

Research Article

J. L. Reveal's Revelance Re-revealed: Addenda to Newly Required Intrafamilial Ranks in Selected Families

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Abstract

This paper presents a preliminary set of addenda establishing new infrafamilial taxa at the ranks of subfamilies, supertribe, tribes and subtribes within selected families of flowering plants mainly for wild and cultivated flora in China and East Asia. The work aims to supplement existing classifications mainly in the paradigm of Linnaean hierarchy, enhancing the balance and phylogenetic coherence of the hierarchical structure in these families. Although there are no widely accepted tenets for designating so called appropriate ranks, the principle set by Angiosperm Phylogeny Group II of treating monogeneric/oligogeneric families as synonyms to their sister groups is here followed and applied when erecting or merging infrafamilial ranks. The addenda cover 70 families (e.g., Anacardiaceae, Apocynaceae, Fabaceae, and Rubiaceae), in which 214 new names (i.e., 23 new subfamilies, 1 new supertribe, 76 new tribes and 115 new subtribes) are validated whether based on existing reference or newly designated types, with diagnoses and included subordinate taxa provided. These newly established taxa, while not necessarily mandatory for use, provide essential, phylogenetically informed options for organizing taxa below the family level and improving the hierarchical structure of angiosperm classification in order to facilitate future study of systematics and compilation of data for plant biodiversity.

Keywords

Infrafamilial Rank, New Subfamily, New Supertribe, New Tribe, New Subtribe

1. Introduction

As Riedl emphasized: “*All the products of man, his knowledge, his tools, his institutions, even his scientific theories and all his associations are structured hierarchically.*” [1] Throughout history, botanists have tried to determine the best way to classify and name plants, and the botanical nomenclature, whose principle was first outlined by the Italian philosopher and botanist Andreas Caesalpinus (1509-1603), has received a boost thanks to contributions from Carl Linnaeus (1707-1778) to Antoine Laurent de Jussieu (1748-1836). The Linnaean hierarchy provides the ranks that we

use to position organisms and the Jussieuan version lays the basis of our current classification. [2] After genera and families introduced by Linnaeus and Jussieu, gradated “natural” ranks were subsequently added by various systematists in 19th century according to their personal criteria and understandings of getting allies with similarities together: the polymathic Constantine Samuel Rafinesque (1783-1840) established the first modern sense subfamily (denoted by the term *sotto famiglia*) Aphaneoideae (Rosaceae) in 1814; and the versatile Augustin Pyramus de Candolle (1778-1841) insert-

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ed tribes (denoted by the term *tribus*) and subtribes (denoted by the term *subtribus*) below family but above genus in his magna opera *Regni Vegetabilis Systema Naturale* and *Prodromus Systematis Naturalis Regni Vegetabilis*, respectively.

As already been stated by Stuessy [3], vertical classification is meaningful with higher level of the hierarchy and they provide a quantitative yardstick to assess across-the-board relationships. But it may also lead to “hierarchical inflation” when further study and understanding of a group are carried out, which is particularly obvious in Amaryllidaceae, Asparagaceae and Rubiaceae, where specialists often have a preference of recognizing an unbalanced large number of tribes for phylogenetically isolated small lineages, making the linear arrangement of infrafamilial ranks somewhat cumbersome. Thereagainst, tendency of adopting PhyloCode-based nomenclature, i.e., naming evolutionary lineages by using free clade definitions, however, causing “hierarchical deflation” on the other hand — this is the case where most leguminologists, Cornaceae taxonomists as well as some solanaceous specialists have done to the Fabaceae, Cornaceae and Solanaceae classification, respectively, by using clades found/confirmed in numerous molecular research without classical Linnaean hierarchy.

In the molecular era, an ideal Linnaean hierarchy within families should combine the advantages of Linnaean and cladistic hierarchy and avoiding their drawbacks, since taxonomists now explore nature by evolutionary clades but are still accustomed to Linnaean ranks. Such naming is challenging, for rank-based classification is an empirically built, subjective system, and there are no widely accepted principles for determining appropriate ranks. Clayton [4] reckoned that “taxonomists have an obvious predilection for the excision of solitary outliers” when establishing small families; while Backlund and Bremer [5] stressed the “secondary principles” of maximizing stability, phylogenetic information, and ease of identification.

This article aims to supplement new infrafamilial names at the ranks of subfamily, supertribe, tribe, and subtribe in flowering plant families mainly for wild and cultivated flora in China and East Asia, making the rank scheme of selected families more balanced and more corresponding with updated phylogenetic results. All taxa established here may not always be used, of course, but they are available if needed.

2. Sources and Methods

At the family level, the modern molecular classification system for flowering plants, APG IV, is adopted. Comprehensive checklists of suprageneric names have been compiled and published by Reveal [6, 7], which, serves as a chief source for determining necessary names not published yet. New ranks, whose circumscription remains the same are validated based on existing reference; and brand new defined ones are mandated with designated types, with diagnoses and included subordinate taxa provided. Due to limited space,

detailed phylogenetic backgrounds are not to be reproduced here. By analogy to the existing APG II principle [8] of merging monogeneric families with their sister groups to reduce the number of families, and with consideration of Backlund and Bremer’s proposal [5], many tribes previously recognized are herein relocated at lower ranks and “distinctive and evolutionarily isolated genera, especially those in primitive positions, are treated as monotypic subtribes” [9] within an available tribe of its allies. Both choices intend to seek equilibrium in the ranking dilemma — maximizing tribal stability and minimizing the number of tribal vis-à-vis.

The Shenzhen Code of ICN [10] has been followed in making necessary nomenclatural decisions, especially under Art. 41.2(a) and Art. 49.2, Ex. 10. Unless more recent information is available, author attributions of suprageneric names cited as reference follow Reveal [6, 7], albeit following the notation required by the journal. In addition to their use in direct citations of text(s), in accordance with the notation used by ICN ([10], ‘Index to scientific names’), double quotation marks [“ ”] are placed around designations or orthographic varieties to indicate that they are not ‘names’ in the sense of ICN [10], Art. 6.3). In the following treatments, all names are arranged in alphabetical order by families to ease the use of the checklist. To achieve precise writing, only selected references are provided for crucial taxonomic information, cladograms or phylogenetic trees are not intended to be reproduced but a brief note is provided when necessary to make clarifications.

3. Nomenclatural Treatment

Acanthaceae [11]

Crabbeinae Z. H. Feng, subtrib. nov. — Type: *Crabbea* Harv.

Diagnosis: Herbs, subshrubs or shrublets. Leaves opposite, without stipules. Axillary inflorescences pauciflorous cymes, sessile, sometimes reduced to a single flower. Bracts foliaceous, (3)4-6(8), forming a sort of involucre. Calyx of 5 subequal sepals, usually free, actinomorphic. Androecium of 4 stamens, didynamous. Ovary bilocular.

Included genera: *Boutonia* DC., *Crabbea* Harv., *Lasiodcladus* Bojer ex Nees, *Pericalypta* Benoist, *Podorungia* Baill., *Pseudodicliptera* Benoist.

Achariaceae [12, 13]

Remarks: Breteler and Wieringa [12] placed *Salpingifera* in Lindackerieae, it appearing as sister to the two genera that comprise Phyllobotryeae but seems to have little in common with Phyllobotryeae [13]. Its unique systematic position merits a new tribe.

Salpingifereae Z. H. Feng, trib. nov. — Type: *Salpingifera* Breteler & Wieringa.

Diagnosis: Shrub. Leaves alternate, stipulate, penninerved, margin dentate. Inflorescence axillary, racemose compound of dichasia (thyrses) reduced to a single flower flanked by pedicels bearing trumpet-shaped glands. Flowers actinomor-

phic, petals 8-10, free, imbricate. Fruit smooth, leathery, indehiscent, a carcerulus. Seeds many, with complete fleshy seed coat.

Monotypic.

Aizoaceae [14]

Remarks: Phylogenetic results cited by Gerbaulet [14] showed that there are three clades in *Mesembryanthemum* s.l. Among which Clade A can be further divided into two subclades, the first one comprises *Callistigma*+*Cryophytum*, and the second encompasses *Aptenia*/*Sceletium*/*Phyllobolus splendens* [= *Splendentia splendens* (L.) B. P. R. Chéron]+*Aridaria*/*Phyllobolus*/*Prenia*; while Clade C includes *Opophytum* only. These clades boast distinguishable synapomorphies, which warrant the level of tribe. Klak and Bruyns' broadest sense of *Mesembryanthemum* most likely represents nomenclatural convenience but ignores the tradition of recognizing these small genera.

Cryophyteae Z. H. Feng, trib. nov. — Type: *Cryophytum* N. E. Br.

Diagnosis: Annuals or short-lived perennials, roots fibrous. Flowers in cymes, petaloid staminodes fused into tube, filamentous staminodes and stamens numerous and filiform, rarely filamentous staminodes absent and petaloid staminodes and stamens few (*Callistigma inachabense*); stigmas free or rarely basally connate and red (*Callistigma inachabense*).

Included genera: *Callistigma* Dinter & Schwantes, *Cryophytum* N. E. Br.

Opophyteae Z. H. Feng, trib. nov. — Type: *Opophytum* N. E. Br.

Diagnosis: Annual herbs, ascending when in leaf, prostrate when in flower, with fibrous roots. Leaf cylindrical, very succulent, decussate and shortly connate at the base, with enlarged central water storing cells. Fruit a hygrochastic capsule with valve wings reflexed and fused in pairs, locules 5.

Monotypic.

Phylloboleae Z. H. Feng, trib. nov. — Type: *Phyllobolus* N. E. Br.

Diagnosis: Prostrate to erect perennials to erect shrubs to minute geophytes, stems weakly lignified, corky or woody. Leaves cylindrical or flattened, persistent or deciduous. Flowers with androecial parts fused into a petalstamen tube. Fruits 4-5(6)-locular, with or without valve wings, valve wings inflexed over the valves. Seeds with a rough testa.

Included genera: *Aptenia* N. E. Br., *Aridaria* N. E. Br., *Phyllobolus* N. E. Br., *Prenia* N. E. Br., *Sceletium* N. E. Br., *Splendentia* (DC.) B. P. R. Chéron.

Amaranthaceae [15-17]

Boseae Z. H. Feng, trib. nov. — Type: *Bosea* L.

Diagnosis: Much- and usually intricately branched erect or scrambling shrubs with alternate leaves, branches long and generally drooping. Flowers hermaphrodite or unisexual (polygamous), in racemes or spikes, the terminal often paniculate. Tepals 5, free, glabrous. Stamens 5, filiform, alternating with five short fleshy lobes at base. Ovary uniovulate; style

obsolete or almost so, stigmas 2-3. Fruit a berry, globose.

Monotypic.

Charpentiereae Z. H. Feng, trib. nov. — Type: *Charpentiera* Gaudich.

Diagnosis: Small shrubby trees with alternate, membranous or coriaceous leaves. Flowers functionally unisexual, in axillary once- or twice-branched panicles, solitary within the bracts. Tepals 5, free, glabrous or puberulent. Stamens 5, expanded and fused into a cup below, alternating with short rounded pseudostaminodes. Ovary uniovulate, style short or none; stigmas 2. Capsule indehiscent; seeds exarillate.

Monotypic.

Iresininae Z. H. Feng, subtrib. nov. — Type: *Iresine* P. Browne.

Diagnosis: Annual or perennial herbs to subshrubs or shrubs, rarely scandent or small trees. Leaves opposite or more rarely wholly or in part alternate. Inflorescences capitate or spike-like, simple or usually in broad, much-branched panicles. Flowers small, with a coma of undulate hairs. Capsule bursting irregularly, membranous.

Monotypic.

Psilotricheae Z. H. Feng, trib. nov. — Type: *Psilotrichum* Blume.

Diagnosis: Perennials or small shrubs with opposite or rarely alternate leaves. Flowers not bright carmine-red inside, in axillary and terminal, sessile to long-pedunculate heads or spikes or broad, lax, panicles, solitary in the bracts. The inner 2 tepals more broadly hyaline-margined than the outer 2, with the central intermediate. Capsule thin-walled, indehiscent.

Monotypic.

Amaryllidaceae [18]

Calostemmatinae Z. H. Feng, subtrib. nov., based on Calostemmateae D. Müll.-Doblies & U. Müll.-Doblies, Feddes Repert. 107(5-6, Short commun.): 7. 1996. — Type: *Calostemma* R. Br.

Included genera: *Calostemma* R. Br., *Proiphys* Herb.

Anacardiaceae [19-21]

Camptospermateae Z. H. Feng, trib. nov. — Type: *Camptosperma* Thwaites.

Diagnosis: Polygamodioecious trees, often with stilt roots and contact dermatitis-causing exudate. Leaves sessile to petiolate, peltate or lobed scales present ad- and abaxially. Inflorescences axillary panicles. Stamens in two whorls of unequal length. Drupe incompletely bilocular with only one locule fertile.

Monotypic.

Camptospermatoideae Z. H. Feng, subfam. nov. — Type: *Camptosperma* Thwaites.

Diagnosis: Polygamodioecious trees, often with stilt roots and contact dermatitis-causing exudate. Leaves sessile to petiolate, peltate or lobed scales present ad- and abaxially. Inflorescences axillary panicles. Stamens in two whorls of unequal length. Drupe incompletely bilocular with only one locule fertile.

The only included tribe: Campnospermateae Z. H. Feng, this publication.

Loxopterygiinae Z. H. Feng, subtrib. nov. — Type: *Loxopterygium* Hook. f.

Diagnosis: Dioecious or monoecious trees with contact dermatitis-causing exudate. Leaves deciduous, alternate, imparipinnate, petiolate; leaflets opposite to subopposite. Inflorescences terminal and/or axillary thyrsoids or panicles. Perianth 5-parted, imbricate, calyx persistent; androecium haplostemonous, staminodes reduced; disk glabrous. Fruits samaroid, drupoid or baccate, 1-locular.

Included genera: *Apterokarpos* Rizzini, *Astronium* Jacq, *Cardenasiodendron* F. A. Barkley, *Loxopterygium* Hook. f., *Myracroduron* Allem ã, *Schinopsis* Engl.

Pentaspadeae Z. H. Feng, trib. nov. — Type: *Pentaspadon* Hook. f.

Diagnosis: Hermaphrodite trees with contact dermatitis-causing exudate turning black with exposure to air. Leaves imparipinnate, with hairy tuft domatia in secondary vein axils abaxially. Androecium usually consists of one whorl of fertile stamens and one whorl of staminodes. Drupe elongated ovoid. Seed oily.

Monotypic.

Pentaspadoideae Z. H. Feng, subfam. nov. — Type: *Pentaspadon* Hook. f.

Diagnosis: Hermaphrodite trees with contact dermatitis-causing exudate turning black with exposure to air. Leaves imparipinnate, with hairy tuft domatia in secondary vein axils abaxially. Androecium usually consists of one whorl of fertile stamens and one whorl of staminodes. Drupe elongated ovoid. Seed oily.

The only included tribe: Pentaspadeae Z. H. Feng, this publication.

Rhoinae Z. H. Feng, subtrib. nov. — Type: *Rhus* L.

Diagnosis: Dioecious or gynodioecious shrubs or trees with contact dermatitis-causing exudate. Leaves evergreen or deciduous, alternate, imparipinnate, rachis sometimes alate. Inflorescences axillary panicles or thyrsoids. Carpels 3; stylopodia 3. Drupe globose or ovoid, 1-locular, exocarp red to brown or purplish.

Included genera: *Cotinus* Mill., *Haplorhus* Engl., *Pistacia* L., *Rhus* L.

Schininae Z. H. Feng, subtrib. nov. — Type: *Schinus* L.

Diagnosis: (Polygamo)dioecious shrubs or trees with contact dermatitis-causing exudate. Leaves evergreen or deciduous, alternate, imparipinnate, petiolate. Rachis often alate. Inflorescences terminal and/or axillary thyrsiform panicles. Flowers articulate, pedicellate, perianth 5-parted. Ovules basal, pendulous, lateral or subapical. Drupe 1-locular, mesocarp thin, fleshy, sometimes resinous.

Included genera: *Euroschinus* Hook. f., *Lithrea* Hook., *Mauria* Kunth, *Schinus* L.

Tapiriroideae Z. H. Feng, subfam. nov. — Type: *Tapirira* Aubl.

Diagnosis: Shrubs or trees. Leaves multifoliolate or rarely

simple/unifoliolate, sessile to (short) petiolate. Inflorescences (sub-/pseudo-)terminal and/or axillary panicles, emerging before/with new leaves. Perianth (4)5(6)-parted, imbricate, androecium diplostemonous. Ovule apical to subapical (basal or sublateral in *Buchanania*), endocarp woody to bony with 1-5 apical opercula, sometimes with spinose projections. Seeds with curved embryo (straight in *Koordersiodendron*).

Included tribes: Buchananieae Marchand, Tapirireae Marchand.

Annonaceae [22]

Anaxagoreae Z. H. Feng, trib. nov., based on Anaxagoreoideae Chatrou, Pirie, Erkens & Couvreur, Bot. J. Linn. Soc. 169(1): 32. 2012. — Type: *Anaxagorea* A. St.-Hil.

Monotypic.

Apocynaceae [23-25]

Alstonioideae Z. H. Feng, subfam. nov. — Type: *Alstonia* R. Br.

Diagnosis: Trees or shrubs. Leaves whorled or opposite. Flowers mostly small, corolla salverform to tubular (rotate in *Dyera*), corona absent. Stamens inserted midway or above in the corolla tube; nectary disc absent, adnate or inconspicuous; stigma with or without a membranous basal collar. Fruit a pair of follicles with woody pericarp, seeds compressed, testa glabrous or pubescent or winged.

The only included tribe: Alstonieae G. Don.

Asclepiadodae Z. H. Feng, supertrib. nov. — Type: *Asclepias* L.

Diagnosis: Trees to shrubs or herbs, succulents, or small geophytes with white, yellow or translucent latex. Leaves opposite (rarely whorled), sometimes reduced to small rudiment or occasionally a spine. Inflorescences usually extra-axillary, solitary, simple. Calyx usually with few to many adaxial colleters. Anthers 2-locular, pollen in pollinia, covered by a waxy outer wall (ectexine). Fruit a pair (often one by abortion) of ventrally dehiscent follicles. Seeds usually with micropylar coma.

Include tribes: Asclepiadeae Duby, Ceropegieae Decne. ex Orb., Eustegieae Rchb. ex Liede & Meve, Fockeeae H. Kunze, Meve & Liede, Marsdenieae Benth.

Aspidospermatoideae Z. H. Feng, subfam. nov. — Type: *Aspidosperma* Mart. & Zucc.

Diagnosis: Trees or shrubs, rarely subshrubs, latex (if present) red, orange or yellow. Leaves alternate, less frequently whorled or opposite. Inflorescences axillary and/or terminal, cymose, dichasial or thyrsiform. Calycine colleters absent, corona absent; style-head mostly without apical crest or basal collar (with a short basal collar in *Haplophyton*). Fruit a pair of follicles, normally with dry pericarp and dehiscent. Seeds with papery wing or cylindrical without wing or hairs.

The only included tribe: Aspidospermateae Miers.

Araceae [26, 27]

Englerarinae Z. H. Feng, subtrib. nov., based on Englerareae A. Hay, Aroideana 46(2): 401. 2023. — Type: *Englerarum* Nauheimer & P. C. Boyce.

Monotypic.

Nephtytidinae Z. H. Feng, subtrib. nov., based on Nephtytideae Engl., Nat. Pflanzenfam. [Engler & Prantl] 2(3): 112, 128. 1887. — Type: *Nephtytis* Schott.

Diagnosis: Laticiferous herbs, stem tuberous to rhizomatous. Leaf blade sagittate or trifid to trisect and highly divided. Spathe boat-shaped or fully expanded, spadix cylindric. Female and male zones usually contiguous; stamens free with filaments lacking or very short (except *Nephtytis*); ovules 1 per locule, anatropous, placenta basal (except *Pseudohydrosme*). Berries and seeds large, testa thin to absent, endosperm absent (fruit unknown in *Pseudohydrosme*).

Included genera: *Anchomanes* Schott, *Nephtytis* Schott, *Pseudohydrosme* Engl.

Philonotiinae Z. H. Feng, subtrib. nov., based on Philonotieae S. Y. Wong & P. C. Boyce, Taxon 59(1): 121. 2010. — Type: *Philonotion* Schott.

Monotypic.

Zantedeschiinae Z. H. Feng, subtrib. nov. — Type: *Zantedeschia* Spreng.

Diagnosis: Laticiferous herbs. Leaf blade lanceolate to hastate-sagittate, primary lateral veins pinnate, forming single marginal vein, higher order venation parallel-pinnate. Spathe $\pm$ obconic, unstricted, tube subcylindric-obconic, spadix shorter than spathe, flowers unisexual, perigone absent; stamens free. Ovary 1-5 locular, ovules (1-)4(-8) per locule, anatropous. Berry green, orange or yellow; seed testa striate, endosperm copious.

Monotypic.

Araliaceae [28, 29]

Remarks: A number of potentially useful names were introduced at the subfamilial and tribal level by Marie-Thérèse Cerceau-Larival in her various publications await validation, one of which is Trachymeneae. Its only member, *Trachymene* (including *Uldinia*), forms an independent clade, which is most close to *Hydrocotyle*, *Astropanax*, *Polyscias*.

Trachymeneae Cerceau-Larival ex Z. H. Feng, trib. nov. — Type: *Trachymene* Rudge.

Diagnosis: Unarmed herbs. Stems branched, leptocaulous. Leaves petiolate, exstipulate. Inflorescences terminal and axillary simple umbellate, often arranged in monochasial or dichasial cymes; bracts whorled at the base of the umbel and basally connate; styles connate; the disc flattened or raised. Fruits dry schizocarps, sometimes with dorsal ribs and/or wings.

Monotypic.

Arecaceae [30]

Remarks: All newly validated arecaceous subtribes harbour genera long left to be assigned to suitable subtribes due to their unique phylogenetic positions.

Braheinae Z. H. Feng, subtrib. nov. — Type: *Brahea* Mart. ex Endl.

Diagnosis: Moderate, mostly solitary, rarely clustered, armed or unarmed palms. Inflorescences solitary, erect or curving, branched to 4 orders. Flowers spirally arranged, solitary or in cincinni of 2-3. Sepals 3, distinct. Petals 3,

united basally in a tube. Stamens 6, filaments connate into a 6-lobed ring.

Monotypic.

Coperniciinae Z. H. Feng, subtrib. nov. — Type: *Copernicia* Mart. ex Endl.

Diagnosis: Moderate to tall, solitary (rarely clustered), armed or unarmed, pleonanthic, hermaphroditic palms. Prophyll tubular, often 2-keeled. Calyx tubular or cyathiform, 3-lobed or with 3 points. Corolla considerably exceeding the calyx, fleshy, thick-tipped or coriaceous, tubular below, divided into 3 valvate lobes. Stamens 6, filament bases connate to form a tube or cupule.

Included genera: *Colpothrinax* Griseb. & H. Wendl., *Copernicia* Mart. ex Endl., *Pritchardia* Seem. & H. Wendl. ex H. Wendl.

Hydriastelinae Z. H. Feng, subtrib. nov. — Type: *Hydriastele* H. Wendl. & Drude.

Diagnosis: Small, moderate or tall, solitary or clustered, unarmed, pleonanthic, monoecious palms. Stems erect, slender to robust, bare, conspicuously ringed with leaf scars. Inflorescence with peduncular bract $\pm$ the same size as the prophyll, completely sheathing the inflorescence in bud. Rachillae bearing opposite and decussate or whorled triads, rarely triads spiral, throughout $\pm$ their entire length.

Monotypic.

Loxococcinae Z. H. Feng, subtrib. nov. — Type: *Loxococcus* H. Wendl. & Drude.

Diagnosis: Moderate, solitary, unarmed, pleonanthic, monoecious palm. Peduncular bract distinctly shorter than the prophyll, scarcely sheathing the inflorescence. Inflorescences infrafoliar, rather short, stiff, spreading. Rachillae bearing spirally arranged triads in the proximal $\frac{1}{2}$ - $\frac{3}{4}$, staminate flowers paired or solitary, asymmetrical, with 12 stamens.

Monotypic.

Podococcinae Z. H. Feng, subtrib. nov. — Type: *Podococcus* G. Mann & H. Wendl.

Diagnosis: Diminutive, acaulescent, clustering (rarely solitary), unarmed, monoecious, pleonanthic palm; stem erect, slender, reed-like. Prophyll basal, tubular, 2-keeled, disintegrating into long fibres or cowl-like; peduncular bracts 2-3(4), flowers borne in triads, inserted superficially in a shallow or deep pits. Stamens 6, biseriate, the outer whorl shorter than the inner. Ovary triovulate-tricarpellate. Fruit ellipsoid-oblong, stigmatic remains nearly basal, endosperm homogeneous, embryo lateral.

Included genera: *Podococcus* G. Mann & H. Wendl., *Truongsonia* A. J. Hend., N. S. Lý, W. J. Baker, S. Bellot, J. Dransf. & Eiserhardt.

Rhopaloblastinae Z. H. Feng, subtrib. nov. — Type: *Rhopaloblaste* Scheff.

Diagnosis: Small to large unarmed, pleonanthic palms. Stems erect, often enlarged at the base, sheath tubular, forming a crownshaft covered by tomentum, deciduous. Leaflets have membranous scales on the midrib abaxially, twisted. Primary inflorescence branches become divaricate as aging,

sepals and petals 3, distinct. Epicarp smooth.

Included genera: *Dictyosperma* H. Wendl. & Drude, *Rhopaloblaste* Scheff.

Washingtoniinae Z. H. Feng, subtrib. nov. — Type: *Washingtonia* H. Wendl.

Diagnosis: Robust, tall, solitary, armed, pleonanthic, hermaphroditic tree palms. Rachis bracts split on one side and pendulous, ensiform. Petals relatively large, flat, chaffy, without grooves on the inner surfaces, becoming strongly reflexed at anthesis. Style elongate, about 3 times as long as the ovarian part of the gynoecium. Flowers and fruit pedicellate. Fruit with persistent chaffy calyx.

Monotypic.

Asparagaceae [31-34]

Remarks: Theropogoneae is an invalid name mentioned by Takenoshin Nakai in 1940 without Latin description, which is validated here.

Albucinae Z. H. Feng, subtrib. nov. — Type: *Albuca* L.

Diagnosis: Plants small to large. Leaves one to several, linear to lanceolate to elliptic, glabrous or variously pubescent or glandular. Raceme subspicate, racemose or corymbose, tepal whorls monomorphic or outer apically tailed, free or shortly fused below, or fused below for at least half their length into an elongate tube. Seeds angular, semilunate or discoid.

Included genera: *Albuca* L., *Battandiera* Maire, *Coilonox* Raf., *Dipcadi* Medik., *Igidia* Speta, *Pseudogaltonia* (Kuntze) Engl., *Stellarioides* Medik., *Trimelopter* Raf.

Pseudoprosperinae Z. H. Feng, subtrib. nov., based on Pseudoprosperae J. C. Manning & Goldblatt, Edinburgh J. Bot. 60(3): 557. 2004. — Type: *Pseudoprospero* Speta.

Monotypic.

Themideae Z. H. Feng, trib. nov., based on Themidaceae Salisb., Gen. Pl. [Salisbury]: 84. 1866 ('Themideae'). — Type: *Themis* Salisb.

Included genera: *Androstephium* Torr., *Bloomeria* Kellogg, *Muilla* S. Watson, *Triteleia* Douglas ex Lindl. (incl. *Themis* Salisb.).

Theropogoneae Nakai ex Z. H. Feng, trib. nov. — Type: *Theropogon* Maxim.

Diagnosis: Acaulescent monopodial herbs, rhizomes short, thick. Leaves distichous, grasslike, sheathing, sessile. Inflorescence axillary, racemose, standing in the centre of a tuft of leaves. Flowers campanulate, nodding; floral bracts and bracteoles linear(-subulate), pedicels decurved, articulated at the apex. Staminal filaments broad; anthers basifixed. Berry black.

Monotypic.

Urgineinae Z. H. Feng, subtrib. nov. — Type: *Urginea* Steinh.

Diagnosis: Bulbiferous herbs. Leaves form a basal rosette, generally withered at flowering time. Inflorescence racemose, ranging from subspiciform to racemose or subcorymbose. Flowers trimerous, commonly arranged helicoidally, rarely secund. Bracts spurred, at least those at the inflorescence

base. Tepals usually show a longitudinal central darker band. Capsules trigonous, dry, loculicidally dehiscent, seeds with a delicate testa, easily detachable from the endosperm.

Included genera: *Aulostemon* Mart.-Azorín, M. B. Crespo, M. Pinter & Wetschnig, *Austronea* Mart.-Azorín, M. B. Crespo, M. Pinter & Wetschnig, *Boosia* Speta, *Drimia* Jacq. ex Willd., *Ebertia* Speta, *Fusifilum* Raf., *Geschollia* Speta, *Indurgia* Speta, *Iosanthus* Mart.-Azorín, M. B. Crespo, M. Pinter, Slade & Wetschnig, *Ledurgia* Speta, *Litanthus* Harv., *Mucinaea* M. Pinter, Mart.-Azorín, U. Müll.-Doblies, D. Müll.-Doblies, Pfosser & Wetschnig, *Rhadamanthopsis* (Oberm.) Speta, *Rhadamanthus* Salisb., *Rhodocodon* Baker, *Sagittanthera* Mart.-Azorín, M. B. Crespo, A. P. Dold & van Jaarsv., *Schizobasis* Baker, *Sekanama* Speta, *Spirophyllous* Mart.-Azorín, M. B. Crespo & M. Á. Alonso, *Squilla* Steinh., *Striatula* M. Pinter, Mart.-Azorín, M. B. Crespo & Wetschnig, *Tenicroa* Raf., *Thuranthos* C. H. Wright, *Triandra* Mart.-Azorín, M. B. Crespo, M. Á. Alonso, N. R. Crouch & M. Pinter, *Urginavia* Speta, *Urginea* Steinh., *Urgineopsis* Compton, *Vera-duthiea* (Oberm.) Speta, *Zingela* N. R. Crouch, Mart.-Azorín, M. B. Crespo, M. Pinter & M. Á. Alonso, *Zulusia* Mart.-Azorín, N. R. Crouch, M. B. Crespo & M. Á. Alonso.

Bignoniaceae [35]

Delostomateae Z. H. Feng, trib. nov. — Type: *Delostoma* D. Don.

Diagnosis: Trees or shrubs, stems glabrous to pubescent. Leaves opposite, simple. Inflorescence a terminal raceme or few-flowered thyse. Calyx cupular, 5-parted, sometimes with a double margin. Corolla red or magenta, tubular to campanulate or tubular. Capsule not subtended by calyx, valves glabrous. Seeds thin, with hyaline wing.

Monotypic.

Jacarandoideae Z. H. Feng, subfam. nov. — Type: *Jacaranda* Juss.

Diagnosis: Trees, sometimes shrubs or xylopodial subshrubs. Leaves opposite, bipinnate or pinnate, rarely simple, opposite. Inflorescence a terminal or axillary few- to many flowered thyse. Calyx campanulate to tubular. Corolla blue or purple-blue to magenta, tubular to campanulate. Stamens 4, included. Ovary flattened cylindrical, ovules ca. 8-seriate per locule. Capsule elliptic or oblong, not subtended by calyx. Seeds thin, with hyaline or brownish wings.

Monotypic.

Boraginaceae [36, 37]

Coldenieae Z. H. Feng, trib. nov., based on Coldeniaceae J. S. Mill. & Gottschling, Taxon 65(3): 509. 2016. — Type: *Coldenia* L.

Monotypic.

Brassicaceae [38-40]

Crambinae Z. H. Feng, subtrib. nov., based on Crambeae Coss., Comp. Fl. Atlant. 2: 99, 306. 1887. — Type: *Crambe* L.

Monotypic.

Orychophragminae Z. H. Feng, subtrib. nov. — Type:

Orychophragmus Bunge.

Diagnosis: Annual, biennial, or rhizomatous perennial herbs. Leaves undivided or pinnately divided into broad segments. Sepals erect to ascending, lateral pair saccate. Petals purple to white, obovate to obcordate. Style prominent; stigma lobes free. Siliques linear, quadrangular or terete; valves keeled.

Monotypic.

Buxaceae [41]

Didymeloideae Z. H. Feng, subfam. nov., based on Didymelaceae Leandri, Ann. Sci. Nat. Bot., s. 4. 10, 19: 316. 1937. — Type: *Didymeles* Thouars.

Monotypic.

Haptanthoideae Z. H. Feng, subfam. nov., based on Haptanthaceae C. Nelson, Ceiba 42(1): 33. 2001. — Type: *Haptanthus* Goldberg & C. Nelson.

Monotypic.

Cactaceae [42-44]

Leuenbergerieae Z. H. Feng, trib. nov., based on Leuenbergerioideae Mayta & Molinari, Succulentop@ 12: 6. 2015. — Type: *Leuenbergeria* Lóe

Monotypic.

Calyceraceae [45, 46]

Remarks: Cryptic diversity of the oligogeneric family Calyceraceae was revealed by phylogeny. Because there are no published subfamilial names in this family, the two major clades are herein recognized as tribes in order not to inappropriately exaggerate the use of subfamily.

Acicarpheae Z. H. Feng, trib. nov. — Type: *Acicarpha* Juss.

Diagnosis: Glabrous, usually non-glutinous (except *Moschopsis*) therophytic, chamaephytic or geophytic herbs. Involucre base fused or not, if fused, then cupuliform, campanulate or acetabuliform. Corolla tube cylindrical to bell-shaped or cupuliform. Ovary relatively large (except *Acicarpha*). Cypselae often keeled.

Included genera: *Acicarpha* Juss., *Anachoretetes* S. Denham & Pozner, *Asynthema* S. Denham & Pozner, *Moschopsis* Phil., *Xiphodesma* Pozner & Zijlstra.

Calycereae Z. H. Feng, trib. nov. — Type: *Calycera* Cav.

Diagnosis: Glabrous, non-glutinous, chamaephytic or rosulate hemicryptophytic herbs. Leaves (on lateral branches) entire, dentate, (pinnately) lobed or runcinate. Cephaloids well differentiated. Flowers 4- or 5-merous, salverform, isometric or tubulose. Calyx homomorphic or polymorphic. Corolla lobes (short) triangular to long (oblong-)lanceolate. Cypselae homomorphic or polymorphic, with spiny or non spiny sepals.

Included genera: *Boopis* Juss., *Calycera* Cav., *Gamocarpha* DC.

Campanulaceae [47]

Adenophorinae Z. H. Feng, subtrib. nov. — Type: *Adenophora* Fisch.

Diagnosis: Annual, biennial or perennial herbs. Leaves cauline, sessile or petiolate, sometimes forming a rosette.

Flowers small to large, arranging in a cyme or raceme, sometimes a panicle or corymbose. Corolla campanulate, tubular, infundibular, rarely urceolate or rotate, lobes long in *Homocodon* and *Hayekia*, otherwise noticeably short. Ovary 3-locular. Fruit capsular, dehiscent by pores or valves.

Included genera: *Adenophora* Fisch., *Boreoasia* D. Y. Hong & Chao Xu, *Brachycodonia* Fed. ex Kolak., *Hanabusaya* Nakai, *Hayekia* Lakušić ex D. Lakušić, Shuka & Eddie, *Homocodon* D. Y. Hong, *Hyssaria* Kolak., *Loreia* Raf. (including *Annaea* Kolak., *Astrocodon* Fed., *Favratia* Feer, *Neocodon* Kolak. & Serdyuk.), *Rosomala* D. Y. Hong & B. B. Liu.

Cannabaceae [48, 49]

Aphanantheae Z. H. Feng, trib. nov. — Type: *Aphananthe* Link.

Diagnosis: Trees or shrubs; branches without spines. Inflorescences axillary, unisexual, or rarely bisexual. Male flowers in condensed cymes or multiflowered racemes at the base of young secondary branches; female flowers solitary or rarely borne in a 2-3-flowered raceme. Ovary sessile. Drupes ovoid to subglobose.

Monotypic.

Cannabininae Z. H. Feng, subtrib. nov. — Type: *Cannabis* L.

Diagnosis: Herbs without latex; stems scabrous or armed with rigid climbing hairs. Leaves palmately compound or lobed, sometimes simple, petiolate, serrate. Male inflorescences bracteate thyrses; staminate flowers pedicellate, regular, with 5 free tepals, stamens 5; female inflorescences basically cymose, spicate; perianth uniseriate. Achene covered by the perianth. Seed 1.

Included genera: *Cannabis* L., *Humulus* L.

Capparaceae [50, 51]

Crateveae Z. H. Feng, trib. nov. — Type: *Crateva* L.

Diagnosis: Shrubs or trees Leaves simple or (1-)3(4-5)-foliolate, stipule minute or absent. Raceme terminal or lateral, loose. Flowers zygomorphic. Sepals 4, often opening prematurely. Petals 4, unguiculate, subequal to unequal. Ovary 1- or (partially) 2-locular. Seeds embedded in pulp.

Included genera: *Cladostemon* A. Braun & Vatke, *Crateva* L., *Dhofaria* A. G. Mill., *Euadenia* Oliv.

Cratevoideae Z. H. Feng, subfam. nov. — Type: *Crateva* L.

Diagnosis: Shrubs or trees Leaves simple or (1-)3(4-5)-foliolate, stipule minute or absent. Raceme terminal or lateral, loose. Flowers zygomorphic. Sepals 4, often opening prematurely. Petals 4, unguiculate, subequal to unequal. Ovary 1- or (partially) 2-locular. Seeds embedded in pulp.

The only included tribe: Crateveae Z. H. Feng, this publication.

Caprifoliaceae [52, 53]

Nardostachyeae Z. H. Feng, trib. nov. — Type: *Nardostachys* DC.

Diagnosis: Perennial herbs. Caudices robust, densely covered with fibrous or lamellar old leaf sheaths. Rosulate leaves narrowly spatulate or linear-oblongate; cauline

leaves usually 2- or 3-paired, lanceolate, smaller apically. Corolla campanulate; stamens 4. Cymes aggregated into a terminal capitulum.

Monotypic.

Zabelieae Z. H. Feng, trib. nov., based on Zabelioideae Hua Feng Wang, H. X. Wang, D. F. Morales-B., M. J. Moore & J. Wen, J. Syst. Evol. 59(5): 910. 2021. — Type: *Zabelia* (Rehder) Makino.

Monotypic.

Caryophyllaceae [54, 55]

Remarks: Saponariinae is an invalid name mentioned by Erwin Emil Alfred Janchen in 1955 without Latin description, which is validated here.

Psammosileninae Z. H. Feng, subtrib. nov. — Type: *Psammosilene* W. C. Wu & C. Y. Wu.

Diagnosis: Perennial herb with subfleshy roots. Leaves subsessile, lateral veins obscure. Inflorescence a terminal thyrses, densely glandular pubescent. Petals 5, free, purplish-pink with 3 longitudinal purple lines. Stamens 5, exserted beyond calyx; styles 2, persistent; anthers pinkish purple. Capsule clavate, membranous, indehiscent, enclosed by persistent calyx.

Monotypic.

Saponariinae Janch. ex Z. H. Feng, subtrib. nov. — Type: *Saponaria* L.

Diagnosis: Perennial, rarely annual herbs. Flowers in lax or dense paniculate or capitate cymes, rarely solitary; bracts herbaceous, bracteoles absent; calyx cylindrical, obscurely 15-25-veined, without scarious commissures (or very narrow ones), 5-toothed; petals 5, mostly distinctly clawed, coronal scales usually present; stamens 10; styles 2(-3). Capsule opening by 4(6) teeth. Seeds reniform to almost globular, embryo curved.

Monotypic.

Celastraceae [56]

Plagioptereae Z. H. Feng, trib. nov., based on Plagiopteraceae Airy Shaw, Kew Bull. 18: 266. 1965. — Type: *Plagiopteron* Griff.

Monotypic.

Siphonodonteae Z. H. Feng, trib. nov., based on Siphonodontoideae Croizat, Lilloa 13: 41. 1947. — Type: *Siphonodon* Griff.

Included genera: *Peripterygia* Loes., *Siphonodon* Griff.

Cleomaceae [57]

Remarks: Oxystylideae is an invalid name mentioned by Armen Takhtajan in 2009 without description, which is validated here.

Oxystylideae Takht. ex Z. H. Feng, trib. nov. — Type: *Oxystylis* Torr. & Frén.

Diagnosis: Annual or perennial herbs, subshrubs or shrubs. Leaves simple or (1-)3(5)-foliolate. Stipules minute or absent. Racemes terminal or axillary, ebracteate or rarely basally bracteate. Flowers inconspicuous, zygomorphic, sepals 4, petals 4, unequal to subequal; stamens (4-)6, all fertile, inserted or exserted. Ovary 2-locular, fruit a capsule, schizo-

carp, or short dehiscent silicle.

Included genera: *Cleomella* DC., *Oxystylis* Torr. & Frén., *Peritoma* DC., *Wislizenia* Engelm.

Commelinaceae [58]

Tinantiinae Z. H. Feng, subtrib. nov. — Type: *Tinantia* Scheidw.

Diagnosis: Annual or perennial herbs. Basal bracts spathaceous or foliaceous. Inflorescence paniculiform or umbelliform thyrses or composed of 1-2 cincinni, or consisting of a solitary flower. Flower zygomorphic, medial petal narrower than the laterals, petals 3, subequal, not clawed. Stamens 6, equal or polymorphic, filaments bearded.

Included genera: *Tinantia* Scheidw., *Sauvallia* C. Wright ex Hassk.

Convolvulaceae [59]

Cardiochlamydoideae Z. H. Feng, subfam. nov., based on Cardiochlamydeae Stefanović & D. F. Austin, Syst. Bot. 28(4): 796. 2003. ('Cardiochlamydeae') — Type: *Cardiochlamys* Oliv.

The only included tribe: Cardiochlamydeae Stefanović & D. F. Austin.

Cornaceae [60, 61]

Chamaepericlymeneae Z. H. Feng, trib. nov. — Type: *Chamaepericlymenum* Hill.

Diagnosis: Herbs, shrubs or trees. Inflorescence has flowers in a head subtended by four involucre bracts that are large and petaloid at anthesis (except in the Mexican *Benthamidia disciflora*, which develops four involucre bracts that fall off before they expand and become petaloid). Fruits simple or compound, usually red.

Included genera: *Benthamidia* Spach, *Chamaepericlymenum* Hill, *Dendrobenthamia* Hutch.

Swideae Z. H. Feng, trib. nov. — Type: *Swida* Opiz.

Diagnosis: Evergreen or deciduous trees or shrubs. Leaves alternate or opposite. Flowers creamy white; inflorescences complex, branched and elongate, flat-, round-, or pyramid topped, with rudimentary, usually early-deciduous bracts at the base of or on the inflorescence branches. Fruits white, blue, or black.

Included genera: *Bothrocaryum* (Koehne) Pojark., *Swida* Opiz, *Yinquania* Z. Y. Zhu.

Costaceae [62]

Dimerocosteae Z. H. Feng, trib. nov. — Type: *Dimerocostus* Kuntze.

Diagnosis: Herbs from low or small rosette to large perennials greater than 3 m in height. Inflorescence often capitate, cylindrical, spirally contorted, scarcely cone-like or flower solitary in the axils of the leaves. Bracteole tubular; labellum open; stigmas cupular. Floral parts with red-brown punctations.

Included genera: *Chamaecostus* C. D. Specht & D. W. Stev., *Dimerocostus* Kuntze, *Monocostus* K. Schum.

Dipentodontaceae [63]

Dipentodontae Z. H. Feng, trib. nov., based on Dipentodontaceae Merr., Brittonia 4: 69, 73. 1941. — Type: *Di-*

pentodon Dunn.

Monotypic.

Ericaceae [64, 65]

Harrimanelleae Z. H. Feng, trib. nov., based on Harrimanelloideae Kron & Judd, Bot. Rev. (Lancaster) 68(3): 409. 2002. — Type: *Harrimanella* Cov.

Monotypic.

Fabaceae [66-71]

Albiziinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Albizia* Durazz.

Diagnosis: Small to very large trees, shrubs, rarely scandent or lianescent shrubs or a liana. Inflorescences globose, sub- or hemiglobose, or corymbiform capitula, dimorphic or homomorphic. Flowers 5-merous, with (slenderly) campanulate or funnel-shaped calyx and corolla. Fruits usually flat and straight or slightly curved non-septate, with papery valves. Seeds with a hard smooth testa, rarely (*Boliviadendron*) the testa thin.

Included genera: *Albizia* Durazz., *Boliviadendron* E. R. Souza & C. E. Hughes, *Enterolobium* Mart.

Aldineae K. W. Jiang & Z. H. Feng, trib. nov. — Type: *Aldina* Endl.

Diagnosis: Trees mainly in tropical forests. Leaves often fascicled at the branch apex. Inflorescences terminal, paniculate. Flowers papilionaceous (*Andira* and *Hymenolobium*) or actinomorphic with (3)4-6 ascendingly imbricate petals (*Aldina*). Ovules 1-3. Fruit woody, drupaceous, with fibrous endocarp (*Aldina* and *Andira*) or compressed, samaroid (*Hymenolobium*).

Included genera: *Aldina* Endl., *Andira* Lam., *Hymenolobium* Benth.

Amherstiinae K. W. Jiang & Z. H. Feng, subtrib. nov., based on Amherstieae Benth., J. Bot. (Hooker) 2: 732. 1840. — Type: *Amherstia* Wall.

Diagnosis: Unarmed trees. Leaves paripinnate; stipules early caducous. Racemes terminal, lax, pendulous. Bracts early caducous; bracteoles red, persistent. Pedicels red, long. Flowers red, showy. Sepals 4, petaloid, subequal. Petals 5, unequal; the lower 2 minute, setaceous; lateral ones spatulate; upper one fan shaped with wavy upper margin. Stamens 10; 9 connate into a pink sheet; 5 of these with partly free filament. Style red, filiform. Pods long-stalked, oblong, flat, dehiscent.

Monotypic.

Anonychiinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Anonychium* (Benth.) Schweinf.

Diagnosis: Unarmed trees 4-20 m high, brachyblasts absent. Leaves somewhat pendulous, bipinnate; fleshy, cup or tub-shaped, nectaries often between some or most leaflet pairs. Inflorescences spiciform racemes, Flowers small, yellowish or greenish-white, sweetly scented. Fruits indehiscent, straight or sub-falcate, dark reddish-brown to blackish, shiny, subterete in cross-section.

Monotypic.

Browneinae K. W. Jiang & Z. H. Feng, subtrib. nov. —

Type: *Brownea* Jacq.

Diagnosis: Shrubs to trees, leaflets 1-many, opposite or rarely alternate. Flowers showy, petaloid, spirally arranged in racemes or panicles. Bracteoles partly connate, sometimes tubular, or free, or even 0 (then bracts large, involucrate). Stamens joined in a sheath (well developed if bracteoles free or 0).

Included genera: *Brachycylix* (Harms) R. S. Cowan, *Brownea* Jacq., *Browneopsis* Huber, *Ecuadendron* D. A. Neill, *Elizabetha* R. H. Schomb. ex Benth., *Heterostemon* Desf., *Macrolobium* Schreb., *Paloue* Aubl., *Paloveopsis* R. S. Cowan.

Cabarieae K. W. Jiang & Z. H. Feng, trib. nov. — Type: *Cabari* Gregário & D. B. O. S. Cardoso.

Diagnosis: Trees. Stipules ovate, caducous. Inflorescences terminal or less often axillary, racemose-paniculate; bracts and bracteoles minute, caducous. Flowers zygomorphic, strongly papilionate, bisexual. Petals purple, pinkish, or white, slightly falcate to oblong. Fruits elastically dehiscent, endocarp detaches from the dry pericarp of the pod.

Monotypic.

Caesalpiniinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Caesalpinia* L.

Diagnosis: Unarmed trees. Leaves paripinnate; stipules early caducous. Racemes terminal, lax, pendulous. Bracts early caducous; bracteoles red, persistent. Pedicels red, long. Flowers red, showy. Sepals 4, petaloid, subequal. Petals 5, unequal; the lower 2 minute, setaceous; lateral ones spatulate; upper one fan shaped with wavy upper margin. Stamens 10; 9 connate into a pink sheet; 5 of these with partly free filament. Style red, filiform. Pods long-stalked, oblong, flat, dehiscent.

Monotypic.

Calliandrinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Calliandra* Benth.

Diagnosis: Shrubs or small trees, rarely perennial herbs or geoxyllic subshrubs. Inflorescences capitate, umbelliform or sometimes elongated into short racemes. Stamens (8) 10 to moderately or extremely numerous in a single flower, exserted or long exserted from the corolla, free from the base or basally fused to form a conspicuous tube. Fruits linear, oblanceolate, narrowly oblong or linear-oblanceolate, flattened, straight or slightly curved.

Included genera: *Acaciella* Britton & Rose, *Afrocalliandra* E. R. Souza & L. P. Queiroz, *Calliandra* Benth.

Chidlowiinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Chidlowia* Hoyle.

Diagnosis: Unarmed tree, small to medium sized, up to 25(30) m. Inflorescence a slender, pendulous panicle, to 40 cm long, usually on old wood or terminal on young branchlets; lateral branchlets numerous and short, 5-7-flowered. Flowers deep red. Stamens 10, partly joined at the base, red; ovary stipitate, style long and red. Fruit oblong-linear, acute at both ends, up to 60 cm long and 6 cm broad.

Monotypic.

Clitorieae K. W. Jiang & Z. H. Feng, trib. nov. — Type: *Clitoria* L.

Diagnosis: Erect or scandent shrubs, lianas, subshrubs, twining herbs or trees. Leaflets ternate or pinnately 1-5-9 foliolate, without glandules beneath; stipels usually present. Bracts and bracteoles persistent. Petals glabrous or sometimes pubescent. Style apical.

Included genera: *Barbieria* DC., *Centrosema* (DC.) Benth., *Clitoria* L., *Clitoriopsis* R. Wilczek, *Periandra* Mart. ex Benth.

Cojobinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Cojoba* Britton & Rose.

Diagnosis: Unarmed trees and arborescent shrubs. Stipules small, ephemeral, caducous, rarely persistent or lignescent. Inflorescences capitula arising either singly or fasciculate, spherical, receptacle subglobose, rarely spicate-racemose. Fruits variable; seeds variable, compressed to flattened, subglobose, discoid, oblong-ellipsoid to ellipsoid.

Included genera: *Cojoba* Britton & Rose, *Hesperalbizia* Barneby & J. W. Grimes, *Lysiloma* Benth.

Cylicodiscinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Cylicodiscus* Harms.

Diagnosis: Very large trees with knee-like outgrowths and small adventitious roots at base. Leaves bipinnate, petiole bearing a round, sunken nectary at the apex. Inflorescences of solitary, axillary spiciform racemes; flowers white; Anthers dorsifixed, bearing an apical globose gland. Fruits pendulous, linear oblong, strap-like, up to 1 m long, dehiscent along the ventral suture, flattened, woody, ca. 10-seeded.

Monotypic.

Daleinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Dalea* L.

Diagnosis: Plants glandular-punctate. Leaves imparipinnate, rarely simple. Inflorescences terminal, spineless, rarely spiny (*Psorodendron*). Flower papilionaceous. Calyx persistent, often enclosing fruit. Style glabrous.

Included genera: *Dalea* L., *Marina* Liebm., *Psorodendron* Rydb., *Psorothamnus* Rydb.

Duparquetieae K. W. Jiang & Z. H. Feng, trib. nov., based on Duparquetioideae Azani & al., Taxon 66(1): 69. 2017. — Type: *Duparquetia* Baill.

Monotypic.

Entadinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Entada* Adans.

Diagnosis: Trees, shrubs, lianas and geoxyllic suffrutices, unarmed. Leaves bipinnate, lacking extrafloral nectaries. Flowers 5-merous, bisexual or staminate, sessile or pedicellate. Fruit papyraceous, with a basal twist, indehiscent, or coriaceous and dehiscent along one suture, or a craspedium breaking up to leave the sutures as a persistent replum. Seeds globular or laterally compressed, winged or not, with or without a pleurogram.

Included genera: *Aubrevillea* Pellegr., *Entada* Adans., *Piptadeniastrum* Brenan.

Fillaeopsidinae K. W. Jiang & Z. H. Feng, subtrib. nov. —

Type: *Fillaeopsis* Harms.

Diagnosis: Large, often buttressed, unarmed trees. Inflorescence a panicle of spiciform racemes, axillary or terminal. Flowers very waxy and shiny on herbarium sheets; calyx broadly open, 5-lobed, probably somewhat succulent. Fruits very large, 60-80 × 15-20 cm, broadly oblong, flattened, dehiscent along both sutures, 8-10-seeded; valves papery to coriaceous, outer layer waxy.

Monotypic.

Haplormosieae K. W. Jiang & Z. H. Feng, trib. nov. — Type: *Haplormosia* Harms.

Diagnosis: Trees. Leaves 1-foliolate, oblong or lanceolate; racemes few- or several-flowered; pedicels with 2 short bracteoles at the apex. Vexillum almost semiorbicular, wings very obliquely ovate, keel-petals obliquely lanceolate, slightly coherent in the upper part. Ovary stipitate, style slender, with minute stigma. Fruit shortly stipitate, obliquely oblong or obovate, compressed, opening by somewhat woody valves.

Monotypic.

Hoffmannsegginae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Hoffmannseggia* Cav.

Diagnosis: Small herbs, subshrubs, shrubs or small to medium-sized or large trees, unarmed or with caducous spines. Multicellular glandular structures present on the stems, leaves and inflorescences. Leaves bipinnate with a terminal pinna. Idioblasts absent in leaflets.

Included genera: *Arquita* Gagnon, G. P. Lewis & C. E. Hughes, *Balsamocarpon* Clos, *Cenostigma* Tul., *Cordeauxia* Hemsl., *Erythrostemon* Klotzsch, *Hoffmannseggia* Cav., *Libidibia* (DC.) Schltdl., *Pomaria* Cav., *Stenodrepanum* Harms, *Stuhlmannia* Taub., *Zuccagnia* Cav.

Inginae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Inga* Mill.

Diagnosis: Unarmed trees or shrubs, rarely with spine-like projections. Inflorescences capitate, umbelliform, spicate or racemose, isolated or clustered in axillary fascicles or terminal panicles. Flowers mostly 5-merous; stamens basally fused in a staminal tube, exerted or included in the corolla. Fruits indehiscent, and then straight or encircled, or passively dehiscent with mostly papery or chartaceous valves. Seeds flattened and discoid, ovoid, obovoid, oblong, elliptic to orbicular.

Included genera: *Abarema* Pittier, *Blanchetiodendron* Barneby & J. W. Grimes, *Inga* Mill., *Ingopsis* (Barneby & J. W. Grimes) Fern, *Leucochloron* Barneby & J. W. Grimes, *Macrosamanea* Britton & Rose ex Britton & Killip, *Osodendron* E. J. M. Koenen, *Pseudocojoba* (Barneby & J. W. Grimes) Fern, *Robrichia* (Barneby & J. W. Grimes) A. R. M. Luz & E. R. Souza, *Zygia* P. Browne.

Jupunbinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Jupunba* Britton & Rose.

Diagnosis: Unarmed trees, treelets and shrubs. Stipules puberulent to glabrous, veinless or faintly 3-veined, or absent. Inflorescences congested or lax racemes, capitate, corymbose-umbellate or spiciform. Flowers homomorphic or het-

eromorphic; stamens numerous, filaments fused into a tube, anthers rimose. Fruit a dehiscent legume, lomentiform or with the endocarp breaking into 1-seeded envelopes.

Included genera: *Hydrochorea* Barneby & J. W. Grimes, *Jupunba* Britton & Rose, *Pseudalbizzia* Britton & Rose, *Punjuba* Britton & Rose.

Lachesiodendrinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Lachesiodendron* P. G. Ribeiro, L. P. Queiroz & Luckow.

Diagnosis: Trees, branches armed with stipules modified into lignified spines, down-curved, paired at branch nodes, prickles absent, lenticels present. Inflorescences 1-2(3) axillary spikes. Flowers 5-merous, yellowish green. Stamens 10, anthers with a short-stipitate caducous apical gland. Fruit a flat-compressed legume with thick margins, straight, not constricted between the 8-10 seeds.

Monotypic.

Mimosinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Mimosa* L.

Diagnosis: Trees, shrubs, herbs, geoxyles, and lianas; brachyblasts absent or sometimes present. Leaves bipinnate, rachis armed or not; extrafloral nectaries absent (most *Mimosa*) or present on the petiole, sometimes also on the rachis and pinnae. Inflorescence globose or ellipsoid capitula, or cylindrical racemes or spikes, solitary, fasciculate or organised in complex synflorescences. Fruit a legume with entire valves, a craspedium or an unjointed craspedium.

Included genera: *Adenopodia* C. Presl, *Mimosa* L., *Piptadenia* Benth.

Neltuminae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Neltuma* Raf.

Diagnosis: Intricately much-branched erect to prostrate shrubs and small trees, armed with either thorns, spinescent shoots or spinescent stipules. Inflorescence either a globose or ovoid elliptic capitulum or a spiciform raceme. Flowers dark maroon, red, white, pale to bright lemon yellow or yellowish-green. Fruits either pale orange-brown, 1(2)-seeded, indehiscent, broadly falcate to semi-orbicular, compressed, the lower suture arched and winged.

Included genera: *Neltuma* Raf., *Strombocarpa* (Benth.) A. Gray, *Xerocladia* Harv.

Newtoniinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Newtonia* Baill.

Diagnosis: Unarmed large trees, often with buttresses and aerial roots. Inflorescences paniculiform comprising aggregated spikes (a raceme in one species), terminal or subterminal. Hypanthium absent but the stamens and petals fused into a stemonozone, forming a nectary disk in several species. Fruits strongly dorsiventrally flattened, dehiscing along ventral suture; seeds strongly flattened, winged.

Monotypic.

Oberholzerieae K. W. Jiang & Z. H. Feng, trib. nov. — Type: *Oberholzeria* Swanepoel, M. M. le Roux, M. F. Wojc. & A. E. van Wyk.

Diagnosis: Erect, single-stemmed, biennial or short-lived

perennial succulent, glaucous, glabrous and unarmed. Stipules paired, fleshy, deciduous. Leaves fleshy and pinnately compound. Inflorescences racemose, with 35-65 flowers, petals white with yellow-green venation. Flowers spirally arranged, each subtended by a lanceolate, fleshy, caducous bract. Fruit obovate-clavate and 1-seeded.

Monotypic.

Orphanodendreae K. W. Jiang & Z. H. Feng, trib. nov. — Type: *Orphanodendron* Barneby & J. W. Grimes.

Diagnosis: Trees with glabrous, vertically striped, elenticeolate annotinous branches, stems dichotomously or trichotomously forked. Inflorescences racemose panicles, twice or thrice forked into 2 equally strong and often a third weaker branch. Petals fugacious, white. Ovary densely loosely sericeous. Fruit ascending, oblanceolate, seeds basipetal on very short fleshy funiculus, obovoid-compressed.

Monotypic.

Pithecellobiinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Pithecellobium* Mart.

Diagnosis: Small trees, shrubs, sometimes sarmentose, growth sympodial or monopodial. Stipules spinescent. Inflorescences spikes or globose capitula that arise singly or in fascicles. Flowers uniform; sepals 5, rarely 4 or 6; petals 5, rarely 4 or 6, connate, equal, radially symmetrical. Fruits oblong or broad-linear; seeds lentiform or plumply obese, with pleurogram.

Included genera: *Ebenopsis* Britton & Rose, *Gretheria* Duno & Torke, *Havardia* Small, *Painteria* Britton & Rose, *Pithecellobium* Mart., *Ricoa* Duno & Torke, *Sphinga* Barneby & J. W. Grimes.

Plathymeniinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Plathymenia* Benth.

Diagnosis: Unarmed deciduous trees, stems dark, terete, glabrous to glaucous, waxy; brachyblasts absent. Leaves bipinnate, pinnae terminating in an adaxial, crateriform nectary. Inflorescences spiciform racemes, flower pedicels persistent and peg-like after abscission of unfertilised flowers; calyx 5-toothed, campanulate. Fruits linear-oblong, tardily dehiscent through both sutures.

Monotypic.

Prosopidinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Prosopis* L.

Diagnosis: Small armed trees, shrubs or subshrubs or occasionally lianescent. Nectary between first pair of pinnae, often obscure, or at apex of petiole and often between leaflets. Inflorescences spiciform racemes, solitary or in fascicles in leaf axils, or grouped into secondary terminal racemes. Fruits either straight, plano-compressed, narrowly linear with coriaceous valves and dehiscent through both sutures.

Included genera: *Indopiptadenia* Brenan, *Prosopis* L.

Pseudosenegaliinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Pseudosenegalia* Seigler & Ebinger.

Diagnosis: Leaves bipinnate, with glands on the petiole and/or rachis. Prickles absent on stem and leaf petiole and rachis. Stipular spines absent. Peduncles lacking an involu-

cre. Flowers usually sessile or subsessile, rarely pedicellate (then the pedicel not persistent).

Included genera: *Mariosousa* Seigler & Ebinger, *Parasenegalia* Seigler & Ebinger, *Pseudosenegalia* Seigler & Ebinger.

Samaneinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Samanea* (Benth.) Merr.

Diagnosis: Unarmed (*Samanea*) or usually armed with axillary spines (*Chloroleucon*) trees or shrubs. Leaves bipinnate, extrafloral nectaries present. Inflorescences umbelliform capitula or racemose spikes, in *Chloroleucon* emerging from a cone of imbricate perules. Androecium with 10-36(52) whitish, greenish, pink, or reddish stamens. Seeds with a hard testa and a pleurogram.

Included genera: *Chloroleucon* (Benth.) Britton & Rose, *Samanea* (Benth.) Merr.

Sanjappinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Sanjappa* E. R. Souza & Krishnaraj.

Diagnosis: Shrubs or trees, armed with spinescent stipules or unarmed. Inflorescences spherical heads, umbels, or elongated spikes or racemes, pedunculate, capitula always homomorphic. Flowers hermaphroditic or functionally staminate; corolla campanulate or infundibuliform, (3-4)5-lobed. Fruits linear to elliptic, oblanceolate or obovate, flattened or thickened. Valves membranous, chartaceous, coriaceous or ligneous.

Included genera: *Faidherbia* A. Chev., *Sanjappa* E. R. Souza & Krishnaraj, *Thailentadopsis* Kosterm., *Viguieranthus* Villiers, *Zapoteca* H. M. Hern.

Senegaliinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Senegalia* Raf.

Diagnosis: Similar to *Pseudosenegaliinae* K. W. Jiang & Z. H. Feng (this publication), but prickles common on stem and usually the leaf petiole and rachis.

Monotypic.

Stryphnodendrinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Stryphnodendron* Mart.

Diagnosis: Trees, rarely shrubs or subshrubs, brachyblasts absent or present, branches and leaves unarmed. Leaves bipinnate, extrafloral nectaries present on the petiole. Flowers 5-merous; stamens 10, anthers with an apical gland. Fruit a dehiscent or indehiscent legume or a follicle, variable in shape and size. Seeds winged or not, brown, dark or white, pleurogram absent or present.

Included genera: *Gwilymia* A. G. Lima, Paula-Souza & Scalon, *Marlimorimia* L. P. Queiroz, L. M. Borges, Marc. F. Simon & P. G. Ribeiro, *Microlobius* C. Presl, *Naiadendron* A. G. Lima, Paula-Souza & Scalon, *Parapiptadenia* Brenan, *Pityrocarpa* (Benth.) Britton & Rose, *Stryphnodendron* Mart.

Sympetalandrinae K. W. Jiang & Z. H. Feng, subtrib. nov. — Type: *Sympetalandra* Stapf.

Diagnosis: Unarmed, small to medium-sized tree (to 30 m), buttressed. Inflorescences dense, terminal and axillary racemes arranged in panicles towards the tip. Bracts persistent beyond anthesis; bracteoles absent at anthesis. Stamens 10, 5

long and 5 short in bud, free, adnate to petals at base. Fruit thickly woody, elongate to 70 cm, tardily dehiscent.

Monotypic.

Gentianaceae [25, 72]

Remarks: *Exacum* and *Saccifolium*, two basalmost lineages in the family are here elevated to subfamilial level, respectively.

Exacoideae Z. H. Feng, subfam. nov., based on *Exaceae* Colla, Herb. Pedem. 4: 174. 1835. — Type: *Exacum* L.

Included tribes: *Exaceae* Colla, *Sebaeae* Endl.

Saccifolioideae Z. H. Feng, subfam. nov., based on *Saccifoliaceae* Maguire & Pires, Mem. New York Bot. Gard. 29: 242. 1978. — Type: *Saccifolium* Maguire & Pires.

The only included tribe: *Saccifolieae* Struwe, Thiv, V. A. Albert & Kadereit.

Haemodoraceae [73]

Anigozanthaeae Z. H. Feng, trib. nov. — Type: *Anigozanthos* Labill.

Diagnosis: Rhizomatous, often caespitose herbs. Inflorescence a terminal simple or bifurcate helicoid cyme or a loose panicle of generally bifurcate helicoid cymes. Flowers zygomorphic, slit further on one side, often nearly to base. Stamens 6, inserted near base or top of tube, stigma entire. Capsule dehiscence loculicidal or septifragal.

Included genera: *Anigozanthos* Labill., *Macropidia* J. Drumm. ex Harv.

Haloragaceae [74]

Glischrocaryoideae Z. H. Feng, subfam. nov. — Type: *Glischrocaryon* Endl.

Diagnosis: Glabrous perennial herbs from woody, branched rootstock, shrubs or small trees. Leaves opposite or alternate, show the phenomenon of juvenile leaf forms. Fruit 2- or 4-winged or ribbed, 1-seeded, occupying the entire locule. Pollen grains isopolar, subspheroidal, 4-6-colpate, the colpi are relatively long and usually tenuimarginate; the sexine is thicker than the nexine.

Included genera: *Glischrocaryon* Endl., *Haloragodendron* Orchard.

Proserpinacoideae Z. H. Feng, subfam. nov. — Type: *Proserpinaca* L.

Diagnosis: Submerged, emergent or seasonally terrestrial rhizomatous perennials. Leaves alternate, subsessile, the submerged pinnatifid, the aerial occasionally simple but distinctly toothed. Flowers bimerous or trimerous, solitary or in dichasia of 3-11 flowers. Stamens 3(4)-6. Ovary bi- or trilocular. Fruit 3-angled, 1-3-seeded.

Included genera: *Meionectes* R. Br., *Proserpinaca* L.

Trihaloragaeae Z. H. Feng, trib. nov. — Type: *Trihaloragis* M. L. Moody & Les.

Diagnosis: Perennial herb or subshrub, stems 4-ribbed. Leaves opposite basally becoming alternate in upper parts, lanceolate to oblanceolate. Flowers trimerous, perfect; sepals 3, deltoid, green; petals 3, hooded, green to cream; stamens 6; styles 3; ovary green, ovoid, 3-ribbed, incompletely 3-locular, septae present only in lower part, locules opposite the petals,

one ovule per locule.

Monotypic.

Hydrocharitaceae [75]

Lagarosiphoneae Z. H. Feng, trib. nov. — Type: *Lagarosiphon* Harv.

Diagnosis: Dioecious or rarely monoecious, freshwater perennials. Leaves submerged, spiral, subopposite or in whorls of 3 or more, scalelike and $\pm$ triangular or foliate and linear-lanceolate. Inflorescences axillary, the male pedunculate and globose containing numerous flowers, the female cylindrical containing 1 sessile flower. Fruit a cylindrical capsule.

Monotypic.

Iridaceae [76, 77]

Geosirideae Z. H. Feng, trib. nov., based on Geosiridaceae Jonker, Recueil Trav. Bot. Néerl. 36: 477. 1939 — Type: *Geosiris* Baill.

Monotypic.

Lythraceae [78, 79]

Cupheae Z. H. Feng, trib. nov. — Type: *Cuphea* P. Browne.

Diagnosis: Herbs, subshrubs, shrubs or trees. Leaves sometimes with glandular black punctate. Inflorescence raceme or thyse, rarely solitary. Flower 4(5)-6-merous, floral tube cyathiform or infundibuliform, corolla in various tones of rose to red, rarely white, greenish, or purple. Ovary mostly 2-locular, sessile or stipitate. Capsule indehiscent or dehiscent.

Included genera: *Adenaria* Kunth, *Cuphea* P. Browne, *Diplusodon* Pohl, *Gyrosphragma* T. B. Cavalc. & Facco, *Koehneria* S. A. Graham, Tobe & Baas, *Pehria* Sprague, *Pleurophora* D. Don, *Woodfordia* Salisb.

Decodoneae Z. H. Feng, trib. nov. — Type: *Decodon* J. F. Gmel.

Diagnosis: Glabrous to velutinous shrubs. Leaves decussate or verticillate, lanceolate. Flowers whorled at the nodes in short-pedunculate dichasia, campanulate, (4)5-merous, heteromorphic, tristylic. Petals (4)5(-7), rose-purple; stamens (8)10, 2 lengths per flower; ovary 3(4)-locular. Capsule globose, loculicidally dehiscent.

Monotypic.

Lawsonieae Z. H. Feng, trib. nov. — Type: *Lawsonia* L.

Diagnosis: Small glabrous shrubs or trees, branches sometimes with nodal spines (in *Ginoria*) or often terminating in a rigid spine (in *Lawsonia*). Flowers solitary in axillary pairs, few-flowered cymes, or panicles, 4-or 6-merous, campanulate, petals 0 or 6. Nectary absent. Pollen with 6 pseudocolpi. Seeds numerous, seed coat trichomes present, straight.

Included genera: *Ginoria* Jacq., *Lawsonia* L., *Tetrataxis* Hook. f.

Puniceae Z. H. Feng, trib. nov. — Type: *Punica* L.

Diagnosis: Glabrous shrubs or small trees. Leaf apical glands present (absent in *Pemphis*). Pollen without pseudocolpi (6 pseudocolpi in *Lafoensia*, *Pemphis*). Ovary superior (inferior in *Punica*), mature placenta basal; ovule outer in-

tegument multiplicative (not in *Galpinia*, unknown in *Capuronia*). Seed trichomes absent (present and spiral in *Lafoensia*).

Included genera: *Capuronia* Lourteig, *Galpinia* N. E. Br., *Lafoensia* Vand., *Pemphis* J. R. Forst. & G. Forst., *Punica* L.

Rotaleae Z. H. Feng, trib. nov. — Type: *Rotala* L.

Diagnosis: Aquatic, amphibious, or terrestrial herbs, or slender-stemmed, glabrous shrubs. Leaves lanceolate-linear (*Diplis*, *Heimia*) or whorled (*Rotala*). Calyx lobes short, less than half the length of the floral tube. Ovary 2- or 4-locular, carpels as many as the calyx lobes or half as many; seeds trichomes present, straight.

Included genera: *Didiplis* Raf., *Heimia* Link, *Rotala* L.

Malvaceae [80]

Heritiereae Z. H. Feng, trib. nov. — Type: *Heritiera* Aiton.

Diagnosis: Trees, sometimes lepidote. Leaves digitately compound or simple, with or without palmate venation. Sepals sometimes reddish, caducous; androgynophore absent or short in female flowers. Fruit indehiscent, winged or strongly keeled, woody to spongy fibrous.

Monotypic.

Marantaceae [81-83]

Calatheeae Z. H. Feng, Z. H. Feng, trib. nov. — Type: *Calathea* G. Mey.

Diagnosis: Rosulate or caulescent herbs. Cymules brachyblastic, 1(2)-3 flowered. Interphylls usually (in *Calathea*) or occasionally present. Bracteoles usually present. Corolla tube long or very long. Outer staminode 1.

Included genera: *Calathea* G. Mey., *Goeppertia* Nees, *Haumania* J. L. Éonard, *Ischnosiphon* Kärn., *Monotagma* K. Schum., *Pleiostachya* K. Schum.

Sarcophrynieae Z. H. Feng, trib. nov. — Type: *Sarcophrynium* K. Schum.

Diagnosis: Rosulate herbs or subscandent herbs. Interphyll often absent. Cymules $\pm$ dolichoblastic, interphylls absent. Bracteole 1(2), mostly glandular. Outer staminodes 2 or absent. Ovary trilocular.

Included genera: *Hypselodelphys* (K. Schum.) Milne-Redh., *Megaphrynium* Milne-Redh., *Sarcophrynium* K. Schum., *Trachyphrynium* Benth., *Thaumatococcus* Benth.

Stachyphrynieae Z. H. Feng, trib. nov. — Type: *Stachyphrynium* K. Schum.

Diagnosis: Small acaulescent to shrub-shaped herbs. Inflorescence mostly simple or sparsely branched synflorescence. interphyll absent (or very rarely present). Bracteoles rudimentary or absent. Outer staminodes 2, mostly petaloid. Ovary 3 ovulate locular.

Included genera: *Afrocalathea* K. Schum., *Marantochloa* Brongn. ex Gris, *Monophyllanthus* K. Schum., *Stachyphrynium* K. Schum.

Melanthiaceae [84]

Heloniadoideae Z. H. Feng, subfam. nov. — Type: *Helonias* L.

Diagnosis: Herbs. Underground stem a rhizome. Inflorescence racemose. Floral bracts usually absent or obsolete,

rarely present (then style 1, long, filiform). Anther thecae $\pm$ confluent. Pollen intectate.

Included tribes: Chionographideae Nakai, Heloniadeae Fr. Meliaceae [85]

Chukrasieae Z. H. Feng, trib. nov. — Type: *Chukrasia* A. Juss.

Diagnosis: Deciduous shrubs or trees. Leaves usually imparipinnate or and bipinnate with leaflets incised or lobed or detate (at least in juveniles). Thyrses axillary, petals 4 or 5, distinct, contorted. Capsule opening from apex with (3)4-5 valves. Seeds with terminal wings.

Included genera: *Chukrasia* A. Juss., *Schmardaea* H. Karst.

Molluginaceae [86-88]

Hypertelidinae Z. H. Feng, subtrib. nov. — Type: *Hypertelis* E. Mey. ex Fenzl.

Diagnosis: Annual or perennial glabrous herbs. Lateral branches and pedicels mostly becoming markedly swollen at the base. Leaves in false whorls, sometimes forming a narrow rim clasping the node. Flowers in axillary or terminal, sessile or pedunculate umbel-like cymes. Capsule dehiscent with 3 valves. Seeds numerous, very finely reticulate to almost smooth.

Monotypic.

Paramollugininae Z. H. Feng, subtrib. nov. — Type: *Paramollugo* Thulin.

Diagnosis: Annual or perennial herbs or small shrubs. Leaves alternate, mostly all crowded in a basal rosette or on short shoots; stipules absent. Flowers in seemingly axillary, dichotomously branched or sometimes raceme-like cymes; bracts small, membranous. Capsule dehiscent with 3 valves. Seeds numerous, papillose.

Monotypic.

Myrtaceae [89]

Melaleucoideae Z. H. Feng, subfam. nov. — Type: *Melaleuca* L.

Diagnosis: Mangroves (Osbornieae) or terrestrial trees or shrubs. Flowers axillary, in monads or triads, not aggregated (Osbornieae) or aggregated in a spike-like or head-like clusters (Melaleuceae). Stamens free or fasciculate (Melaleuceae). Ovary inferior. Embryo straight.

Included tribes: Melaleuceae Burnett, Osbornieae Peter G. Wilson.

Xanthostemonoideae Z. H. Feng, subfam. nov. — Type: *Xanthostemon* F. Muell.

Diagnosis: Shrubs or trees. Leaves spiral. Oil ducts present in stems and petioles (Lophostemoneae) or not. Flowers and fruit with numerous veins in the hypanthium. Ovulodes absent. Fruit not syncarpous, dry and dehiscent, rarely fleshy. Seeds semi-discoid, borne on a rod-like placenta (Xanthostemoneae) or not. Embryo with cotyledons equal to or longer than the hypocotyl.

Included tribes: Lophostemoneae Peter G. Wilson, Xanthostemoneae Peter G. Wilson.

Nyctaginaceae [90]

Commicarpeae Z. H. Feng, trib. nov. — Type: *Commicarpus* Standl.

Diagnosis: Subshrubs. Leaves often fleshy. Flowers in capitula, umbels or racemes; perianth tubular, 5-lobed; stamens 2-6; stigma peltate. Anthocarp obscurely 10-ribbed, studded with large wart-like glands.

Monotypic.

Onagraceae [91]

Onagrinae Z. H. Feng, subtrib. nov. — Type: *Onagra* Mill.

Diagnosis: Herbs or woody subshrubs, caulescent or acaulescent, leaves often forming basal rosette at least before anthesis. Stipules absent. Flowers actinomorphic or zygomorphic, vespertine or diurnal, usually ephemeral. Sepals (3) 4, reflexed, stamens (6)8, usually in 2 series. Fruit a usually loculicidally dehiscent capsule, seeds many, usually in rows per locule.

Included genera: *Chylismia* (Torr. & A. Gray) Nutt. ex Raim., *Eulobus* Nutt. ex Torr. & A. Gray, *Oenothera* L.

Orchidaceae [92-94]

Remarks: *Stolziinae* is an invalid name mentioned by Alex Drum Hawkes and Alfonse Henry Heller in 1959 but the author has not been able to locate any valid publication of such a name, which is validated here.

Ansellinae Z. H. Feng, subtrib. nov. — Type: *Ansellia* Lindl.

Diagnosis: Epiphytic or rarely lithophytic herbs. Inflorescences pyramidal, lateral, arising from nodes in upper parts of the stem, racemose, branched; floral bracts persistent. Flowers yellow, heavily spotted with blackish maroon or brown, labellum yellow veined with purple and bearing a white callus, callus 2- or 3-ridged. Anther cap conical, pollinia two, deeply sulcate.

Monotypic.

Epistephiinae Z. H. Feng, subtrib. nov. — Type: *Epistephium* Kunth.

Diagnosis: Terrestrial, sympodial, erect herbs. Leaves coriaceous, ovate, characterized by prominent reticulate venation. Inflorescence a terminal raceme, rarely axillary. Flowers showy, resupinate, typically light pink to dark purple in colour, labellum free, with undulate margins, rolled to form a floral tube around the column. Capsule cylindrical and rigid with distinct calyculus at the apex.

Monotypic.

Eriodinae Z. H. Feng, subtrib. nov. — Type: *Eriodes* Rolfe.

Diagnosis: Epiphytic or lithophytic herbs with creeping rhizomes. Pseudobulb conical to globose, subtended by fibrous sheaths bearing 1-3 leaves. Inflorescence erect, racemose; peduncle and rachis terete, pubescent; floral bracts persistent, ciliate. Flowers erect, labellum motile, simple, ligulate, recurved toward apex.

Monotypic.

Imerinaeinae Z. H. Feng, subtrib. nov. — Type: *Imerinaea* Schltr.

Diagnosis: Terrestrial herbs with a creeping rhizomes, up

to 30 cm tall. Pseudobulb cylindrical-ovoid, unifoliate, arranged in a linear series on rhizome. Flowers subnate, non-resupinate, borne almost at a right angle to ovary. Sepals and petals yellowish to reddish, labellum cornea-shaped, nine-nerved. Ovary ribbed.

Monotypic.

Pinaliinae Z. H. Feng, subtrib. nov. — Type: *Pinalia* Lindl.

Diagnosis: Epiphytic, lithophytic or rarely terrestrial herbs. Pseudobulbs rudimentary or well developed, bearing 1-2(3) leaves toward apex, base covered in sheaths. Inflorescence axillary, subterminal to terminal (branching in *Dolichiopsis*), if lateral then covered in red hairs. Petals smaller than sepals. Pollinia four or eight, mostly clavate.

Included genera: *Aeridostachya* (Hook. f.) Brieger, *Ascidieria* Seidenf., *Bambuseria* Schuit., Y. P. Ng & H. A. Pedersen, *Bryobium* Lindl., *Callostylis* Blume, *Campanulorchis* Brieger, *Ceratostylis* Blume, *Cryptochilus* Wall., *Cylindrolobus* Blume, *Dendrolirium* Blume, *Dilochiopsis* Brieger, *Epiblastus* Schltr., *Mediocalcar* J. J. Sm., *Mycarantes* Blume, *Oxystophyllum* Blume, *Pinalia* Lindl., *Strongyleria* (Pfitzer) Schuit., Y. P. Ng & H. A. Pedersen, *Trichotosia* Blume.

Stolziinae A. D. Hawkes & A. H. Heller ex Z. H. Feng, subtrib. nov. — Type: *Stolzia* Schltr.

Diagnosis: Dwarf epiphytic or lithophytic herbs, forming mats on the substrate. Pseudobulb of one node, bearing 1(2) leaves at apex. Inflorescence terminal, floral bracts conspicuous, covering ovary. Flower (sub)campanulate, not widely opening; labellum V-shaped in transverse section. Column with a foot, curving; pollinia 8.

Included genera: *Porpax* Lindl., *Stolzia* Schltr.

Orobanchaceae [95]

Phtheirosperminae Z. H. Feng, subtrib. nov. — Type: *Phtheirospermum* Bunge ex Fisch. & C. A. Mey.

Diagnosis: Annual or perennial herbs, viscid glandular villous. Leaves pinnately parted to pinnatisect. Flowers axillary from upper leaves in lax racemes, short pedicellate. Bracteoles absent. Calyx lobes entire to pinnately parted. Corolla lower lip spreading flat, 3-lobed; upper lip shorter than lower, 2-lobed. Capsule ovoid, compressed, beaked, loculicidal, valves entire.

Monotypic.

Oxalidaceae [96, 97]

Averrhoae Z. H. Feng, trib. nov. — Type: *Averrhoa* L.

Diagnosis: Liana, shrubs or trees. Leaves unifoliate or trifoliate, or plurifoliate (*Averrhoa*), leaflets herbaceous to papery (Averrhoa) or chartaceous to coriaceous (*Dapania*, *Sarcotheca*). Inflorescences thyrsoid-paniculate. Flowers small, sepals 5, shortly or loosely connate at base or at middle. Fruits are more fleshy capsules (*Dapania*) or berries (*Averrhoa*, *Sarcotheca*). Seeds exarillate or arillate, if present, aril bright to whitish yellow.

Included genera: *Averrhoa* L., *Dapania* Korth., *Sarcotheca* Blume.

Biophyteae Z. H. Feng, trib. nov. — Type: *Biophytum* DC.

Diagnosis: Herbs up to 1 m, stem sometimes woody. Leaves sometimes rosulate, pinnate, plurijugate, terminal leaflet lacking. Inflorescences umbelliform or ± capituliform. Flowers yellow, heterostylous (at least in part); stamens united at the base; ovules many per locule. Fruit a loculicidal capsule.

Monotypic.

Pandanaceae [98]

Remarks: *Sararanga* is the basalmost clade and sister to the rest genera of Pandanaceae, it is here given a subfamilial rank in analogy to the available Freycinetioideae and Pandanoideae.

Sarangoideae Z. H. Feng, Z. H. Feng, subfam. nov. — Type: *Sararanga* Hemsl.

Diagnosis: Large trees, aerial roots forming a fine mesh or network at the base of the trunk. Leaves in four spiral rows on fertile shoots, not auriculate. Inflorescences paniculate, terminal, pendulous, richly branched to third or fourth order. Flowers with a perianthlike cupule. Fruit a berry. Seeds small, straight; seed coat thickened.

Monotypic.

Papaveraceae [99]

Chelidoniinae Z. H. Feng, subtrib. nov. — Type: *Chelidonium* L.

Diagnosis: Perennial herbs with pinnately incised or divided leaves. Calyx and corolla of 2-merous whorls, caducous; petals yellow, stamens many, stigmas on short style. Fruit valves caducous; seeds few to many, ellipsoid or obovoid, arillate.

Included genera: *Chelidonium* L., *Coreanomecon* Nakai, *Hylomecon* Maxim.

Eomeconinae Z. H. Feng, subtrib. nov. — Type: *Eomecon* Hance.

Diagnosis: Perennial glabrous herbs with palmately incised basal leaf, blade orbiculate-reniform to (rarely) cordate-sagittate. Rhizomes orange or reddish, bright orange to red lactiferous. Calyx caducous. Buds erect. Seeds few, arillate or not.

Included genera: *Eomecon* Hance, *Sanguinaria* L.

Phyllanthaceae [100, 101]

Margaritariinae Z. H. Feng, subtrib. nov. — Type: *Margaritaria* L. f.

Diagnosis: Dioecious (monoecious) trees or shrubs. Calyx 4 or 6. Inflorescences axillary; staminate flowers axillary glomerules; pistillate ones sometimes solitary. Disk annular, sometimes slightly lobed. Stamens 2 or 4, filaments usually distinct. Ovary (2)3(4-6)-locular.

Included genera: *Margaritaria* L. f., *Plagiocladus* Jean F. Brunel.

Plantaginaceae [102, 103]

Remarks: The cited references above showed that six subtribes can be recognized in Antirrhineae, among them *Chaenorhinum* group and *Galvezia* group are the last two clades lack of available subtribal name.

Bacopinae Z. H. Feng, subtrib. nov. — Type: *Bacopa*

Aubl.

Diagnosis: Annual or perennial erect or prostrate (aquatic) herbs. Leaves sessile to subsessile, opposite or verticillate. Flowering axes located in leaf axils, consisting of 1-2 flowers or short multi-flowered branches. Flowers with radial or bilateral symmetry, sepals free, petal colouration ranging from blue to white, stamens 2-5.

Monotypic.

Chaenorhininae Z. H. Feng, subtrib. nov. — Type: *Chaenorhinum* (DC.) Rchb.

Diagnosis: Annual or suffrutescent herbs, glabrous or glandular-pubescent. Leaves cauline, opposite, subsessile to alternate above. Flowers distinctly pedicellate. Calyx deeply 5-lobed. Corolla white, pink, bluish-lilac, limb 2-lipped, calcarate abaxially at base. Ovary ovoid to globose.

Monotypic.

Galveziinae Z. H. Feng, subtrib. nov. — Type: *Galvezia* Dombey ex Juss.

Diagnosis: Glabrous, glandular-pubescent to villose herbs or shrubs. Leaves cauline, opposite below, alternate above, subsessile to petiolate. Flowers distinctly pedicellate. Corolla limb subequally 2-lipped, gibbous or saccate abaxially at base. Seeds numerous, testa cristate or tuberculate, if not then cyathiform, with longitudinal ridges.

Included genera: *Galvezia* Dombey ex Juss., *Pseudorontium* (A. Gray) Rothm., *Schweinfurthia* A. Braun.

Plumbaginaceae [104, 105]

Acantholimoninae Z. H. Feng, subtrib. nov. — Type: *Acantholimon* Boiss.

Diagnosis: Perennial caespitose or rosette herbs to subshrubs. Leaves sometimes thick and fleshy. Calyx subtubular to infundibuliform, usually 10-costate. Inflorescence a panicle, usually consisting of spicules. Style mostly glabrous, rarely verrucose. Stigma disciform or capitate.

Included genera: *Acantholimon* Boiss., *Bamiania* Lincz., *Bukiniczia* Lincz., *Cephalorhizum* Popov & Korovin, *Chaetolimon* (Bunge) Lincz., *Dictyolimon* Rech. f., *Ghaznianthus* Lincz., *Goniolimon* Boiss., *Limoniopsis* Lincz., *Neogontscharovia* Lincz., *Popoviolimon* Lincz., *Vassilczenkoa* Lincz.

Podostemaceae [106-108]

Cladopodeae Z. H. Feng, trib. nov. — Type: *Cladopus* H. A. Möller.

Diagnosis: Roots ribbon-like. Leaves subulate, linear, or ensiform. Floral bracts in two ranks, flower solitary, shortly peduncled. Stamen 1 or 2(3); stigmas 2, forked near base. Tepals 2, one on each side of stamen. Ovary globose, smooth. Capsules ovoid to globose, short stalked, smooth or slightly ribbed.

Included genera: *Cladopus* H. A. Möller, *Paracladopus* M. Kato.

Hydrobryeae Z. H. Feng, trib. nov. — Type: *Hydrobryum* Endl.

Diagnosis: Roots crustose or ribbon-like. Leaves linear, or columnar. Floral bracts simple, or bilobed, trifid or pectinate.

Stamen 1 or 2; stigmas 1 or 2. Tepals 2, one on each side of stamens. Ovary bilocular, ellipsoid and flattened. Capsules 8-20 ribbed.

Included genera: *Ctenobryum* Koi & M. Kato, *Diplobryum* C. Cusset, *Hanseniella* C. Cusset, *Hydrobryum* Endl., *Hydrodiscus* Koi & M. Kato, *Laosia* Koi, Won & M. Kato, *Thawatchaia* M. Kato, Koi & Y. Kita.

Primulaceae [109]

Stimpsonieae Z. H. Feng, trib. nov. — Type: *Stimpsonia* C. Wright ex A. Gray.

Diagnosis: Annual or biennial herb. Leaves in a basal rosette and scattered along the stem, dentate, with articulated hairs. Flowers solitary in the leaf-axils along the stem; calyx campanulate; corolla white, hypocrateriform with a short tube, hairy. Stamens adnate to the tube; stigma capitate. Capsule globose, opening with apical valves; seeds many, reticulate.

Monotypic.

Ranunculaceae [110]

Remarks: The tribal name Glaucidieae and subtribal name Glaucidiinae are not rarely used in ranunculaceous literature but ambiguity on their valid publication exists, hence a formal validation here.

Glaucidieae Z. H. Feng, trib. nov., based on Glaucidieae Tamura, Bot. Mag. (Tokyo) 85(997): 40. 1972. — Type: *Glaucidium* Siebold & Zucc.

Glaucidinae Z. H. Feng, subtrib. nov., based on Glaucidieae Tamura, Bot. Mag. (Tokyo) 85(997): 40. 1972. — Type: *Glaucidium* Siebold & Zucc.

Resedaceae [51]

Remarks: Borthwickioideae and Borthwickieae are invalid names mentioned by Bi-Sin Sun and Cheng-Yi Wu in 1959 without description, which are validated here.

Borthwickieae B. S. Sun & C. Y. Wu ex Z. H. Feng, trib. nov., based on Borthwickiaceae J. X. Su, Wei Wang, Li Bing Zhang & Z. D. Chen, Taxon 61(3): 608. 2012. — Type: *Borthwickia* W. W. Sm.

Monotypic.

Borthwickioideae B. S. Sun & C. Y. Wu ex Z. H. Feng, subfam. nov., based on Borthwickiaceae J. X. Su, Wei Wang, Li Bing Zhang & Z. D. Chen, Taxon 61(3): 608. 2012. — Type: *Borthwickia* W. W. Sm.

The only included tribe: Borthwickieae B. S. Sun & C. Y. Wu ex Z. H. Feng, this publication.

Restionaceae [111]

Anarthrieae Z. H. Feng, trib. nov., based on Anarthriaceae D. F. Cutler & Airy Shaw, Kew Bull. 19(3): 489. 1965. — Type: *Anarthria* R. Br.

Included genera: *Anarthria* R. Br., *Hopkinsia* W. Fitzg., *Lyginia* R. Br.

Anarthrioideae Z. H. Feng, subfam. nov., based on Anarthriaceae D. F. Cutler & Airy Shaw, Kew Bull. 19(3): 489. 1965. — Type: *Anarthria* R. Br.

The only included tribe: Anarthrieae Z. H. Feng, this publication.

Rhamnaceae [112-114]

Alphitoniae Z. H. Feng, trib. nov. — Type: *Alphitonia* Reissek ex Endl.

Diagnosis: Unarmed or spinescent shrubs, sometimes tall trees. Leaves alternate. Calyx 5, widely spreading. Anther appendages present. Hypanthium short, floral disk usually thick or prominent. Fruit a large black 2-3-seeded capsule with a mealy layer. Seeds arillate, coloration uniform.

Included genera: *Alphitonia* Reissek ex Endl., *Granitites* Rye.

Ampelozizyphoideae Z. H. Feng, subfam. nov. — Type: *Ampelozizyphus* Ducke.

Diagnosis: Unarmed climbers or trees. Leaves alternate, venation palmate, 3-5-nerved. Flowers in axillary fascicles (*Bathiorhamnus*, *Doerpfeldia*) or clustered cymes, or composed of several cymes forming a panicle (*Ampelozizyphus*). Style bifid or trifold. Fruit fleshy, (1- or 2-) 3-locular; seed with endosperm.

Included tribes: Ampelozizyphae J. E. Richardson, Bathiorhamneae J. E. Richardson, Doerpfeldiae J. E. Richardson.

Fenghwaieae Z. H. Feng, trib. nov. — Type: *Fenghwaia* G. T. Wang & R. J. Wang.

Diagnosis: Evergreen treelet. Leaves alternate, anisophyllous, often clustering at the top of branches. Flowering petals cucullate, inferior ovary with 3-locular and one ovule in each locule, elongate capsular fruit with five longitudinal ridges, seeds verrucose.

Monotypic.

Rosaceae [115-120]

Argentininae Z. H. Feng, subtrib. nov. — Type: *Argentina* Hill.

Diagnosis: Perennial herbs, sometimes with a woody caudex. Leaves interruptedly pinnate. Stipular auricles present, ventral. Style filiform, lateral. Achenes glabrous, sometimes with basal swellings or ventral appendages.

Monotypic.

Aruncinae Z. H. Feng, subtrib. nov. — Type: *Aruncus* Adans.

Diagnosis: Large perennial herbs, trailing subshrub or erect shrubs. Leaves alternate, simple or biternate to 2-3-pinnate. Inflorescences terminal, panicle-shaped (compound) racemes. Flowers pentamerous. Fruit a follicle or follicle like achene, pericarp thin to coriaceous or bony. Seeds few, 1-4.

Included genera: *Aruncus* L., *Holodiscus* (K. Koch) Maxim., *Luetkea* Bong., *Xerospiraea* Henrickson.

Kerriinae Z. H. Feng, subtrib. nov. — Type: *Kerria* DC.

Diagnosis: Unarmed, leaf-shedding shrubs. Leaves simple; stipules present, free. Flowers bisexual. Hypanthium open at top, dry at maturity. Sepals imbricate. Stamens many. Pistils several, free; stylodia terminal; ovules attached in the middle. Achenes drupaceous.

Included genera: *Coleogyne* Torr., *Kerria* DC., *Neviusia* A. Gray, *Rhodotypos* Siebold & Zucc.

Prinsepiinae Z. H. Feng, subtrib. nov. — Type: *Prinsepia* Royle.

Diagnosis: Armed, leaf-shedding shrubs or small trees. Leaves with distinctly incised or entire margin; stipule 0, or minute, or rudimentary. Flowers (4)5-merous, uni- or bisexual, sepals imbricate or valvate. Hypanthium campanulate to obconical. Petals white or yellow. Seed with membranous testa.

Included genera: *Exochorda* Lindl., *Oemleria* Rchb., *Prinsepia* Royle.

Pyracanthinae Z. H. Feng, subtrib. nov. — Type: *Pyracantha* M. Roem.

Diagnosis: Shrubs, evergreen, mostly with thorns. Leaf margins incised or entire; stipules small, caducous, but sometimes leafy and persistent. Inflorescence a terminal corymb-shaped thyrs. Carpels 5, ventrally and laterally free from each other, with exposed, hairy apex. Fruit red, orange or yellow, flesh rather thin, without sclereids.

Monotypic.

Rubiaceae [121, 122]

Remarks: Rubiaceae is the fourth largest family of angiosperms with ca. 617 genera. However, in the latest classification of Rubiaceae [122], too many tribes are recognized while the rank subtribe is rarely used, as mentioned in the section of *Introduction*. As already pointed out by Ezedin [123], “two subfamilies together housing an overwhelming 68 tribes” can not be a balanced scheme for the infrafamilial classification of such a large family and “a few tribes large enough to potentially accommodate a future subtribal classification”. Herein, one of two basalmost lineages, *Luculia* group is elevated to subfamilial rank along with a series of subtribes newly validated; the other, *Acranthera* and *Copetosapelta* although phylogenetically close akins, they hardly bear macrometric synapomorphies. The circumscription of these new taxa are not intended to be altered but they may provide new insights for further consideration and help in a better division for the whole Rubiaceae.

Aitchisoniinae Z. H. Feng, subtrib. nov., based on Aitchisonieae Bordbar, Razafim. & Mirtadz., Pl. Syst. Evol. 308(1)-7: 8. 2022. — Type: *Aitchisonia* Hemsl. ex Aitch.

Aleisanthiinae Z. H. Feng, Z. H. Feng, subtrib. nov., based on Aleisanthieae Mouly, J. Florence & B. Bremer, Ann. Missouri Bot. Gard. 96(1): 155. 2009. — Type: *Aleisanthia* Ridl.

Argostemmatinae Z. H. Feng, subtrib. nov., based on Argostemmateae Bremek. ex Verdc., Bull. Jard. Bot. État Bruxelles 28: 281. 1958. — Type: *Argostemma* Wall.

Augustinae Z. H. Feng, subtrib. nov., based on Augusteae Kainul. & B. Bremer, Bot. J. Linn. Soc. 173(3): 395. 2013. — Type: *Augusta* Pohl.

Chioninae Z. H. Feng, Z. H. Feng, subtrib. nov., based on Chioneae Razafim. & Rydin, Taxon 73(3): 680. 2024. — Type: *Chione* DC.

Clavistigmatinae Z. H. Feng, subtrib. nov., based on Clavistigmateae T. Y. Tu & P. W. Xie, Biol. Diversity 1(2): 70. 2024. — Type: *Clavistigma* T. Y. Tu & P. W. Xie.

Craterisperminae Z. H. Feng, subtrib. nov., based on Craterispermeae Verdc., Bull. Jard. Bot. Bruxelles 28: 281. 1958.

— Type: *Craterispermum* Benth.

Crossopteryginae Z. H. Feng, subtrib. nov., based on Crossopterygeae F. White ex Bridson, Fl. Zambes. 5(3): 389. 2003. — Type: *Crossopteryx* Fenzl.

Cyanoneurinae Z. H. Feng, subtrib. nov., based on Cyanoneureae Razafim. & B. Bremer, Taxon 64(2): 294. 2015. ('Cyanoneuroneae') — Type: *Cyanoneuron* Tange.

Dentellinae Z. H. Feng, subtrib. nov. — Type: *Dentella* J. R. Forst. & G. Forst.

Diagnosis: Prostrate or erect herbs. Inflorescences terminal or displaced to pseudoaxillary, 1-flowered, flowers minute or remarkably reduced. Corolla funnelform, 5-merous, inside frequently pubescent in throat. Ovary bilocular. Seeds trigonous, surface with areoles lacking a rounded protrusion.

Included genera: *Dentella* J. R. Forst. & G. Forst., *Pentodon* Hochst.

Dunniinae Z. H. Feng, subtrib. nov., based on Dunnieae Rydin & B. Bremer, Pl. Syst. Evol. 278(1-2): 121. 2009. — Type: *Dunnia* Tutchet.

Foonchewiinae Z. H. Feng, subtrib. nov. — Type: *Foonchewia* R. J. Wang.

Diagnosis: Subshrubs or shrubs. Leaves leathery or subpapy, young leaves often turning black when dry. Inflorescence terminal and/or sometimes pseudoaxillary, usually turning black when dry. Flower pale yellow or white, heterostylous. Calyx lobes 5, persistent. Fruit dehiscent by apical pores, rarely loculicidal under extreme condition.

Monotypic.

Glionnetiinae Z. H. Feng, Z. H. Feng, subtrib. nov., based on Glionnetieae Razafim. & Rydin, Taxon 73(3): 687. 2024. — Type: *Glionnetia* Tirveng.

Greeneinae Z. H. Feng, Z. H. Feng, subtrib. nov., based on Greeneae Mouly, J. Florence & B. Bremer, Ann. Missouri Bot. Gard. 96(1): 156. 2009. — Type: *Greenea* Wight & Arn.

Houstoniinae Z. H. Feng, subtrib. nov. — Type: *Houstonia* L.

Diagnosis: Prostrate or erect herbs, subshrubs to medium sized shrubs. Leaves opposite or whorled, sessile or short petioled. Inflorescence often terminal, (pseudo)axillary cymes, cincinnus or terminal thyrses in *Leptoscela*. Calyx lobes (2-)4(6), sometimes persistent and crowned at mature fruit. Corolla lobes 4(5). Ovary bilocular (rarely aberrantly 3-locular in *Houstonia*). Capsule dehiscent loculicidally or septically.

Included genera: *Amphistemom* Groeninckx., *Arcytophyllum* Willd. ex Schult. & Schult. f., *Astiella* Jovet, *Carterella* Terrell, *Hedythyrus* Bremek., *Houstonia* L., *Leptoscela* Hook. f., *Lucya* DC., *Mexotis* Terrell & H. Rob., *Mitrasacmopsis* Jovet, *Oldenlandiopsis* Terrell & W. H. Lewis, *Philaliphora* Groeninckx., *Phyllocrater* Wernham, *Stenaria* (Raf.) Terrell, *Stenotis* Terrell, *Stephanococcus* Bremek., *Thamnoldenlandia* Groeninckx.

Luculioideae Z. H. Feng, subfam. nov., based on Luculieae Rydin & B. Bremer, Pl. Syst. Evol. 278(1-2): 120. 2009. — Type: *Luculia* Sweet.

Pavettinae Z. H. Feng, subtrib. nov., based on Pavetteae Dumort., Anal. Fam. Pl.: 32. 1829. — Type: *Pavetta* L.

Prismatomeridinae Z. H. Feng, subtrib. nov., based on Prismatomerideae Y. Z. Ruan, Acta Phytotax. Sin. 26: 446. 1988. — Type: *Prismatomeris* Thwaites.

Schizocoleinae Z. H. Feng, subtrib. nov., based on Schizocoleae Rydin & B. Bremer, Pl. Syst. Evol. 278(1-2): 120. 2009. — Type: *Schizocolea* Bremek.

Schraderinae Z. H. Feng, subtrib. nov., based on Schradereae Bremek., Recueil Trav. Bot. Néerl. 31: 253. 1934. — Type: *Schradera* Vahl.

Scyphiphorinae Z. H. Feng, subtrib. nov., based on Scyphiphoreae Kainul. & B. Bremer, Bot. J. Linn. Soc. 173(3): 397. 2013. — Type: *Scyphiphora* Gaertn.

Sherbourniinae Z. H. Feng, subtrib. nov., based on Sherbournieae Mouly & B. Bremer, Taxon 63(4): 814. 2014. — Type: *Sherbournia* G. Don.

Strumpfiinae Z. H. Feng, Z. H. Feng, subtrib. nov., based on Strumpfiae Delprete & T. J. Motley, Syst. Bot. 39(4): 1201. 2014. — Type: *Strumpfia* Jacq.

Trailliaedoxinae Z. H. Feng, subtrib. nov., based on Trailliaedoxae Kainul. & B. Bremer, Bot. J. Linn. Soc. 173(3): 397. 2013. — Type: *Trailliaedoxa* W. W. Sm. & Forrest.

Rutaceae [124, 125]

Haplophylleae Z. H. Feng, trib. nov., based on Haplophylloideae Appelhans, Bayly, Heslewood, Groppo, Verboom, P. I. Forst., Kallunki & Dureto, Taxon 70(5): 1050. 2021. — Type: *Haplophyllum* A. Juss.

Monotypic.

Veprideae Z. H. Feng, trib. nov. — Type: *Vepris* Comm. ex A. Juss.

Diagnosis: Dioecious or polygamous shrubs to trees. Leaves simple or (1-)3-9(-12)-foliolate, alternate, subopposite or opposite, sometimes grouped in a terminal bouquet. Inflorescences (pesudo)terminal, axillary or cauliflorous panicles, racemes, glomerules or few-flowered fascicles to solitary; flowers (3-)4(-5)-merous. Ovules 1 or 2 per locule. Fruit drupaceous or formed of (1)2-4 separate follicles.

Included genera: *Ivodea* Capuron, *Vepris* Comm. ex A. Juss.

Sapindaceae [19, 126]

Alectryinae Z. H. Feng, subtrib. nov. — Type: *Alectryon* Gaertn.

Diagnosis: Falsely polygamous shrubs or trees. Leaves alternate, paripinnate, or less often unifoliate; distal leaflet rudimentary. Inflorescences axillary thyrses, racemose or panicles. Sepals 4-5(-7). Flowers actinomorphic, petals 0 or 5. Ovary mostly 3-carpellate, with a single ovule per carpel. Fruit a capsule.

Included genera: *Alectryon* Gaertn., *Diploglottis* Hook. f., *Elattostachys* (Blume) Radlk., *Lecaniodiscus* Planch. ex Benth., *Podonephelium* Baill.

Aryterinae Z. H. Feng, subtrib. nov. — Type: *Arytera* Blume.

Diagnosis: Shrubs or trees. Leaves alternate, paripinnate. Inflorescences axillary or pseudo-terminal racemose thyrses. Flowers zygomorphic or actinomorphic, petals (2-)5(6), absent in *Dictyoneura*. Stamens usually (5-)7-8(-10). Ovary (1)2-3(4)-carpellate. Capsule (1)2-3-locular, dehiscent. Seed arillate.

Included genera: *Arytera* Blume, *Castanospora* F. Muell., *Cupaniopsis* Radlk., *Dictyoneura* Blume, *Lepiderema* Radlk., *Lepidocupania* Buerki, Callm., Munzinger & Lowry, *Neorarytera* Callm., Buerki, Munzinger & Lowry, *Synima* Radlk.

Cupaniinae Z. H. Feng, subtrib. nov. — Type: *Cupania* L.

Diagnosis: Falsely polygamous trees. Leaves alternate, paripinnate, distal leaflet rudimentary. Inflorescences axillary or ramiflorous, or terminal thyrses or racemes. Petals 5, with marginal or basal appendages or without appendages; disk (semi-)annular. Stamens (4-6)8. Ovary 2(3)-carpellate, with a single ovule per carpel. Seeds arillate or exarillate.

Included genera: *Cnesmocarpon* Adema, *Cupania* L., *Matayba* Aubl., *Mischarytera* (Radlk.) H. Turner, *Molinaea* Comm. ex Juss., *Pentascyphus* Radlk., *Tina* Roem. & Schult., *Toechema* Radlk., *Vouarana* Aubl.

Eurycorymbinae Z. H. Feng, subtrib. nov. — Type: *Eurycorymbus* Hand.-Mazz.

Diagnosis: Shrubs or trees. Leaves alternate, paripinnate or unifoliolate. Inflorescences axillary, subterminal or ramiflorous corymbose, spicate or ramiflorous thyrsoid. Flowers mostly actinomorphic, sepals 5, petals 5, appendaged or not; stamens (5-)7(8). Ovary 2-3(4)-carpellate, fruit a 2-3-locular capsule.

Included genera: *Eurycorymbus* Hand.-Mazz., *Gongrodiscus* Radlk., *Rhysotoechia* Radlk., *Sarcotoechia* Radlk., *Stor-thocalyx* Radlk.

Nepheliinae Z. H. Feng, subtrib. nov. — Type: *Nephelium* L.

Diagnosis: Falsely polygamous trees. Leaves alternate, paripinnate; distal leaflet rudimentary. Inflorescences terminal or axillary thyrses. Flowers actinomorphic, petals 0 or 5, disc annular. Stamens (5-)8(-10), stigmas 2-3-lobed; pollen (brevi)colporate. Ovary (2)3(4)-carpellate, fruits indehiscent, or tardily dehiscent. Seeds partly or completely covered by a arillode.

Included genera: *Blighia* K. D. Koenig, *Dimocarpus* Lour., *Litchi* Sonn., *Nephelium* L., *Otonephelium* Radlk., *Pometia* J. R. Forst. & G. Forst., *Xerospermum* Blume.

Pancoviinae Z. H. Feng, subtrib. nov. — Type: *Pancovia* Willd.

Diagnosis: Falsely polygamous trees or shrubs. Leaves alternate, paripinnate; terminal leaflet rudimentary. Inflorescences terminal, axillary or cauliflorous thyrses. Flowers actinomorphic or zygomorphic. Calyx mostly urceolate or turbinate, sepals (3)4-5. Stamens 7-8(9-11). Fruit a loculicidal capsule or indehiscent, seeds arillate or exarillate.

Included genera: *Aporrhiza* Radlk., *Chytranthus* Hook. f., *Cubilia* Blume, *Glennia* Hook. f., *Haplocoelopsis* F. G. Davies, *Laccodiscus* Radlk., *Radlkofera* Gilg, *Pancovia*

Willd., *Placodiscus* Radlk.

Stadmaniinae Z. H. Feng, subtrib. nov., based on *Stadmanieae* Buerki & Callm., Amer. J. Bot. 108(7): 1249. 2021. — Type: *Stadmania* Lam. ex Poir.

Sapotaceae [127-131]

Donellinae Z. H. Feng, subtrib. nov. — Type: *Donella* Pierre ex Baill.

Diagnosis: Trees, occasionally shrubs, rarely a liana; latex present. Venation eucamptodromous-brochidodromous or brochidodromous. Stipules absent. Flowers generally bisexual. Sepals 5. Corolla lobes 5. Anthers glabrous, often bearing an apical tuft of hairs. Seed strongly laterally compressed, testa smooth.

Included genera: *Breviea* Aubrév. & Pellegr., *Donella* Pierre ex Baill.

Eberhardtiae Z. H. Feng, trib. nov. — Type: *Eberhardtia* Lecomte.

Diagnosis: Trees. Flowers axillary, fascicled, rust colored tomentose. Corolla tubular, glabrous, 5-merous. Staminodes 5, glabrous, with terminal sagittate appendage. Ovary 5-celled. Fruit a 3-5-seeded loculicidal capsule, slightly constricted between the seeds. Seed scar oblong; endosperm oily.

Monotypic.

Eberhardtioideae Z. H. Feng, subfam. nov. — Type: *Eberhardtia* Lecomte.

Diagnosis: Trees. Flowers axillary, fascicled, rust colored tomentose. Corolla tubular, glabrous, 5-merous. Staminodes 5, glabrous, with terminal sagittate appendage. Ovary 5-celled. Fruit a 3-5-seeded loculicidal capsule, slightly constricted between the seeds. Seed scar oblong; endosperm oily.

The only included tribe: Eberhardtiae Z. H. Feng, this publication.

Lucuminae Z. H. Feng, subtrib. nov. — Type: *Lucuma* Molina.

Diagnosis: Trees or shrubs. Leaves with spinous-serrate margin and minute translucent veins; and often with oblique tertiary venation. Flowers 5-6-merous (occasionally ≥ 8), calyx quincuncial, corolla lobes with a glabrous or papillate margin; stamens inserted at base, in upper half or near top of corolla tube. Staminodes present or absent, Fruit (pulp) yellow, up to 5-seeded. Seeds orange-segmented, globose or ellipsoid.

Included genera: *Chloroluma* Baill., *Lucuma* Molina, *Martiusella* Pierre.

Planchonellinae Z. H. Feng, subtrib. nov. — Type: *Planchonella* Pierre.

Diagnosis: Evergreen, small tree or shrub with latex. Leaves spirally arranged or occasionally opposite or 3-whorled, venation areolate, if not then have visible tertiary leaf venation. Inflorescences axillary, cauliflorous or ramiflorous, flowers sympetalous, corolla rotate, cupular of tubular. Corolla lobes 5(-8), stamens inserted in corolla tube, staminodes present or not. Fruit 1-5-seeded, endosperm present or absent.

Included genera: *Amorphospermum* F. Muell., *Gayella*

Pierre, *Magodendron* Vink, *Niemeyera* F. Muell., *Pichonia* Pierre, *Planchonella* Pierre, *Pycnandra* Benth., *Sahulia* Swenson, *Sersalisia* R. Br., *Van-royena* Aubr. é.

Xantolideae Z. H. Feng, trib. nov. — Type: *Xantolis* Raf.

Diagnosis: Trees or shrubs, often armed by spines modified from leaves or branches. Flowers bisexual. Corolla with short tube, lobes 5; stamens equal to corolla; staminodes present, alternating with stamens, fimbriate, or sometimes petaloid, aristate in *Xantolis*; styles long exerted. Ovary (4)5-locular. Fruit berry-like, 1(-2)-seeded. Seeds free.

Included genera: *Spiniluma* (Baill.) Aubr. é., *Xantolis* Raf.
Styracaceae [132]

Alniphyllae Z. H. Feng, trib. nov. — Type: *Alniphyllum* Matsum.

Diagnosis: Trees. Leaves alternate, pedicels articulated; stipules absent; leaf blade margin serrate. Bud scales absent; fertile shoots produced both laterally and terminally on twig of the previous growth period. Calyx truncate or slightly 5-toothed. Corolla lobes 5, imbricate. Stamens 10(-12), filaments coherent or slightly connate at base. Ovary superior, 5-locular.

Included genera: *Alniphyllum* Matsum., *Bruinsmia* Boerl. & Koord.

Thymelaeaceae [133]

Edgeworthiinae Z. H. Feng, subtrib. nov. — Type: *Edgeworthia* Meisn.

Diagnosis: Shrubs or trees. Leaves alternate, in *Edgeworthia* usually clustered apically. Inflorescence terminal or axillary, consisting of dense or few flowered involucre capitulas. Calyx tube cylindric, incurved, interior yellow, white or red. Petaloid appendages absent. Flowers bisexual, tetramerous, petals absent. Stamens in 2 whorls. Disk cup-shaped.

Included genera: *Edgeworthia* Meisn., *Eriosolena* Blume, *Rhamnoneuron* Gilg.

Urticaceae [134, 135]

Dendrocnideae Z. H. Feng, trib. nov. — Type: *Dendrocnide* Miq.

Diagnosis: Shrubs or sometimes very large trees, with stinging hairs. Leaves alternate; stipules connate, intrapetiolar. Cystoliths punctiform. Inflorescences axillary, paniculate or racemose. Achenes compressed, disk-shaped and circular in outline; if not then ellipsoidal to ovoid, not chartaceous, usually strongly verrucose.

Included genera: *Dendrocnide* Miq., *Discocnide* Chew.

Girardiniae Z. H. Feng, trib. nov. — Type: *Girardinia* Gaudich.

Diagnosis: Tall annuals, armed with long stinging hairs; leaves alternate, coarsely serrate or lobed; stipules connate, intrapetiolar, often large. Female perianth $\pm$ united into a tube, (2-)3-toothed and split at length. Achene broad, oblique, much compressed.

Monotypic.

Laporteeae Z. H. Feng, trib. nov. — Type: *Laportea* Gaudich.

Diagnosis: Small shrubs or perennial herbs with stinging hairs. Inflorescences solitary, axillary, cymose-dichotomous panicles, rarely simple racemes. Flowers reflexed, monoecious or dioecious, female pedicels winged laterally or dorso-ventrally. Achene oblique, enclosed in the $\pm$ unchanged perianth, sometimes shortly stipitate.

Monotypic.

Maoutieae Z. H. Feng, trib. nov. — Type: *Maoutia* Wedd.

Diagnosis: Shrubs. Leaves alternate, crenate-serrate, hairy below; stipules connate or 2-3-fid, intrapetiolar. Cystoliths punctiform. Flowers monoecious or dioecious; male flowers perianth 4-5-partite, rudimentary ovary glabrous or woolly; female flowers perianth cupular, minute or absent; stigma sessile.

Included genera: *Gibbsia* Rendle, *Leucosyke* Zoll. & Moritz, *Maoutia* Wedd.

Oreocnideae Z. H. Feng, trib. nov. — Type: *Oreocnide* Miq.

Diagnosis: Trees, erect or scandent shrubs. Leaves with prominent arachnoid tomentum beneath. Inflorescences unisexual, axillary, in branched inflorescences with cymosely arranged clusters, rarely single, axillary ones. Female flowers at the base surrounded by a $\pm$ developed fleshy “capula”. Achene straight, almost completely adnate to the persisting perianth.

Monotypic.

Pileinae Z. H. Feng, subtrib. nov. — Type: *Pilea* Lindl.

Diagnosis: Cystoliths usually linear or fusiform. Leaves opposite (rarely spirally alternate), mostly anisophyllous, lamina $\pm$ at a right angle with the stem, equal-sided or nearly so. Stigma sessile, penicillate-capitate. Perianth lobes of female flowers free or connate at base. Staminodes present.

Included genera: *Achudemia* Blume, *Lecanthus* Wedd., *Metapilea* W. T. Wang, *Petelotiella* Gagnep., *Pilea* Lindl.

Velloziaceae [136, 137]

Barbaceniopsidae Z. H. Feng, trib. nov. — Type: *Barbaceniopsis* L.B. Sm.

Diagnosis: Xerophytic shrubs; stems simple or few-branched; blades long-persistent and gradually decomposing, linear; flowers solitary on long pedicels, unisexual, dioecious; perianth tube short; tepals subequal; stamens 6; filaments highly fused with tepals; anthers appearing sessile, basifixed, latrorse; stigmas linear, elongate.

Monotypic.

Zingiberaceae [138-140]

Caulokaempferieae Z. H. Feng, trib. nov. — Type: *Caulokaempferia* K. Larsen.

Diagnosis: Small herbs with well developed pseudostems. Inflorescence terminal, few-flowered, flowering from apex to base. Bracts distichous, each subtending 1-few flowers. Lateral staminodes large, petaloid, as long as petals. Ovary trilocular. Capsule fleshy, irregularly dehiscent by 1 broad slit. Seeds exarillate.

Monotypic.

Geostachyinae Z. H. Feng, subtrib. nov. — Type: *Geosta-*

chys (Baker) Ridl.

Diagnosis: Acaulescent herbs, stilt-rooted. Bracts prominent and inflated, sheathing, covering the peduncle. Inflorescences and infructescences lax with visible rachis, the cincinni (rarely single flowers) are borne on long pedicels. Anther crest semilunar, usually with obscure or prominent 2-3 lobes.

Monotypic.

Hemiorchideae Z. H. Feng, trib. nov. — Type: *Hemiorchis* Kurz.

Diagnosis: Small, rhizomatous herbs. Leaf lamina decurrent on petiole. Inflorescence a raceme arising basally, terminal on a separate leafless shoot. Floral tube straight, anther not hinged, anther appendages absent. Labellum free, lateral staminode borne at or beside the labellum.

Included genera: *Gagnepainia* K. Schum., *Hemiorchis* Kurz.

Lanxangiinae Z. H. Feng, subtrib. nov. — Type: *Lanxangia* M. F. Newman & Škorničk.

Diagnosis: Large clump-forming herbs with distichous leafy shoots. Inflorescences arising close to base of pseudostem, many-flowered. Bracts always subtending a single flower, bracteoles tubular. Flowers of open type with ovate to elliptic labellum and entire thin crisp margin. Staminodes absent. Infructescences dense, fruits globose or sub-globose, smooth, usually dark red, bracts decayed when in fruit.

Monotypic.

Siliquamomeae Z. H. Feng, trib. nov. — Type: *Siliquamomum* Baill.

Diagnosis: Rhizomatous herbs. Leaves few. Inflorescence a lax raceme, terminal; bracts minute, bracteole absent. Calyx tubular-campanulate, membranous, 3-dentate. Labellum conspicuous and pendulous; filament very short, each theca with a long-acuminate crest. Capsule narrowly fusiform, more than 10 cm long, torulose.

Monotypic.

4. Conclusion

This preliminary set of addenda establish necessary new infrafamilial names at the ranks of subfamily, supertribe, tribe, subtribes within 70 families of flowering plants mainly for wild and cultivated flora in China and East Asia, aiming to enhance the balance and phylogenetic coherence of classification schemes below the family level and facilitate relevant botanical work, especially the compilation of Floras, checklists, and online database. These names fill critical gaps in the hierarchical structure, particularly in families with complex or recently resolved phylogeny. Although not mandatory, these taxa provide valuable tools for refining angiosperm classification, facilitating clearer communication and understanding of plant diversity, especially in China and East Asia. As the subsequent plan, future classification with detailed descriptions for these taxa is also under preparation.

Abbreviations

APG	Angiosperm Phylogeny Group
ICN	International Code of Nomenclature for Algae, Fungi, and Plants

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Author Contributions

Zhen-Hao Feng is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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