved from the same progenitors. However, they did so relatively early as they are clearly distinguished as a group from the rest of the subgenus. Both sections are primarily South American with only a few species extending north to Mexico and the West Indies.

On the other hand, the Paleotropical decandrous section, *Lysiphyllum*, is more widely distributed, occurring in tropical east Africa, the Indochinese Peninsula, the Malesian Area, and Australia. In general, the section is less specialized than the remaining eight Paleotropical sections of the subgenus. The calyx is always closed before anthesis and either splits irregularly in the upper part or to the mouth of the hypanthium into two to five lobes at anthesis. Section *Lysiphyllum* is subdivided into two subsections, *Bracteolanthus* and *Tournaya*, which are distinguished on the basis of flower size and pollen characters. The flowers are small and the pollen sexine is perforate with undulate or rugulose tectum in subsection *Bracteolanthus* while the flowers are large and the sexine consist of irregular processes in *Tournaya*. Subsection *Bracteolanthus* is further subdivided into series *Austerales*, *Hookerae*, and

Dipterae. The series are distinguished on the basis of calyx dehiscence, gynophore attachment (adnate or free), and fruit dehiscence. *Bracteolanthus* was erected by de Wit to accommodate an unusual species, *Bracteolanthus dipterus* (= *Bauhinia diptera*) with large persistent bracteoles arising at the top of the pedicel and enclosing the bud before anthesis. However, a closely related species, *B. dewitii*, described by Larsen and Larsen (1978), is similar to de Wit's species except that it has deciduous bracteoles arising from the middle of the pedicel. Thus, de Wit's genus can not be maintained. Instead, the authors have chosen to recognize it at the subsectional level and in an expanded sense to include part of de Wit's *Lysiphyllum*.

Subsection *Tournaya* is also subdivided into two series, *Africanae* and *Winitae*. Series *Africanae* contains the single species, *B. gossweileri*, from tropical east Africa. It has entire leaves and dehiscent fruits while series *Winitae*, from Burma and Thailand, has bifoliolate leaves and indehiscent fruits. *B. gossweileri* was previously placed in the segregate genus *Gigasiphon* where it has always been considered anomalous in that it is a tendrilled liana while the other species of *Gigasiphon* are trees without tendrils. Schmitz (1973), on the basis of pollen morphology, placed it in a new monotypic genus, *Tournaya*. However, it appears best placed in section *Lysiphyllum* on the basis of its pollen morphology and long-tubular hypanthium. Subsection *Tournaya* is recognized here in an expanded concept to include the two Burmese and Thai species which are placed in series *Winitae*.

The remaining sections of subgenus *Phanera* are all highly derived and are characterized by a reduction in fertile stamen number to two or three. All are restricted to the Paleotropics, with the bulk in the Malesian Area and Southern Asia. Of this group, the African section *Tylosema* emerges as a quite distinct group of species in that it has two fertile stamens and some of the staminodes are petaloid. The only other species of this subgenus having two fertile stamens is *B. bassacensis*, but this is clearly related to the other triandrous species of

subsection *Fulvae* series *Chloroxantheae*. Section *Tylosema*, far removed geographically and evolutionarily from the other six triandrous sections, has been treated as the segregate genus *Tylosema* by some recent workers. In view of its distinctiveness in Africa in comparison to the other species of the tribe, this is readily understandable. However, in comparison with the whole of *Bauhinia*, it is best treated as a section of subgenus *Phanera*.

Another section which is readily identifiable is *Palmatifolia* which is unique in having its anthers opening by a central pore in each theca rather than by a longitudinal slit as in the rest of the tribe. This is clearly an advanced feature. Otherwise, this section closely resembles subsect. *Fulvae* from which it was evidently derived. Section *Palmatifolia* is de Wit's *Phanera* subgenus *Biporina*. De Wit's section *Bifoliola* and *Cinnamomifolia* can not be maintained as distinct from section *Palmatifolia* and are reduced to synonymy here.

The largest section of the subgenus is section *Phanera* with about 55 species. It also appears to be less specialized than some of the other triandrous sections in the subgenus (e.g. *Lasiobema*, *Austrocercis*, *Semla*, and *Pseudobauhinia*) in that it frequently has reduced stamens in addition to the three fertile ones. The presence of reduced stamens indicates its relationship to the more primitive decandrous sections. Section *Phanera* is closely related to section *Palmatifolia* which also has reduced stamens but differs in the method of anther dehiscence.

Section *Phanera* is subdivided into three subsections: *Phanerosiphon*, *Fulvae*, and *Clavatae*. Subsection *Phanerosiphon*, a monotypic Bornean subsection, is distinguished by its long-tubular hypanthium (5-10 cm long). Subsection *Fulvae*, with about 28 species, is distinguished from subsection *Clavatae*, also with about the same number of species, by its anther length. The anthers are 1-3 mm long in *Fulvae* and 8-25 mm long, rarely as short as 4 mm, in *Clavatae*.

Subsection *Fulvae* is further subdivided into four series, *Fulvae*, *Corymbosae*, *Chloroxantheae*, and *Loxocalyx*, which are distinguished on the basis of a combination of hypanthium/sepal length ratios,

petal claw/blade length ratios, and whether or not the staminodes form a fleshy, digitate body. All series are from Southern Asia and the Malesian Area. Bentham (1865) recognized the monotypic section *Loxocalyx* within *Bauhinia* to accommodate *B. macrostachya* (= *B. wallichii*). De Wit (1956) misinterpreted this section to be typified by *B. scandens* L. and relegated it to synonymy under his *Lasiobema* (= section *Lasiobema*). When restored to its original concept, we feel it can only be maintained as a series in subsection *Fulvae*.

Subsection *Clavatae* is subdivided into series *Clavatae* and *Insignes* on the basis of whether the petals are retained or are early caducous and the stigma size. In Series *Clavatae* the petals are tardily caducous and the stigma large peltate in while *Insignes* the petals are early caducous and stigma small and little differentiated from the style.

We essentially followed de Wit (1956) in our treatment of the *Phanera* group, but with some nomenclatural adjustments. Subsections *Fulvae*, *Phanerosiphon*, and *Clavatae* correspond to sections *Micranthera*, *Phanerosiphon*, and *Meganthera* respectively of de Wit (1956). Series *Fulvae*, *Corymbosae*, *Chloroxantheae*, and *Loxocalyx* of subsection *Fulvae* correspond to subsections *Fulvae* (including *Sessiles*), *Corymbosae*, and *Chloroxantheae* of de Wit. Series *Clavatae* and *Insignes* of subsection *Clavatae* correspond to de Wit's subsections within his section *Meganthera*.

De Wit (1956) placed *B. williamsii* in the segregate subgenus *Austrocercis* within *Phanera* on the basis of its "pseudopapilionaceous" corolla and the presence of a fleshy, digitate body possibly composed of coalested staminodes. This distinct species is apparently a derivative of section *Phanera* and is recognized as comprising the monotypic section *Austrocercis*.

The monotypic section *Pseudobauhinia* differs from the rest of the *Phanera* alliance in that it is a shrub lacking tendrils. It is restricted to South China. In spite of its difference in habit, it is clearly a derivative of section *Phanera* because of the similarity in floral morphology.

Section *Lasiobema* is a group of about 15 species in the Malesian Area, Southern Asia, and South China. It differs from other scandent triandrous sections of *Phanera* by its often conspicuous nectiferous disc arising from the margin of the hypanthium and being nearly continuous except sometimes where the adnate gynophore emerges with the abaxial wall of the hypanthium. A structure similar in appearance also occurs in *B. bracteata* (section *Phanera* subsection *Fulvae* series *Chloroxantheae*), but is tubular and apparently of a different origin. De Wit's concept of *Lasiobema* is overly broad in that it includes species now placed in sections *Lasiobema*, *Tubicalyx*, and *Phanera*.

Section *Lasiobema* is further subdivided into subsections *Scandentes*, *Pullae*, and *Championae* on the basis of calyx, disc, inflorescence, and fruit characters. Subsection *Scandentes* has small flowers in slender racemes, the calyx remaining entire or only splitting irregularly in upper part, the nectiferous disc smooth or nearly so, and the fruits small, indehiscent. Subsection *Pullae* has moderate-sized flowers in pyramidal racemes, the calyx splitting nearly to the mouth of hypanthium with spreading lobes, the nectiferous disc with an irregularly-lobed surface, and fruits large, dehiscent. Subsection *Championae* has small to moderate-sized flowers in slender to pyramidal racemes, the calyx splitting to the mouth of the hypanthium into 2-5 reflexed lobes, the nectiferous disc smooth or nearly so, and fruits small, dehiscent. The first two are monotypic while the latter consists of about 13 species in Southern Asia, the Malesian Area, and South China.

Section *Tubicalyx* is a small group of four species restricted to the Indochinese and Malay Peninsula. The calyx is open at the top before anthesis and remains campanulate and 5-dentate. This is considered a primitive character reminiscent of section *Lasiobema* to which it is closely related. However, species of section *Tubicalyx* lack the nectiferous disc characteristic of section *Lasiobema*. The leaves are

entire and have strongly developed secondary veins which is considered a derived feature. This further distinguishes them from section *Lasiobema* which most often has bilobed leaves. De Wit (1956) included several species in his genus *Lasiobema* which are now placed here. He noted the absence of the swollen nectiferous disc may warrant the placement of these species a segregate genus.

The last section of the triandrous alliance of subgenus *Phanera* is the monotypic section *Semla* which occurs in India, Nepal, and Pakistan. It resembles section *Pseudobauhinia* in lacking tendrils, but has a nectiferous disc which clearly makes it a derivative of section *Lasiobema*.

Overall, it appears that the Cercideae has existed since the Upper Cretaceous, having arisen early in the evolutionary history of the family. Four small genera are relictual (*Cercis*, *Adenolobus*, *Griffonia*, and *Brenierea*) while the large genus *Bauhinia* is widespread and has undergone several evolutionary "bursts" and declines in response to changing climatic and geological conditions, e.g. uplifting, subsidence, and continental movements. The most recent pronounced evolutionary changes have occurred in subgenus *Bauhinia* in tropical America and in subgenus *Phanera* in Southern Asia and the Malesian Area.

What remains to be done at this point, essentially in *Bauhinia*, is primarily revisionary work at the species level, investigations of various biological systems (e.g. pollination), further botanical exploration for new species, range extensions, and information on poorly or incompletely known species. Chemical, cytological, and anatomical data are especially poorly known.

Additional studies may certainly result in some modifications of the classification proposed here. As stated in the introduction, it is hoped that this work will provide a solid systematic framework upon which to base further studies and will stimulate interest in the group.

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| – semla Wund. | 24 | L. triplinervia Spreng. | 24 |
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|--|----|--|-------|
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