SMITHSONIAN INSTITUTION

Contributions from the United States National Herbarium
Volume 47: 1-185

Character Variation in Angiosperm Families

by

Aaron Goldberg

Department of Systematic Biology - Botany,
National Museum of Natural History
Washington, DC
2003

ABSTRACT

Goldberg, Aaron. Character Variation in Angiosperm Families. *Contributions from the United States National Herbarium*, volume 47: 185 pages, 1 figure, 4 tables. — The purpose of this work is to provide a quantitative estimate of the variation in character states in angiosperm families. The less variant a character is the more reliable it is in classification and phylogeny. My classification of the dicot families published in 1986 is herein amended to reflect further understanding of genetic relationships and degree of advancement of some families. A new dendrogram of the orders is provided, and an ordinal allocation of the families is given. The characters and character states for 57 monocot families and 336 dicot families are presented in separate tables. In Tables 1 and 2, approximately 100 characters are used to characterize all organs and some tissues as well as some ecological and geographic attributes. The percentage of occurrence of each character state (quantitative estimate) is computed separately for dicot and monocot families and the results are presented in Table 3. In about 115 of the characters the percentage of occurrence is similar for both monocots and dicots. In about 60 characters the percentage differs significantly, of these 3/4 suggest the primitive condition occurs in monocots. Two hundred eighty-eight character states that occur in relatively few families are given in Table 4, a summary of characters and states that occur in a few families. Approximately 53% of these infrequent character states occur in both dicot and monocot families, about 40% occur only in dicot families, and about 7% occur only in monocot families.
KEY WORDS: Angiosperm Families, Character Variation, Classification, Evolution, Phylogeny.

DATE OF PUBLICATION: September 2003

Cover Design and Figure 1 by Alice Tangerini: front *Magnolia grandiflora* L. (Magnoliaceae), *Nepenthes* sp. (Nepenthaceae), *Stanhopea oculata* (G. Lodd.) Lindl. (Orchidaceae); back *Aponogeton distachyus* L.f. (Aponogetonaceae), *Musa sinensis* Sagot (Musaceae), *Pandanus candelabrum* P. Beauv. (Pandanaceae).

Contributions from the United States National Herbarium (ISSN 0097-1618) Department of Systematic Biology - Botany, National Museum of Natural History, MRC-166, Smithsonian Institution, Washington, DC, 20013-7012, USA.

POSTMASTER: Send address changes to Contributions US National Herbarium, Department of Systematic Biology - Botany, National Museum of Natural History, MRC-166, P.O. Box 37012, Smithsonian Institution, Washington, DC, 20013-7012, USA.

The paper used in this publication meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials Z39.48--1984.

The periodical, Contributions from the United States National Herbarium, was first published in 1890 by The United States Department of Agriculture. From 1 July 1902 forward it was published as a Bulletin of the United States National Museum. The series was discontinued after volume 38 (1974), and has been revived with volume 39 (2000) as a venue for publishing longer taxonomic papers, checklists, floras, and monographs, produced by the staff and associates at the U.S. National Herbarium. It is externally peer reviewed, and published at irregular intervals. Subscription and other correspondence should be addressed to CUSNH, Department of Systematic Biology - Botany, National Museum of Natural History, MRC-166, Smithsonian Institution, Washington, DC, 20013-7012, USA e-mail: CUSNH@nmnh.si.edu. The present issue is available for free while supplies last.

CONTENTS

INTRODUCTION 5
GUIDING PRINCIPLES 6
DISCUSSION 7
ACKNOWLEDGMENTS 11

TABLE 1. COMMON CHARACTER STATES OF DICOT FAMILIES
1a. Habitat: moisture and temperature; habit; life style; xylem perforatations; leaves; stipules; inflorescences. 12
1b. Flower symmetry; sex; sepals or tepals; petals. 30
1c. Stamens; staminodes; anthers; pollen; floral disk. 46
1d. Pistils: number and meristicity; ovary; placentation; ovules per locule. 64
1e. Ovules (continued); styles; stigmas; fruit type and dehiscence. 80
1f. Seeds; endosperm; embryo; cotyledons; geographical distribution. 98

TABLE 2. COMMON CHARACTER STATES OF MONOCOT FAMILIES
2a. Habitat: moisture, temperature; habit; life style; xylem perforations; leaves: position, sheath, margins; intravaginal scales; crystals. 118
2b. Inflorescences; flower symmetry; sex; sepals; petals. 122
2c. Petals (continued); stamens; staminodes; anthers; pollen. 126
2d. Nectaries; pistils; ovary; placentation; ovules per locule. 130
2e. Ovules (continued); styles; stigmas; fruit: types and dehiscence; seeds per locule. 134
2f. Endosperm; embryo; geographic distribution. 138

TABLE 3. SUMMARY OF COMMON CHARACTER VARIATION IN DICOT AND MONOCOT FAMILIES IN TABLES 1 AND 2, IN PERCENT. 143

REFERENCES 149

APPENDIX:
CHARACTERS THAT OCCUR IN FEW DICOT FAMILIES (MOSTLY 0.3-5%). 157

CHARACTERS THAT OCCUR IN FEW MONOCOT FAMILIES (MOSTLY 2-7%). 173

TABLE 4. SUMMARY OF CHARACTERS AND STATES THAT OCCUR IN A FEW FAMILIES, IN PERCENT OR AN ESTIMATE 179

INDICES TO THE FAMILY NUMBERS USED
DICOT FAMILIES 183
MONOCOT FAMILIES 185

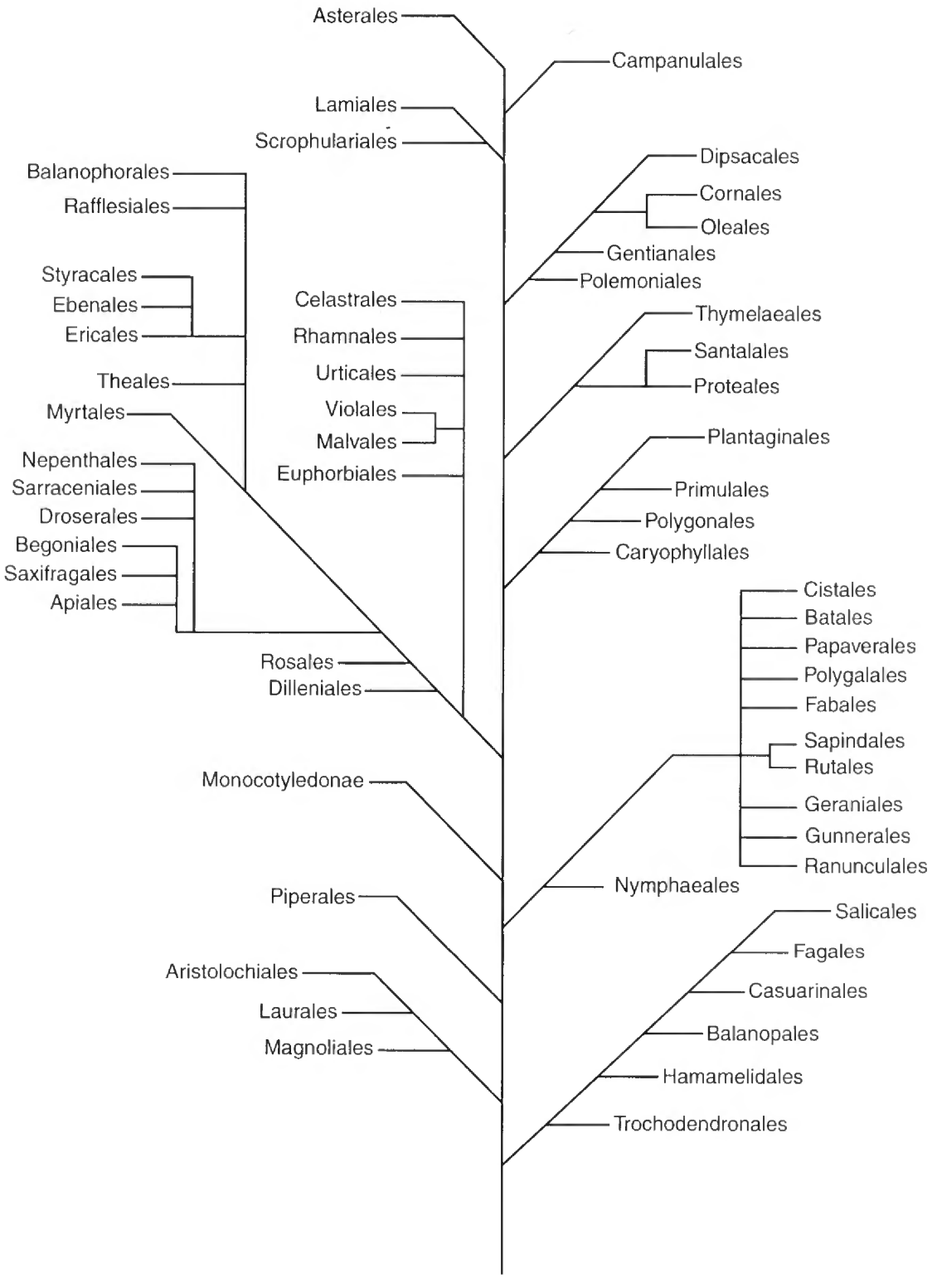

Figure 1. Suggested Phylogeny and degree of advancement of the orders of dicotyledons

Character Variation in Angiosperm Families

Aaron Goldberg[1]

INTRODUCTION

J. D. Hooker wrote, "A knowledge of the relative importance of characters can only be acquired by long study; and without a due appreciation of their value no natural group can be defined". During my career I have attempted to develop that appreciation.

The primary purpose of this work is to provide a quantitative estimate of the variation in character states within angiosperm families. In deciding on which characters to use and the importance to ascribe to each, taxonomists consider their variability. In general, the lower the variability, the greater the reliance one can place on the character. None of the 11 taxonomists (Cronquist 1981; Young 1981; Takhtajan 1997; Thorne 2000a, 2000b; Dahlgren 1980, 1985; Dahlgren et al. 1982; Hutchinson 1973; Melchior 1964; Stebbins 1974; Rouleau 1981; Benson 1979; Emberger 1960) whose allocation of families to orders I presented in my previous works (Goldberg 1986, 1989) have published a quantitative estimate of the variation in character states.

This work is based upon my previous publications; however, my understanding of genetic relationships and degree of advancement of a few families has changed. A new dendrogram of the dicot orders is presented in Figure 1, and the ordinal allocation of the families is given in Table 1. The length of the lines in Figure 1 is not intended to be significant. The taxa at the base of the dendrogram and at the base of the branches have more primitive character states than those toward the top of the dendrogram and at the apex of the branches. The taxa in a branch are more closely related to one another than they are to those in other branches; they are not necessarily ancestral to one another. In Tables 1 and 2, in general, within each order, families with most primitive characters are mentioned first, and most closely related families are kept together.

Tables 1 and 2 consist of selected data that the botanical community has accumulated during the last 300 years, plus what I have been able to add. The arrangement of the data is given in traditional taxonomic order, and the discussion in the text is also in that order. The data can be used as the reader sees fit. In Table 3, for comparison of the dicot and monocot families, I sum the data separately for each, and express it in percent. The reader can do likewise to compare particular orders, or families within orders.

This work can also be used to identify a specimen to family if one has a general idea as to which family it might belong. My previous works (Goldberg 1986, 1989) are much more suitable for that purpose since the characters of the families are well illustrated and the descriptions are given in greater detail. My next endeavor will be to revise those publications.

In recent years several taxonomists have published an overview of the system of classification at the family level and above, and they have expressed their views as to the polarity of character states. In my 1986 and 1989 publications I compared my ordinal allocation of

[1] Department of Systematic Biology - Botany, MRC-166, National Museum of Natural History, Smithsonian Institution, Washington DC 20013-7012, USA.

the families of angiosperms with 11 other systems (Cronquist 1981; Young 1981; Takhtajan 1997; Thorne 2000a, 2000b; Dahlgren 1980, 1985; Dahlgren et al. 1982; Hutchinson 1973; Melchior 1964; Stebbins 1974; Rouleau 1981; Benson 1979; Emberger 1960). The angiosperm phylogeny group (APG 2003) is placing families in orders based primarily on DNA sequences of a few genes, and their study is far from complete. Results from molecular studies will be included in my comparison and allocation of families within the orders in my revised treatments. In examining the literature, I find Cronquist's classification system and concepts most frequently mentioned, but there are elements of his work with which many taxonomists do not agree. Our understanding of the classification and phylogeny of the angiosperm families is continually improving.

I believe the best way to determine genetic relationships of plants is to perform artificial hybridizations or crosses between two or more genetically diverse individuals. Even if fertile offspring do not form, results from synapsis, i.e., the pairing of chromosomes during meiosis, can indicate important relationships among plants. Usually members of different families have been genetically isolated from one another for a long period so that their chromosomes are no longer similar enough for synapsis to occur. Another way to determine relationship is grafting. Usually only related plants can be grafted together, and rarely does a scion use the stock merely as a substrate. Direct study of the genotype is difficult, time consuming, and expensive. The above approaches, although very useful and informative, are less expedient than relying primarily on phenotypic characters to indicate relationship. These characters are, as it were, an expression and magnification of the genotype.

Classifications and phylogenies consider similarities and differences among taxa; a classification emphasizes differences that separate, whereas a phylogeny emphasizes similarities that unite. Taxonomists generally agree that classifications should reflect phylogenies. A classification is of primary importance because points of reference are needed for other studies. By successive approximations, classifications are refined and therefore reflect phylogenetic hypotheses.

Classification is a practical study. A fundamental activity of the taxonomist is the determination of specimens in a reasonable length of time. The characters used should be readily observable. For this purpose a good specimen, hand lens, and preferably a dissecting microscope are needed. More sophisticated equipment is generally not used. For the study of phylogeny the best equipment available should be used, such as the electron microscope, as should all procedures deemed necessary, such as DNA sequencing. The time factor is often less important in the study of phylogeny. In making my decisions I consider whether the characters and states are pervasive or merely occasional in a family. The former condition is generally given more weight.

The phylogenetic history of an organism or taxon can encompass relationships of various degrees. It may be direct and in a single line, collateral in lines from a common ancestor, or more distant. Angiosperms are the most recently evolved major group of plants and they have been in existence from at least the early Lower Cretaceous (120 million years ago). To my knowledge, no modern angiosperm family has been reported to become extinct. It is usually more difficult to find adequate characteristics to separate families than it is to find characteristics to indicate common descent.

GUIDING PRINCIPLES

My understanding of the polarity of character states is based on the following rationale.

1. The most significant environmental event affecting vegetative characteristics and many reproductive traits during the history of the angiosperms was a gradual cooling and drying of a large part of the earth. Ever since plants colonized the land they have been developing characteristics that enable them to cope with changing and often harsher conditions. Angiosperms arose and, during most of their history, evolved under mesic conditions. For most of the Mesozoic the dominant organisms on land were ferns, pteridosperms, gymnosperms, and reptiles. The primitive ferns, gymnosperms, and reptiles were apparently unable to endure harsh conditions. Uplift of the continents made the land drier and cooler. Emergence of high mountains accentuated these conditions because they produced a rain shadow. The epicontinental

seas that carried warm water across the continents and into the Polar Regions were drained. Consequently, the Polar Regions became cold, the climate of the central part of the continents became continental, and more heat was retained in the equatorial region. Some gymnosperms and ferns have evolved to tolerate harsh conditions, but they are no matches for the angiosperms, that, for most conditions, have more proficient vascular and reproductive systems. Furthermore, angiosperms developed various chemicals that deter herbivory.

2. The most significant factor affecting the reproductive characters was coevolution with insects. A major evolutionary trend has been from anemophily to entomophily. Under favorable climatic conditions where most families can survive and members of species are often widely separated, entomophily is much more proficient than anemophily. Because of their excellent olfactory sense, insects are capable of transporting pollen precisely from anther to stigma over a significant distance to pollinate isolated plants.

3. General character states are primitive; whereas specialized states are derived. In attempting to decide which primitive states are most primitive, I consider their occurrence among the families. The fewer families that exhibit a particular primitive state, the more primitive it is. For example, few dicot families have xylem without vessels, so I consider that condition one of the most primitive states in dicots.

4. Pteridosperms, primitive pteridophytes, and primitive gymnosperms arose before angiosperms, so characters or states occurring universally in these groups or considered primitive in them, also would be considered primitive in angiosperms. These groups are dioecious or monoecious. Therefore, the dioecious and monoecious conditions are often primitive in angiosperms. Likewise, vessels are almost universally absent from the xylem of pteridophytes and gymnosperms, so this trait is primitive in angiosperms. Reproductive organs in the gymnosperms and pteridophytes do not have homologous structures to the perianth in angiosperms; therefore absence of a perianth is usually primitive in the angiosperms. When pollen grains are aperturate in gymnosperms, they are often monosulcate (e.g., *Ginkgo* and cycads). Therefore, monosulcate pollen is a primitive feature in angiosperms. Because gymnosperms are almost universally anemophilous, the earliest angiosperms must have been anemophilous, and since gymnosperms with this characteristic have survived, I see no reason why primitive anemophilous angiosperms could not have survived.

DISCUSSION

For each family, I treat about 100 characters representing all organs and some tissues, and some ecological and geographical attributes (Table 1 & 2). I found these characters most useful in understanding the classification and phylogeny of the families. Emphasis is placed on characters of the reproductive organs, and those readily determined, as well as those whose polarity can be surmised from the above rationale. For each character the primitive state is given first. In some cases reversal from the derived state to the primitive state occurs. Unless specified otherwise, the definitions of characters and states are those of Kiger and Porter (2001), Jackson (1928) and Erdtman (1996). Tables 1 and 2 can be used to facilitate the determination of a specimen to family if one has a general idea as to where it belongs in my phylogenetic sequence.

My concept of families is about intermediate in interpretation ranging from very broad in many to very narrow in a few. It would be of interest to determine whether a broader or narrower concept of families would affect decisions concerning the significance in the variation of particular characters within and between families. The present publication makes the data concerning the characters of families readily accessible to botanists throughout the world. Only a basic understanding of botany and English are necessary to use the tables, and they can readily be modified for various types of analyses.

I totaled each character state of the families in Tables 1 and 2, and express the sum in percent (Table 3). If the state occurred in the family it was tallied; and then divided by the total number of families in dicots (336) and monocots (57). The difference between the percentage of families with only the primitive state and those with only the derived state is an index of the extent to which evolution has

proceeded toward the derived state. The percentage of families with both states is an index of the extent to which transformation has occurred and is occurring. The lower the latter index, the more diagnostic the character state is likely to be. The character-state index of compared taxa need not be 100% to indicate relationship, but the higher the number, the greater the probability of a relationship. A characteristic unique to a particular family is highly diagnostic of that family, but it conveys no information regarding relationships. A characteristic limited to only two or few families may be due to convergence. Several characteristics limited to particular families are probably good indicators that these families are related.

In Table 3, the percentages for dicot families and monocot families are given separately. It is of interest to compare the two. In 115 of the characters the percentages for dicot and monocot families are similar. The difference between dicot and monocot families is significant in about 60 character states. In approximately 3/4 of these 60 character states the primitive condition occurs in monocots. Many of the similarities between monocot and dicot families appear to be due to convergence since these two taxa have coexisted under the same selective pressures for millions of years. However, some similarities between monocot and dicot families are due to their common origin.

In Table 4, character states that occur in relatively few families, I totaled the character states of the families and expressed the sum in percent or as an estimate. Of the 288 character states considered, about 53% occur in both dicot and monocot families, about 40% occur only in dicot families, and about 7% occur only in monocot families.

As mentioned above, the climate under which the angiosperms arose and began to diversify during the Mesozoic was mesic in temperature and moisture. Additional families were later able to adapt to wet conditions, and many became able to diversify under dry and/or hotter conditions. A significantly greater number of monocot than dicot families became adapted to wet conditions, and the converse is true for dry conditions where more dicot families diversified. Relatively few angiosperm families can survive extended cold periods.

In one early dicot line and one early monocot line, the habit may have been a small tree or shrub. In a subsequent lineage it may have been an herb. The dicots usually retain a vascular cambium for secondary growth, whereas the monocots have none. Consequently, the dicots went on to develop large trees, whereas the monocots developed relatively few trees and shrubs. Under most circumstances, a dicot with a cambium can grow taller than most monocots and consequently can shade out many monocots.

Saprophytic taxa are more frequent in monocots than in dicots, whereas angiosperms that are parasitic on other angiosperms occur among a small number of taxa in dicots but not at all in monocots. Both of these life styles are relatively insignificant when compared to the autotrophic condition found in most angiosperms.

The vascular system of most dicots is more advanced than that of the monocots. For example, few dicot families lack vessels in the xylem whereas many monocot families lack them. The monocots have more families with sclariform perforation plates in the xylem, whereas the dicots have more families with simple perforations, the derived condition.

The earliest leaves were alternate in position, but a considerable percentage of families still show transition to the opposite condition. The same is true in leaf shape from entire to non-entire, and from simple to compound. In some cases there has been reversion from the non-entire to the entire condition, and from the compound to the simple condition. Medium thickness of leaves is the primitive condition and coriaceous the derived. Many monocot families have a leaf sheath, whereas dicot families rarely have any. The sheath has become closed in many monocot families and the trend is still continuing. Stipules, that retard loss of moisture from young buds, were absent in the earliest angiosperms, but a considerable percentage of dicot families have developed them and are continuing to do so. A few monocot families have stipules but they do not have exposed leaf buds. Quite a few monocot families have intravaginal scales, which retard loss of moisture by developing buds, whereas the dicots lack them. Considerably more monocot than dicot families have raphides.

Close association of flowers facilitated pollination. In entomophilous flowers, the

earliest condition might have been a solitary terminal flower. It was followed by racemes, which gave rise to spikes, umbels, heads, and panicles. The cymose condition occurs primarily in families with opposite leaves, and it gave rise to fascicles and some umbels and heads. There has been some reversion to the solitary condition in both monocots and dicots, particularly among plants that have been reduced to small herbs.

Initially, flowers were actinomorphic. Zygomorphic flowers are better adapted for pollination by specialists, and sometimes provide a landing platform for insects.

Like their anemophilous ancestors, the earliest flowering plants had diclinous flowers. The dioecious condition came first, then monoecious, followed by perfect flowers and the polygamous condition. Bringing the sexes closer together facilitates pollination, often making a single visit of a pollinator to a plant or flower sufficient. The greatest sum of families have attained the perfect condition. Some families have reverted to the diclinous condition, requiring cross-pollination, which favors the spread of character trends throughout the population. The polygamous condition and dichogamy also favors cross-pollination. Reversion to the diclinous condition usually occurs in plants growing under harsh conditions that prevent them from having large or medium-sized flowers with a full complement of organs.

In monocots, frequently the outer and inner perianth whorls are similar in color and texture (i.e., tepals), whereas the sepals of dicots are usually herbaceous to better serve as protection for the essential organs, allowing these plants to become better adapted to harsher climatic conditions. The percentage of dicot families with the calyx pleiomerous and diplomerous, and with five or four sepals, is significantly greater than that of the monocot families. The percentage of families with three sepals is significantly greater in monocot families. Both dicots and monocots show a tendency toward connation of the sepals, the dicots significantly more so than the monocots. The sepals are only valvate or open in aestivation in 10% of the dicot families, whereas they are valvate or open in 42% of the monocot families.

In most dicots the number of petals has gone from indefinite and spirally arranged to a definite number in whorls. In some taxa (e.g., some Magnoliaceae) there are two whorls, each of three petals, and in some taxa the number is reduced to one whorl with five petals. In many taxa five petals and sepals are reduced to four, particularly in those with opposite leaves. The percentage of petals is significantly greater in the diplomerous, pleiomerous, tetramerous, and pentamerous categories for dicot families than for monocot families. The corolla in monocot families is predominantly trimerous. In a few monocots trimery has been reduced to dimery.

Initially the stamens of a flower were pleiomerous, or the inflorescence was an ament with numerous minute male flowers. These conditions are most appropriate for anemophily. As flowers became better and better adapted for entomophily, plants required fewer and fewer stamens and proceeded through the diplomerous and haplomerous conditions to the oligomerous condition. Some families with specialized pollinators require only one stamen, and some require only half an anther. Connation of stamens tends to conserve moisture in the pistil. With movement of the stamens onto the corolla, the flower could function with shorter filaments or even sessile anthers. The percentages of families with more than 10 stamens and with five and four are significantly greater in dicot families, whereas the percentages of families with three and six stamens are significantly greater in monocots.

In perfect flowers initially the stamens were hypogynous. In some families they have become markedly perigynous. In Table 1, I use the column head stamens "episepalous" to include those inserted on a calyx tube or at the apex of an hypanthium.

Stamens are homologous with petals and leaves, and like the latter, the primitive ones have more than an unbranched vascular bundle. Undifferentiated stamens are most primitive. With loss of tissue anthers can become basifixed and eventually dorsifixed. The last state is often versatile, facilitating transfer of pollen to the pollinator. In relatively few families the anthers became connate. In connate anthers the pollen is shed ventrally, and in growing up through the tube formed by the anthers, the style acts as a piston pushing the pollen up to a position where it is accessible to pollinators.

The entomophilous condition probably arose early in the history of the angiosperms because a majority of the families are insect pollinated and relatively few are wind pollinated. As

mentioned above, entomophily is more proficient than anemophily under most circumstances. Anemophilous plants must be gregarious for good pollination. Only a few members of a few families have reverted to anemophily (e.g., some Asteraceae, Aceraceae, and Rosaceae). Under harsh climatic conditions even some floral structures are reduced or eliminated.

When pollen is aperturate in the gymnosperms, it is usually monosulcate (e.g., *Ginkgo*, cycads). Many monocot families but only a few dicot families (in the orders Magnoliales, Aristolochiales, Piperales, and Nymphaeales) have retained monosulcate pollen. By reducing the sulcate condition the aperture became ulcerate. Dicot pollen grains became colpate and later colporate. Both dicots and monocots have some porate taxa, and in some families of dicots and monocots, particularly families with many aquatic species, the pollen became inaperturate.

The earliest flowers lacked nectar, but now it has become the major reward for the majority of pollinators. In addition, nectar retards loss of moisture from the ovary. In different families, different organs may produce nectar. Some stamens of some families have been converted to nectaries. In the dicots the nectary is most commonly in the form of a disk surrounding the base of the ovary or, in a few taxa, between the stamens and the petals, or sometimes the nectary is on the hypanthium, or on petals. In the monocots the nectaries are most frequently septal in the ovary, but sometimes they are found on petals.

Many, free pistils appears to be the primitive condition. This condition occurs in relatively few families. Connation of two or more pistils to form a compound pistil facilitates pollination and conserves moisture. Initially the ovary was superior. Its enclosure, in the receptacle, and in the inferior condition, conserves moisture and makes the ovary less vulnerable to attack by some predators.

Initially, compound pistils were pleiomerous and diplomerous but the majority have evolved to the haplomerous and oligomerous conditions. The 2-, 4-, 5-, and more that 5-carpellate states are significantly more common in dicots than in monocots, whereas the tricarpellate state is more common in monocots.

Ventral placentation in the unicarpellate pistils and the axile placentation in compound pistils are the primitive states. With the loss of septa in compound pistils, the apical, basal, free-central, and parietal conditions evolved. Rarely did the parietal condition arise without going through the axile state (e.g., Annonaceae).

In anemophilous flowers there are generally few ovules per pistil. With the assurance of more abundant delivery of pollen by insects, the number of ovules increased. However, in small flowers the number of ovules has remained low. In entomophilous flowers the number of parts is related to the size of the flower, as there is a limit to the miniaturization of organs. As the flower becomes smaller, organs and some of their parts are eliminated. The primitive condition of the ovule is bitegmic and crassinucellar, whereas the derived condition is unitegmic and tenuincellar. In these two respects the ovule of dicots has proceeded significantly further to the derived condition than has the monocot ovule.

In entomophilous flowers there has been a tendency of styles and stigmas to become connate and reduced in number and for the stigmas to become apical. In anemophilous flowers, separate styles and stigmas, that in some taxa are subdivided, and stigmatic surfaces extending down the styles, provide a greater surface for catching pollen.

Carpels are homologous with leaves. The most leaf-like fruit is a follicle. With formation of the compound pistil, capsules arose. Seeds of follicles and capsules are often wind-dispersed. With animal dispersal, capsules became fleshy and then developed into berries and drupes. The seeds of berries generally pass through the gut of animals unharmed. Drupes protect seeds from animals that chew their food. In compound fruits, if closure of the carpels is weak, dehiscence is ventricidal. If carpels are loosely united, dehiscence is septicidal. When carpels are firmly connate, dehiscence frequently is loculicidal, i.e., along the dorsal suture. In some families one large seed develops when there are several ovules in the ovary (e.g., Fagaceae). Under some circumstances large seeds have a competitive advantage. Moreover, primitive seeds have abundant endosperm. Transfer of the stored food from endosperm to embryo usually results in a larger embryo, which gives the seedling a head start in growth. In addition, increase in size of the embryo by bending and folding within the seed gives the seedling a head start in competition with other plants. This head

start is particularly advantageous in regions with a short growing season.

In the primitive condition, the cotyledons of dicots are narrow and relatively short, as they are in gymnosperms. The derived cotyledon is foliar, or plano-convex due to stored food, again providing a head start in growth for the seedling. The longer monocot embryos are advanced over the shorter ones. For monocot embryos I score length: width when the embryo is longer than wide, and width: length in the few cases where it is wider than long. The length of the embryo relative to the endosperm is generally greater for dicots than it is for monocots.

Most angiosperm families have been in existence long enough to have migrated from one continent to another. Migration is much faster than evolution to family rank. Few families are endemic to a single continent and between one-fourth and one-third of the families have reached all continents. Although Europe is larger than Australia, it has fewer families represented, which is probably due to loss during the cold climate in the Pleistocene.

ACKNOWLEDGMENTS

I am especially grateful to Dr. Joseph H. Kirkbride, Jr. of the United States Department of Agriculture (USDA) for the countless hours he spent and for his patience in converting my tables to electronic form and for making suggestions for their improvement. He consulted with Dr. David F. Farr of the USDA. I am grateful to Drs. Peter F. Stevens and Klaus Kubitzki for critical reading of the manuscript and their suggestions for its improvement. Diane M. Tyler, Managing Editor, Smithsonian Institution Press, Series Publications, also read the manuscript and made suggestions for its improvement. I thank Deborah A. Bell for being an intermediary between Dr. Kirkbride and myself; Marilyn J. Hansel for converting the manuscript to electronic form; Alice Tangerini for preparing the cover and dendrogram; and Patricia Gentili-Poole and Paul Peterson for editing the final version for publication.

Table 1a. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; stds, stamindes; usu, usually; W.I., West Indies;

Order Family	Habitat					Habit				Life style		
	moisture			temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
Trochodendrales												
1. Cercidiphyllaceae		×		×		×				×		
2. Tetracentraceae		×		×		×				×		
3. Eupteleaceae		×		×		×	×			×		
4. Trochodendraceae		×		×		×				×		
Hamamelidales												
5. Platanaceae		×		×		×				×		
6. Myrothamnaceae			×	×	×		×			×		
7. Buxaceae		×		×	×	×	×			×		
8. Hamamelidaceae		×		×	×	×	×			×		
9. Daphniphyllaceae		×			×	×	×			×		
10. Didymelaceae		×			?	×				×		
Salicales												
11. Salicaceae	×	×		×	×	×	×			×		
Balanopales												
12. Balanopaceae		×			×	×	×			×		
Fagales												
13. Leitneriaceae	×			×		×	×			×		
14. Rhoipteleaceae		×			×	×				×		
15. Myricaceae	×		×	×	×	×	×			×		
16. Betulaceae	×	×		×		×	×			×		
17. Ticodendraceae	×	×		×		×				×		
18. Juglandaceae		×		×	×	×				×		
19. Fagaceae		×		×	×	×	×			×		
Casuarinales												
20. Casuarinaceae			×	×	×	×	×			×		
Piperales												
21. Saururaceae	×			×	×				×	×		
22. Piperaceae	×	×			×	×	×		×	×		
23. Lactoridaceae		×		×			×			×		
24. Chloranthaceae		×		×	×	×	×		×	×		
Magnoliales												
25. Magnoliaceae		×		×	×	×	×			×		
26. Winteraceae	×	×		×		×	×			×		
27. Annonaceae	×	×		R	×	×	×			×		
28. Eupomatiaceae		×			×	×	×			×		
29. Degeneriaceae		×			×	×				×		
30. Austrobaileyaceae	×				×		×	×		×		
31. Himantandraceae	×				×	×				×		
32. Schisandraceae		×		×	×		×	×		×		
33. Illiciaceae		×		×	×	×	×			×		
34. Canellaceae		×			×	×				×		
35. Myristicaceae	×				×	×				×		

of dicotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume;
N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome;
see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix;
1pa, 1 per axil; ~, about; and ∞, many.

Xylem perforations						Leaves						Stip-ules		Inflorescences									
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×		×		×		×	×	×			×		×								×	×	
	×					×		×			×		×			×							
×		×		×		×		×			×	×										×	
	×					×		×			×	×											×
×		×	×		×	×		×			×		×							×			
×		×		×			×	×			×		×			×							
×		×	R	×		×	×	×		×	×	×		×		×					×		
×		×		×		×	×	×		×	×		×	R		×				×			
×		×		×		×	R	×		×	R	×		×					×				
×		×		×		×		×		×		×		×		×							
×			×			×		×		R	×		×			×							
×		×	R	×	×	×	×			×	×	×				×					×		
×			×			×		×		×		×				×							×
×		×			×	×			×		×		×				×						
×		×	×		×	×		×		×	×	×	×			×							
×		×		×	×	×		×			×		×			×							×
×		×				×		×			×		×			×					×		
×		R	×		×	×	R		×	R	×	×				×					×		
×		×	×			×		×		×	×		×							×	×		×
×		×	×	×	×			×		×		×								×			
×		×	×	×		×		×		×			×	×		×							
×		R	×		×	×	×	×		×		×	×	R		×							
×			×			×		×		×		×									×		×
×	×	×		×			×	×			×		×			×	×			×			×
×		×	R	×	×	×		×		×	R		×								×		
	×					×		×		×		×									R	×	×
×			×			×		×		×		×									×		
×		×		×	×	×		×		×		×									×		
×		×		×		×		×		×		×									×		
×		×				×	×	×		×			×								×		×
×		×	×		×	×		×		×		×									×		
×		×	×		×	×		×		×	×	×									×		
×		×		×		×		×		×		×									×		
×		×		×	×	×		×		×		×		×							×		×
×		×	×		×	×		×		×		×		×			×			×		×	×

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
36. Trimeniaceae		×			×	×	×	×		×		
37. Amborellaceae		×			×		×			×		
38. Monimiaceae	×	×		×	×	R	×	R		×		
39. Calycanthaceae		×		×			×			×		
40. Idiospermaceae	×				×	×				×		
Laurales												
41. Gomortegaceae		×		×		×				×		
42. Lauraceae	×	×		×	×	×	×		R	×		
43. Hernandiaceae		×			×	×	×	×		×		
Aristolochiales												
44. Aristolochiaceae		×		×	×		×	×	×	×		
Nymphaeales												
45. Cabombaceae	×			×	×				×	×		
46. Nelumbonaceae	×			×	×				×	×		
47. Nymphaeaceae	×			×	×				×	×		
Ranunculales												
48. Ranunculaceae	×	×		×	R		R		×	×		
49. Ceratophyllaceae	×			×	×				×	×		
50. Coriariaceae		×		×		×	×		R	×		
51. Circaeasteraceae		×		×					×	×		
52. Nandinaceae		×		×	×		×			×		
53. Paeoniaceae		×		×			×		×	×		
54. Berberidaceae		×		×	×		×		×	×		
55. Podophyllaceae		×		×					×	×		
56. Sargentodoxaceae		×			×			×		×		
57. Menispermaceae	×	R		×	×	R		×	×	×		
58. Lardizabalaceae		×		×	×		R	×		×		
Gunnerales												
59. Gunneraceae	×			×	×				×	×		
Geraniales												
60. Connaraceae		×		×	×	×	×	×		×		
61. Geraniaceae		×		×	×		×		×	×		
62. Vivianiaceae		×		×			sub		×	×		
63. Limnanthaceae	×	×		×					×	×		
64. Oxalidaceae		×		×	×	R	×		×	×		
65. Tropaeolaceae	×	×	×	×	×				×	×		
66. Balsaminaceae		×		R	×		R		×	×		
67. Linaceae		×		×	×	×	×		×	×		
68. Erythroxylaceae	×	×		×	×	×	×			×		
69. Zygophyllaceae			×	×	×	R	×		×	×		
70. Balanitaceae		×			×	×	×			×		
71. Malpighiaceae		×		×	×	×	×	×		×		
72. Stackhousiaceae			×	×	×				×	×		
Rutales												
73. Meliaceae	×	×		×	×	×	×			×		
74. Simaroubaceae		×		R	×	×	×			×		
75. Rutaceae		×	×	×	×	×	×		R	×		
76. Pittosporaceae		×		×	×	×	×			×		
77. Cneoraceae		×		×			×			×		

Xylem perforations						Leaves						Stip-ules		Inflorescences									
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×		×		×		×		×		×	×	×		×			×						
	×					×		×		×	×	×					×					×	×
×		×	×	×		R	×	×		×	×	×		×							R		×
×			×				×	×		×		×									×		
×		×					×	×		×		×									×		
×		×		×			×	×		×		×		×			×						
×		R	×		×	×	R	×		×	R	×		×			×		×	R			×
×		R	×		×	×		×	×	×	×	×			×			×						×
×			×			×		×		×		×		×							×		
	×					×	×			×	×	×									×		
R	×	R						×		×			×								×		
×	×	R				×		×		×	×	×	×								×		
×		R	×		×	×	R	×	R		×	×	R	×			×	×			×	×	×
	×							×			×	×									×		
×			×			R	×	×		×			×	×							R		
×			×					×			×	×									×		
×			×			×			×			×					×						
×		×			×	×			×		×	×									×		
×		R	×		×	×		×	×	×	×	×	R	×		×	×				×	×	×
×			×				×	×		×	×		×	×		×	×		sub		×		×
×			×			×			×	×	×	×		×									
×			×			×		×	R	×	×	×		×				×			R	×	×
×		×	×		×	×			×		×	×									×		
×		×	×	×		×		×			×		×				×						
×			×			×		R	×	×	R	×				×	×					×	
×		R	×		×	×			×		×		×	×					sub		×		×
×			×				×	×		×	×	×					×					×	×
×			×			×		×	×	×	×	×									×		
×		×	×			×		R	×	×	R	×		×				×	sub		×		×
×			×			×	×	×	R			×	×								×		
×			×			×	R	×			×	×		×					sub		×		
×		×	×	×	×	×	R	×		×	R	×	×	×				×					×
×		R	×		×	×		×		×			×								×	×	
×			×			R	×	×	×	×		×	×	R							×		×
×			×			×			×	×		×							×				
×			×			R	×	×		×		R	×	×			×						×
×			×			×		×		×		×		×		×	×		R		R	×	×
×			×			×	R	R	×	×	×	×		×			×		×					×
×			×			×	R	R	×	×	×	×	R	×		×	×							×
×		R	×		×	×	×	×	×	×	×	×		×		×				×				×
×		R	×			×	R	×		×	R	×			×			×			R		×
×			×			×		×		×		×									×		×

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
78. Burseraceae	×	×	×		×	×	×			×		
79. Anacardiaceae		×		×	×	×	×	×		×		
Sapindales												
80. Akaniaceae		×			×	×				×		
81. Sapindaceae		×		R	×	×	×	×	R sub	×		
82. Melianthaceae		×		×	×	×	×			×		
83. Hippocastanaceae		×		×	R	×	×			×		
84. Staphyleaceae		×		×	×	×	×			×		
85. Aceraceae		×		×		×	×			×		
86. Sabiaceae		×		×	×	×	×	×		×		
Fabales												
87. Caesalpiniaceae		×		×	×	×	×		×	×		
88. Fabaceae		×		×	×	R	×	×	×	×		
89. Mimosaceae		×		×	×	×	×		R	×		
Polygalales												
90. Polygalaceae	×	×		×	×	R	×	×	×	×		?R
91. Krameriaceae			×	×	×		×		×	×	R	
92. Trigoniaceae	×				×	×	×	×		×		
93. Vochysiaceae		×			×	×	×	×		×		
Papaverales												
94. Papaveraceae		×		×	×	×	×		×	×		
95. Fumariaceae		×		×					×	×		
96. Tovariaceae		×		×	×		×		×	×		
97. Capparaceae		×	×	×	×	×	×	×	×	×		
98. Brassicaceae		×		×	R		R		×	×		
99. Pentadiplandraceae ?	×				×		×	×		×		
100. Resedaceae			×	×	×		R		×	×		
101. Moringaceae			×		×	×				×		
102. Bretschneideraceae		×		×	?	×				×		
Batales												
103. Bataceae		×		×	×		sub			×		
Cistales												
104. Cistaceae			×	×	×		×		×	×		
105. Cochlospermaceae			×		×	×	×			×		
106. Bixaceae		×			×	×	×			×		
Caryophyllales												
107. Cactaceae			×	×	×	×	×		×	×		
108. Aizoaceae			×		×		×		×	×		
109. Portulacaceae		×	×	×	×		×		×	×		
110. Basellaceae		×			×				×	×		
111. Didiereaceae			×		×	×	×			×		
112. Gyrostemonaceae		×	×	×	×	×	×			×		
113. Phytolaccaceae		×		×	×	R	×		×	×		
114. Barbeuiaceae		×			×	×	×	×		×		
115. Achatocarpaceae		×	×	×	×	×	×			×		
116. Petiveriaceae		×		×	×		×		×	×		
117. Agdestidaceae		×			×		×	×	×	×		
118. Nyctaginaceae		×	×	×	×	×	×		×	×		
119. Stegnospermataceae			×		×		×			×		

Xylem perforations						Leaves						Stipules		Inflorescences								
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×			×			×	R	R	×	×	×	×	R	×			×			R			
×		R	×		×	×	R	×	×	×	×	×	R				×						×
×		R	×	×		×			×		×	×					×						×
×			×			×	R	×	×	×	×	×	R				×						×
×			×			×			×		×	×	×	×									
×		R	×			×			×	×	×	×						×					
×		×		×	×	×	×	R	×		×	R	×	×			×						
×			×	×	×	×		×	×	×	×	×		R			×						
×			×			×	R	R	×	×	R		×	×		×							R
×			×			×	R	R	×	×	×	R	×	×		×	×				×		R
×			×			×	R		×	×		R	×	×		×				×			
×			×			×	R	×		×		×	R	×		×	×				×		
×			×			×		×		×		×		×									
×			×			R	×	×		×		×	×	×			×						R
×			×			R	×	×		×		×	×	×			×						×
×			×			×	R	×		×	×	×		×			×				×		×
×			×			×	R	×			×	×		×									
×			×			×			×	×			×	×									
×			×			×	R	×	×	×	R	×		×									
×			×			×		×	×	×	×	×		×									
×			×			×		×		×			×						R				
×			×			×		×		×	×	×		×									
×		×	×			×			×	×		×		×									
×			×				×	×		×		×	×			×					×		
×			×			R	×	×		×		×	×	×							×		×
×			×			×		×	R		×		×	×			×						
×			×			×		×		×			×	×									×
×			×			×		×		×		×					R				×		
×			×			×	×	×		×	R	×	R								×		×
×			×			×	×	×		×		R	×				×			×	×		×
×			×			×		×		×	R	×		×		×	×						
×			×			×		×		×		×											×
×			×			×		×		×		×	×	×		×					×		
×			×			×		×		×		×		×		×	R						
×			×			×		×		×		×		×									
×			×			×		×		×		×		×								×	
×			×			×		×		×	R	×	×	×		×	×						
×			×			×		×		×		×											×
×			×			×	×	×		×		×		R									×
×			×			×		×		×		×		×				×					×

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
120. Caryophyllaceae		×		×	R		R		×	×		
121. Molluginaceae			×	×	×		R		×	×		
122. Illecebraceae			×	×	×				×	×		
123. Amaranthaceae		×		×	×	R	R		×	×		
124. Chenopodiaceae			×	×	×	R	×		×	×		
Polygonales												
125. Polygonaceae	×	×	×	×	×	×	×		×	×		
Primulales												
126. Plumbaginaceae			×	×	×		×	×	×	×		
127. Primulaceae		×		×	?		R		×	×		
128. Tamaricaceae			×	×	×	×	×		×	×		
129. Frankeniaceae			×	×	×		×		×	×		
130. Myrsinaceae	×	×		×	×	×	×		R	×		
131. Theophrastaceae		×		×	×	×	×			×		
Plantaginales												
132. Plantaginaceae	×	×		×	×		×		×	×		
Proteales												
133. Proteaceae		×	×	×	×	×	×		R	×		
Santalales												
134. Olacaceae		×		×	×	×	×	×	R	R	hemi	
135. Aptandraceae		×			×	×						
136. Octoknemaceae		×			×	×	×					
137. Opiliaceae		×			×	×	×	×		R	hemi	
138. Medusandraceae	×				×	×				×		
139. Cardiopteridaceae ?		×			×				×	×		
140. Santalaceae		×	×	×	×	×	×		×		hemi	
141. Loranthaceae		×	×	×	×	R	×		×		hemi	
142. Misodendraceae		×		×			sub				hemi	
143. Grubbiaceae ?		×		×			×			×		
Thymelaeales												
144. Geissolomataceae			×	×			×			×		
145. Gonystylaceae ?		×			×	×	R			×		
146. Thymelaeaceae		×		×	×	×	×	×	R	×		
Euphorbiales												
147. Euphorbiaceae	×	×	×	×	×	×	×		×	×		
148. Simmondsiaceae ?			×	×			×			×		
149. Callitrichaceae	×			×	×				×	×		
150. Aextoxicaceae		×		×		×				×		
151. Pandaceae	×				×	×				×		
Urticales												
152. Eucommiaceae ?		×		×		×				×		
153. Barbeyaceae			×		×	×				×		
154. Urticaceae	×	×		×	×	×	×		×	×		
155. Theligonaceae		×		×	×				×	×		
156. Cannabaceae		×		×	×				×	×		
157. Moraceae		×		×	×	×	×		R	×		
158. Ulmaceae		×		×	×	×	×			×		
Malvales												
159. Sterculiaceae		×		R	×	×	×		R	×		

Xylem perforations						Leaves						Stip-ules		Inflorescences								
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×			×				×	×		×		×	×	×			×			×	×		×
						×	×	×		×		×	×								×	×	×
×			×			R	×	×		×	R	R	×								×		?
×			×			×	×	×		×		×		×		×				×			×
×		R	×		×	×	R	×		×	×	×				×		×		×	R		×
×			×			×	R	×		×		R	×	×		×		×		×			×
×			×			×		×		×		×		×		×	×		×	×			×
×			×			×	×	×		×	×	×		×			×		×		×		
×			×			×		×		×		×		×		×					×		
×			×				×	×		×		×									×		×
×		R	×		×	×	×	×		×	×	×		×			×		×			×	×
×			×			×	R	×		×	×	×		×	×		×				R	×	
×			×			×	R	×		×	×	×				×				×	R		
×		R	×		×	×	R	×	R	×	×	×		×		×			×	×	R		
×		×	×	×	×	×		×		×		×						×					×
×			×			×		×		×		×		×			×		×				
×		×	×	×	×	×		×		×		×		×									
×			×			×		×		×		×		×		×	×		×				
×		×		×		×		×			×		×	×									
×			×			×		×		×		×						×					×
×			×			×	×	×		×		×		×		×				×	×		×
×			×			R	×	×		×		×		×		×					×		×
×			×			×		×		×	×	×		×		×				×	×		
×		×		×		×		×		×		×											×
×		×		×	×		×	×		×		?	×								×		
×			×			×	R	×		×		×						×	R				
×			×			×	×	×		×		×		×		×			×	×	R	×	R
×		×	×			×	R	×	×	×	×	R	×	×		×		×			×		×
×			×				×	×		×		×		R						×	×		
	×						×	×		×		×									1pa		
×		×		×		×		×		×		×		×									
×		×	×		×	×		×			×		×	×									
×		×	×			×		×			×	×									×	×	
×			×				×	×		×		×											×
×			×			×	×	×		R	×	R	×			×				×			×
×			×			×	×	×		×			×									×	×
×			×			×	×	×			×		×			×	×						×
×			×			×	R	×	R	×	×		×						×	×				×
×		R	×		×	×	R	×		×	×		×								×	×	×
×			×			×	R	×	×	×	×		×				×				R		×

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
160. Elaeocarpaceae		×			×	×	×			×		
161. Tiliaceae		×		R	×	×	×		R	×		
162. Sphaerosepalaceae		×			×	×	×			×		
163. Malvaceae		×		×	×	R	×		×	×		
164. Bombacaceae	×		×		×	×				×		
Violales												
165. Flacourtiaceae		×		×	×	×	×			×		
166. Lacistemataceae	×	×			×	×	×			×		
167. Passifloraceae		×		R	×	R	×	×	×	×		
168. Malesherbiaceae			×	×			×		×	×		
169. Turneraceae	×	×		×	×	×	×		×	×		
170. Achariaceae			×	×	×		×		×	×		
171. Caricaceae	×				×	×	×		R	×		
172. Violaceae	×	×		×	×	×	×	R	×	×		
173. Stachyuraceae ?		×		×	?	×	×			×		
174. Scyphostegiaceae ?	×				?	×				×		
175. Peridiscaceae	×				×	×				×		
176. Hoplestigmataceae ?	×				×	×				×		
177. Loasaceae		×	×	×	×	×	×		×	×		
178. Cucurbitaceae	×	×	×	×	×	R	R		×	×		
Rhamnales												
179. Vitaceae		×		×	×			×		×		
180. Leeaceae	×				×	×	×		×	×		
181. Rhamnaceae		×	×	×	×	×	×	×	R	×		
182. Erythropalaceae		×		×	×		×	×		×		
183. Aquifoliaceae		×		×	×	×	×			×		
184. Icacinaceae	×		×		×	×	×		R	×		
Celastrales												
185. Ctenolophonaceae	×				×	×				×		
186. Ixonanthaceae	×				×	×	×			×		
187. Irvingiaceae	×				×	×				×		
188. Dichapetalaceae	×				×	×	×	×		×		
189. Celastraceae		×		×	×	×	×	×		×		
190. Goupiaceae		×			×	×	×			×		
191. Siphonodontaceae	×				×	×		×		×		
Dilleniales												
192. Dilleniaceae		×		R	×	×	×	×	R	×		
193. Actinidiaceae		×		×	×		×	×		×		
194. Saurauiaceae		×			×	×	×			×		
Rosales												
195. Rosaceae		×	×	×	×	×	×		×	×		
196. Chrysobalanaceae	×				×	×	×			×		
197. Elaeagnaceae		×	×	×	×	×	×			×		
198. Neuradaceae			×		×				×	×		
199. Corynocarpaceae ?		×			×	×	×			×		
200. Crossosomataceae ?			×	×			×			×		
Myrtales												
201. Myrtaceae		×	×		×	×	×		R sub	×		
202. Lecythidaceae	×				×	×	×			×		

Xylem perforations						Leaves						Stip-ules		Inflorescences									
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×		×	×		×	×	×	×		×	×		×	×			×							×
×			×			×	R	×		R	×		×											×
×			×			×		×		×			×				×		×					×
×			×			×		×			×		×								×			×
×			×			×		×	×	×	×		×								×			×
×		×	×			×	R	×		×	×	R	×	×		?				R	×			×
×		×		×	×	×		×		×	×		×	×		×								
×		R	×			×		×	R		×	R	×	×							×			×
×		×	×		×	×		×		×	×	×		×			×				×			×
×		×	×	×		×		×			×	×		×							×			×
×		×			×	×		×			×	×		×							×	×		
×			×			×		×	×		×	×		×			×				×	×		×
×		×	×	×	×	×	R	×		×	×		×	×			×				×			
×		×		×	×	×		×			×		×	×										
×		×	×		×	×		×			×		×	×			×							
×		×	×			×		×		×			×	×										
×			×			×		×		×		×												×
×			×			×	×	×		×	×	×	R	×						×	×			×
×			×			×		×	×	×	×	×		R			×				×			×
×			×			×	R	×	×	R	×		×	×			×							×
×			×			×	R	R	×		×	×			×									×
×		×	×		×	×	×	×		×	×	×	×		×									×
×			×			×		×		×		×			×									×
×		×		×	×	×	R	×		R	×	×	×	R							R	×		×
×		×	×	×		×	R	×		×	R	×		×		×	×	×						×
×		×		×	×		×	×		×			×										×	×
×			×			×		×		×	×		×	×			×							×
×			×			×		×		×			×				×							×
×		×	×		×	×		×		×			×											×
×		×	×		×	×	×	×		×	×	×	×	R										×
×		×			×	×		×		×	×		×	×					×					×
×			×			×		×		×	×		×						×					×
×		×	×	×	×	×	R	×		×	×	×	R	×			×						×	×
×		×	×	×		×		×			×	×											×	×
×		×		×		×		×		?	×	×					×							?
×		R	×		×	×	R	×	×	R	×	R	×	×		×	×		×	×	×			×
×			×			×		×		×			×	×		×	×	×						×
×			×			×	R	×		×		×		×		×					×	×	×	
×			×			×		×			×	×	×								×			
×			×			×		×		×			×	×			×							
×			×			×		×		×		×									×			
×		×	×	×	×	×	×	×		×	R	×		×			×				R			×
×		R	×		×	×		×		×		×	R	×	×						×			

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
203. Barringtoniaceae		×			×	×	R			×		
204. Asteranthaceae	×				×	×	×			×		
205. Dialypetalanthaceae	×				×	×				×		
206. Sonneratiaceae	×	×			×	×				×		
207. Punicaceae			×	×	×	×	×			×		
208. Rhizophoraceae	×	×			×	×	×			×		
209. Lythraceae	×	×		×	×	×	×		×	×		
210. Crypteroniaceae		×			×	×				×		
211. Oliniaceae		×			×	×	×			×		
212. Penaeaceae		×		×			×			×		
213. Melastomataceae	×	×		×	×	×	×		×	×		
214. Onagraceae	×	×	×	×	×	R	R		×	×		
215. Haloragaceae	×			×	×	R	R		×	×		
216. Hippuridaceae	×			×					×	×		
217. Trapaceae	×			×	×				×	×		
218. Combretaceae	R	×	×		×	×	×	×		×		
Theales												
219. Theaceae		×		×	×	×	×			×		
220. Bonnetiaceae	×			×	×	×	R			×		
221. Pentaphylacaceae		×			×	×	×			×		
222. Pellicieraceae	×				×	×				×		
223. Medusagynaceae		×			×		×			×		
224. Eucryphiaceae		×		×		×	×			×		
225. Paracryphiaceae		×		×		×	×			×		
226. Symplocaceae		×		R	×	×	×			×		
227. Tetrameristaceae		×			×	×	×			×		
228. Clusiaceae	×				×	×	×			×		
229. Quiinaceae	×				×	×	×	×		×		
230. Hypericaceae	×	×		×	×	R	×		×	×		
231. Elatinaceae	×			×	×		×		×	×		
232. Dipterocarpaceae	×				×	×				×		
233. Humiriaceae	×				×	×	×			×		
234. Ancistrocladaceae ?	×				×		R	×		×		
235. Marcgraviaceae		×			×	R	×	×		×		
236. Caryocaraceae	×				×	×	×			×		
237. Ochnaceae		×			×	×	×		R	×		
238. Strasburgeriaceae		×			×	×				×		
239. Diegodendraceae		×			×	×	×			×		
240. Scytopetalaceae	×				×	×	×			×		
241. Sarcolaenaceae		×		×	×	×	×			×		
Ericales												
242. Ericaceae		×		×	×	R	×			×		
243. Tremandraceae		×		×	×		×	R		×		
244. Epacridaceae		×		×	×	×	×			×		
245. Clethraceae		×		×	×	×	×			×		
246. Empetraceae		×		×			×			×		
247. Pyrolaceae		×		×					×	×		R
248. Monotropaceae		×		×					×			×
249. Diapensiaceae		×		×			×		×	×		

Xylem perforations						Leaves						Stip-ules		Inflorescences									
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×		R	×		×	×		×		×	×	×		×	×								
×		R	×		×	×		×		×		×			×						×		
×			×				×	×		×			×					×					×
×			×				×	×		×		×			×						×		×
×			×			R	×	×		×		×									×	×	
×		×	×	×	×	×	×	×		×	×	×	×	×		×					R		×
×			×			R	×	×		×		×	×	×			×				×		×
×			×				×	×		×		×		×			×						
×			×				×	×		×			×										×
×			×				×	×		×		×	×								×		
×			×				×	×		×	R	×	R				×				×		×
×			×			×	×	×		×	R	×	R	×		×	R				×		
×			×			×	×	×			×	×		×		×	×				×	×	
	×							×		×		×									1pa		
×			×			×	×	×			×	?									1pa		
×			×			×	×	×		×		×		×		×	×						
×		×		×		×		×			×	×		R			R				×		
×		R	×		×	×	R	×		×	R	×		×			×		×				
×		×		×	×	×		×		×		×		×									
×			×			×		×			×	×									×		
×			×				×	×			×	×					×						
×		×	×	×	×		×	×	×		×		×								×		
×		×		×		×		×		×	×			×		×	×						
×		×		×		×		×		×	×			×		×	×						
×		×	×		×	×		×		×				×									
×		×	×	×	×	×		×		×	×								×				
×		×		×		×		×		×	×	×		×			×						
×		×	×		×	×		×		×		×		×									
×			×			×		×		×			×										
×		×	×		×	×		×		×	×	×		×					×				
×		×		×		×		×		×	×	×		×	×								
	×					×		×		×		×		×									
×		R	×		×	×	×	×		×	×	×		×									
×		×	×	×	×	×	R	×		×	×	×		×			×						
×			×			×	×	×		×	×	×											
×		×	×	×	×	×	R	×		×	R	×		×									
×		×		×		×		×			×	×		×			×						
×		×	×		×	×		×		×		×		×						×			
×		×		×		×		×		×	×	×		×	×				×				
	×					×		×		×		×		×						×			
×		R	×		×	×	×	×		×	×	×		×						sub			

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
250. Cyrillaceae	×			×	×	×	×			×		
251. Lennoaceae			×	×	×				×		×	
Ebenales												
252. Ebenaceae	×	×		×	×	×	×			×		
253. Sapotaceae	×			R	×	×	×			×		
Styracales												
254. Styracaceae		×		×	×	×	×			×		
255. Lissocarpaceae	×				×	×				×		
256. Alangiaceae		×		×	×	×	×	R		×		
Rafflesiales												
257. Hydnoraceae			×	×	×				×		×	
258. Rafflesiaceae		×	×	×	×				×		×	
259. Balanophoraceae		×			×				×		×	
Araliales												
260. Araliaceae		×		×	×	×	×	×	×	×		
261. Apiaceae	×	×	×	×		R	R		×	×		
Saxifragales												
262. Crassulaceae	×	×	×	×	×		×		×	×		
263. Saxifragaceae	×	×	×	×	?				×	×		
264. Parnassiaceae	×			×					×	×		
265. Eremosynaceae			×	×					×	×		
266. Francoaceae		×		×					×	×		
267. Davidsoniaceae		×		×	×	×				×		
268. Hydrangeaceae		×		×	×	×	×	R	×	×		
269. Philadelphaceae		×		×	×	×	×			×		
270. Pterostemonaceae		×		×			×			×		
271. Iteaceae		×		×	×	×	×			×		
272. Baueraceae	×			×			×			×		
273. Bruniaceae		×		×	×		×			×		
274. Vahliaceae			×		×				×	×		
275. Donatiaceae		×		×					×	×		
276. Tetracarpaeaceae		×		×			×			×		
277. Escalloniaceae		×		×	×	×	×			×		
278. Grossulariaceae		×		×			×			×		
279. Brunelliaceae		×			×	×				×		
280. Cunoniaceae		×		×	×	×	×	R		×		
281. Greyiaceae		×			×	×	×			×		
282. Cephalotaceae	×			×					×	×		
Begoniales												
283. Begoniaceae		×			×				×	×		
284. Datiscaceae			×	×	×		×			×		
Droserales												
285. Dioncophyllaceae	×				×			×		×		
286. Droseraceae	×	×		×	×				×	×		
287. Byblidaceae		×		×	×		×		×	×		
288. Podostemaceae ?	×			×	×				×	×		
289. Hydrostachyaceae ?	×				×				×	×		
Sarraceniales												
290. Sarraceniaceae	×			×					×	×		

Xylem perforations						Leaves						Stip-ules		Inflorescences									
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×		×		×		×		×		×		×	×	×									
×			×			×		×		×		×						×		×			×
×			×			×	R	×		×		×									1pa		×
×		R	×		×	×	R	×		×	R	×	R								×	×	×
×		×	R		×	×		×		×	R	×		×			×				R		×
×		×	×			×		×		×		×											×
×		×	×		×	×		×		×	×	×		×									×
×			×																		×		
×			×			×	R	×		×		×		R		R					×		R
×		?	×			×		×		×		×				×	×			×			
×		×	×			×	R	×	×	R	×	R	×	×		×	×		×	×			R
×		R	×		×	×	R	R	×	R	×	×	R	×			×		×	R		×	×
×		R	×		×	×	R	×	R	×	×	×											×
×			×			×	R	×	×		×	×									R		×
×			×			×		×		×		×									×		
×			×			×		×		×	×	×											×
×			×			×		×			×	×		×			×						
×		×	×			×			×				×			×							
×		×	R	×		×	×	×			×		?		×					×			
×		×		×		R	×	×		×			×										×
×		×		×		×		×			×		×	×		×				×	×		
×			×				×	×		×		×											×
×		×				×		×		×		×									×		
×			×			×		×			×			×									
×		×		×	×	×	R	×			×	×		×									×
×		×	R		×	×		×			×	×	×	×							sub		
×		×	R	×	×		×	×	×		×		×				×						
×		×	×	×	×	R	×	R	×		×		×				×			×	R		
×			×			×		×			×	×		×									
×		×				×		×			×	×		×									×
×		×	×	×		rad	R	×	R		×		×								×		×
×			×			×			×		×	×					×					×	
×			×			×		×		×	×	×											×
×			×			×		×			×	×	×	R							R		×
×		×	×	×		×		×		×		×		×							×		
	×					×		×			×	×									×	×	×
	×					rad		×			×		×			×							
×		×				×		×		×		×		×							×		

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
Nepenthales												
291. Nepenthaceae	×				×		×	×	×	×		
Polemoniales												
292. Polemoniaceae		×		×	×	R	R	R	×	×		
293. Hydrophyllaceae		×	×	×	×		R sub		×	×		
294. Boraginaceae		×		×	×	×	×	×	×	×		
295. Fouquieriaceae			×	×	×	×	×			×		
Gentianales												
296. Loganiaceae		×	×	R	×	×	×	×	×	×		
297. Rubiaceae	×	×		×	×	×	×	×	×	×		
298. Columelliaceae		×		×		×	×			×		
299. Gentianaceae		×		×	×		R		×	×		R
300. Menyanthaceae	×			×	×				×	×		
301. Convolvulaceae		×		×	×	R	×	×	×	×		
302. Cuscutaceae		×		×	×				×		×	
303. Apocynaceae		×		×	×	×	×	×	×	×		
304. Plocospermataceae		×			×	×	×			×		
305. Asclepiadaceae		×	×	×	×	R	×	×	×	×		
Oleales												
306. Oleaceae		×		×	×	×	×	×		×		
307. Salvadoraceae			×		×	×	×			×		
Cornales												
308. Davidiaceae		×		×		×				×		
309. Nyssaceae	×	×		×	×	×	×			×		
310. Garryaceae			×	×	×	×	×			×		
311. Cornaceae		×		×	R	×	×		R	×		
Dipsacales												
312. Caprifoliaceae		×		×		×	×	×	R	×		
313. Adoxaceae	×	×		×					×	×		
314. Valerianaceae		×		×			R	R	×	×		
315. Dipsacaceae		×	×	×	×				×	×		
Scrophulariales												
316. Solanaceae		×		×	×	×	×	×	×	×		
317. Nolanaceae		×		×	×		×		×	×		
318. Scrophulariaceae		×		×	R	R	×	×	×	×	hemi	
319. Orobanchaceae		×		×	×				×		×	
320. Buddlejaceae ?		×		×	×	×	×		R	×		
321. Globulariaceae		×		×			×		R	×		
322. Lentibulariaceae	×			×	×				×	×		
323. Acanthaceae	×	×	×	×	×	R	×	×	×	×		
324. Bignoniaceae		×		×	×	×	×	×	R	×		
325. Gesneriaceae		×		×	×	R	×	×	×	×		
326. Pedaliaceae			×	×	×	R	R		×	×		
Lamiales												
327. Myoporaceae		×		×	×	×	×			×		
328. Verbenaceae	×	×		×	×	×	×	×	×	×		
329. Phrymaceae		×		×					×	×		
330. Lamiaceae	×	×	×	×	×	R	R		×	×		

Xylem perforations						Leaves						Stip-ules		Inflorescences								
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×			×			×		×		×	R	×		×									
×		×	×		×	×	×	×	R	×	R	×			×					×	R		×
×			×			×	R	×	×	×	×	×							×		R		×
×			×			×	R	×		×		×									R		×
×		R	×		×	×		×		×		×		×			×						
×		R	×				×	×		×		×	×	×		×	×			×	R		×
×		R	×		×		×	×		×	R		×					×		×	R		×
×		×					×	×		×	×	×											×
×			×			R	×	×		×		×									×		×
×		×	×			×	R	×	×	×	×	×					×			×	R		×
×			×																			×	
×		R	×			R	×	×		×		×	R				×				×		×
×			×				×	×		×		×											
×			×			R	×	×		×	R	×							×				×
×		R	×		×	R	×	×	×	×	×	×		×			×							×
×			×				×	×		×		×	×	×		×	×					×	
×		×		×		×		×			×	×								×			
×		×		×		×		×		×	R	×		×					×	×	R		
×		×			×		×	×		×		×		×		×							
×		×	R	×		R	×	×		×	R	×		×			R		×	×			×
×		×	×	×			×	×	R	×	×	×	R	×									×
×			×				×	×		R	×	×								×			×
×		R	×				×	×	×	×	×	×								×			×
×		R	×				×	×		×	×	×								×			×
×			×			×	R	×		×	R	×									×		×
×			×			×	R	×		×		×		×							×		
×			×			×	×	×		×	×	×		×		×	×				×		×
×			×			×		×		×		×		×		×					×		
×			×			R	×	×		×	R	×	×	×				×			×		
						×		×		×		×		×		×					×		
×			×			R	×	×		×		×		×									×
×			×			R	×	R	×	×	×	×					×				×		×
×			×			R	×	×		×	×	×		R							×	R	×
×			×			×	×	×		R	×	×		×							×		×
×			×																				
×			×			×	R	×		×	×	×									×		×
×		R	×		×	R	×	×	R	×	×	×				×	×			×	×		×
×			×				×	×			×	×				×							
×		R	×		×	R	×	×		×	×	×		R		R				R	R		×

Table 1a cont.

Order Family	Habitat					Habit				Life style		
	Moisture			Temperature								
	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	autotrophic	parasitic	saprophitic
Campanulales												
331. Campanulaceae		×		×	×	R	R		×	×		
332. Goodeniaceae		×	×	×	×		×		×	×		
333. Brunoniaceae		×		×					×	×		
334. Calyceraceae			×	×	×		R sub		×	×		
335. Stylidiaceae		×		×	×		R sub		×	×		
Asterales												
336. Asteraceae	R	×	×	×	×	R	×	R	×	×		

Xylem perforations						Leaves						Stip-ules		Inflorescences									
present	absent	scalariform	simple	many bars	few bars	alternate	opposite	simple	compound	entire	not entire	absent	present	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme
×		R	×		×	×	R	×		R	×	×		×		×		×		×	×		×
×			×			×	R	×		×	×	×		×		×	×			×	×		×
×			×			rad		×		×		×								×			×
×			×			×		×		×		×								×			
×			×			×		×		×		×		×		×							×
×		R	×		×	×	×	×	R	×	×	×				×				×			

Table 1b. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; stds, stamindes; usu, usually; W.I., West Indies;

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
Trochodendrales													
1. Cercidiphyllaceae	x			x			x		x		4		?
2. Tetracentraceae	x		x				x		x		4	x	
3. Eupteleaceae	x					x		x					
4. Trochodendraceae	x		x					x					
Hamamelidales													
5. Platanaceae	x				x			x					
6. Myrothamnaceae	x			x				x					
7. Buxaceae	x			x	x		x	R	x		4,6(0)		x
8. Hamamelidaceae	x		x	x	x	x	x	R	x		4,5(0,6,7)	x	x
9. Daphniphyllaceae	x			x				x					
10. Didymelaceae	x			x			x	x	x		0-4		
Salicales													
11. Salicaceae	x			x				x					
Balanopales													
12. Balanopaceae	x			x				x					
Fagales													
13. Leitneriaceae	x			x			?	x	x		0,4(3-8) (?)	?	?
14. Rhoipteleaceae	x					x	x		x		4	x	
15. Myricaceae	x			x	x	x		x					
16. Betulaceae	x				x		x	x	x		0,4(1-5)		x
17. Ticodendraceae	x			x	x			x					
18. Juglandaceae	x			R	x		x	x	x		0,3-6		x
19. Fagaceae	x			R	x		x		x		4-6(-7)		x
Casuarinales													
20. Casuarinaceae	x			x	x		x	x	x		0(2?)	x	
Piperales													
21. Saururaceae	x		x					x					
22. Piperaceae	x		x					x					
23. Lactoridaceae	x				x	x	x		x		3	x	
24. Chloranthaceae	x		x	x	x		x	x	x		0,3		
Magnoliales													
25. Magnoliaceae	x		x		R		x	x	x		0,3	x	
26. Winteraceae	x		x			R	x		x		2-6	x	x
27. Annonaceae	x		x	R	R		x		x		3(2,4)	x	x
28. Eupomatiaceae	x		x					x	x		0		
29. Degeneriaceae	x		x				x		x		3(4)	x	
30. Austrobaileyaceae	x		x				x			x	19-24	x	
31. Himantandraceae	x		x				x				2		x
32. Schisandraceae	x			x	x		x			x	9-15	x	
33. Illiciaceae	x		x				x			x	7-33	x	
34. Canellaceae	x		x				x		x		3-5	x	x
35. Myristicaceae	x			x	R		x		x		3(2-5)		x
36. Trimeniaceae	x		x	x			x		x		6,4 or ∞	x	
37. Amborellaceae	x		R	x			x			x	8		x

of dicotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume;
N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome;
see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix;
1pa, 1 per axil; ~, about; and ∞, many.

Sepals or Tepals						Petals										
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
				x			x									
				x			x									
							x									
							x									
							x									
							x									
			x	x			x									
			R	x		x	R	4,5(0,6,7)	x					R	x	
							x									
				x	x		x									
							x									
							x									
			x	x	R		x									
				x			x									
							x									
				x	R		x									
							x									
			x	x			x									
			x	x			x									
					R?		x									
							x									
							x									
				x			x									
				x			x									
x				x		x		6-18	x		x		x	x	x	
	x			x	x	x		3-12+	x					x	x	x
				x	R	x		6(12)	x	R				R	x	
							x									
				x		x		12-18	x				x	x		
		x				x		see sep	x							
					x	x		4-7						x	x	
		x	x			x		see sep	x							
		x	x			x		see sep	x							
x				x		x	R	4,5(-12,0)	x	x			R	R	x	
	x			x	R		x									
		x		x			x									
			x			x		see sep	x							

Table 1b cont.

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
38. Monimiaceae	x		x	x	x		x	R		x	4-20(0)	x	
39. Calycanthaceae	x		x				x			x	15-30	x	
40. Idiospermaceae	x		x				x			x	30-40	x	
Laurales													
41. Gomortegaceae	x		x				x			x	6-10	x	
42. Lauraceae	x		x	x		x	x			x	6(4,9)	x	x
43. Hernandiaceae	x		x	x	x	x	x			x	3-10	x	x
Aristolochiales													
44. Aristolochiaceae	x	x	x				x		x		3		x
Nymphaeales													
45. Cabombaceae	x		x				x		x		3(4)	x	
46. Nelumbonaceae	x		x				x		x		4	x	
47. Nymphaeaceae	x		x				x		x		4-6	x	
Ranunculales													
48. Ranunculaceae	x	R	x	R	R		x		x		5-8(3)	x	
49. Ceratophyllaceae	x				x		x		x		8-15(?)		x
50. Coriariaceae	x		x	x	x		x		x		5(6)	x	
51. Circaeasteraceae	x		x				x		x		2(3)	x	
52. Nandinaceae	x		x				x		x		∞	x	
53. Paeoniaceae	x		x				x		x		5(3-7)	x	
54. Berberidaceae	x		x				x		x		6(4)	x	
55. Podophyllaceae	x		x				x		x		6	x	
56. Sargentodoxaceae	x			x			x		x		6	x	
57. Menispermaceae	x			x	R		x		x		6(1-12)	x	
58. Lardizabalaceae	x			x	x	x	x		x		3,6	x	
Gunnerales													
59. Gunneraceae	x		x	x	x		x		x		2		x
Geraniales													
60. Connaraceae	x		x	R			x		x		5(4,3)	x	x
61. Geraniaceae	x	x	x				x		x		5(4,8)	x	x
62. Vivianiaceae	x		x				x		x		5(4)	x	x
63. Limnanthaceae	x		x				x		x		5-3	x	
64. Oxalidaceae	x		x				x		x		5	x	x
65. Tropaeolaceae		x	x				x		x		5		x
66. Balsaminaceae		x	x				x		x		3(5)	x	
67. Linaceae	x		x				x		x		5(4)	x	x
68. Erythroxylaceae	x		x				x		x		5	x	x
69. Zygophyllaceae	x	R	x	R			x		x		5(4)	x	R
70. Balanitaceae	x		x				x		x		5	x	
71. Malpighiaceae	x	x	x			R	x		x		5	x	x
72. Stackhousiaceae	x		x				x		x		5		x
Rutales													
73. Meliaceae	x		x	R	R	R	x		x		5(3,4)	x	R
74. Simaroubaceae	x		R	x		x	x		x		3-5(-8)	R	x
75. Rutaceae	x		x	R	R	R	x	R	x		4,5(0,3)	x	x
76. Pittosporaceae	x	R	x			R	x		x		5	x	x
77. Cneoraceae	x		x				x		x		3(4)		x
78. Burseraceae	x		x			x	x		x		3-5		x
79. Anacardiaceae	x		x	x		x	x		x		5(3-7)	x	x

Sepals or Tepals						Petals										
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
		x	x	x		x		see sep	x							
		x				x		see sep	x							
		x				x		see sep	x							
			x	x		x		see sep	x							
		R?	R	x		x	R	see sep	x	x						
x	?		x	x		x		see sep	x							
				x		x	x	0,3	x						x	
				x		x		3(4)	x						x	
				x		x		~20	x				x			
			x	x		x	R	5-~25(0)	x	R			x	x	x	
			x	x	R	x	R	5(0-12)	x				R	R	x	
		x	x				x									
x				x		x		5(6)	x						x	
				x			x									
		x				x		6	x					x		
			R	x	R	x		5(-20)	x				R	R	x	
			x	R		x		6(4)	x					x	R	
				x		x		6,9	x					x	x	
				x		x		6	x						x	
		R	x	R	R	x	R	6(0-9)	x	R				x	x	
			x	x		x	x	6,0	x						x	
					x		x									
x	x			x	R	x		5(4)	x	R					x	
x			R	x		x	R	5(2-4,8,0)	x		x			R	x	R
	x			x		x	R	5(4,0)	x						x	
	x			x	x	x		5-3	x						x	x
x				x		x		5	x	x					x	
				x		x		5(2)	x						x	R
				R	x	x		5	x	x					x	
x				x		x		5(4)	x		x				x	
				x		x		5	x		x				x	
x	R			x		x	R	5(4,0)	x						x	
				x		x		5	x						x	
x	x			x		x		5	x						x	
x				x		x		5	x	x					x	
				x	R	x		5(3-14)	x	R			R	R	x	R
			R	x	x	x	R	3-5(7,8,0)	x	R				R	x	x
				x	R	x	R	4,5(0,3)	x	R	x	x			x	R
x	x			x		x		5	x	x	x				x	
				x		x		3(4)	x						x	
				x	x	x	R	3-5(0)	x	R					x	x
			R	x	R	x	R	5(0,3-7)	x	R				R	x	R

Table 1b cont.

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
Sapindales													
80. Akaniaceae	x		x				x		x		5		x
81. Sapindaceae	x	x	R			x	x		x		5(3,4)	x	R
82. Melianthaceae		x	x			R	x		x		5(4)	x	x
83. Hippocastanaceae		x	x			x	x		x		5(4)	x	x
84. Staphyleaceae	x		x	R		x	x		x		5(-3)	x	x
85. Aceraceae	x			x		x	x		x		5(4)	x	R
86. Sabiaceae	x		x			x	x		x		5(4,6)	x	x
Fabales													
87. Caesalpiniaceae	x	x	x	R		R	x	R	x		5(3,6,0)	x	R
88. Fabaceae		x	x				x		x		5(4)		x
89. Mimosaceae	x		x		R		x	R	x		5(3-6,0)	R	x
Polygalales													
90. Polygalaceae	R	x	x				x		x		5	x	R
91. Krameriaceae		x	x				x		x		5(4)	x	
92. Trigoniaceae		x	x				x		x		5	x	x
93. Vochysiaceae		x	x				x		x		5		x
Papaverales													
94. Papaveraceae	x		x	x	x		x		x		2,3(4)	x	R
95. Fumariaceae		x	x	x		x	x		x		2	x	
96. Tovariaceae	x		x	x	x		x		x		8(7-9)	?	
97. Capparaceae	x	x	x	R	R		x		x		4(-8)	x	x
98. Brassicaceae	x	R	x				x		x		4	x	R
99. Pentadiplandraceae ?	x					x	x		x		5	x	
100. Resedaceae	R	x	x		R		x		x		2-8	x	x
101. Moringaceae		x	x				x		x		5	x	
102. Bretschneideraceae		x	x				x		x		5		x
Batales													
103. Bataceae	x			x	x		x	?	x		2,4,0(?)		?
Cistales													
104. Cistaceae	x		x				x		x		5(3)	x	
105. Cochlospermaceae	x		x				x		x		5	x	
106. Bixaceae	x		x				x		x		5	x	
Caryophyllales													
107. Cactaceae	x		x				x			x	∞,(few)	x	R
108. Aizoaceae	x		x	R			x		x		5-8		x
109. Portulacaceae	x		x		R		x		x		2(5-8)	x	x
110. Basellaceae	x		x				x		x		5(4-8)		x
111. Didiereaceae	x			x			x		x		2	?	
112. Gyrostemonaceae	x			x	x		x		x		2-5		x
113. Phytolaccaceae	x		x	R			x		x		4-10	x	
114. Barbeuiaceae	x		x				x		x		5	x	
115. Achatocarpaceae	x			x			x		x		4,5	x	x
116. Petiveriaceae	x		x	R			x		x		4,5	x	x
117. Agdestidaceae	x		x				x		x		4,5	x	x
118. Nyctaginaceae	x		x	R			x		x		5(3-7)		x
119. Stegnospermataceae	x		x				x		x		5	x	
120. Caryophyllaceae	x		x	R			x		x		5(4-25)	x	x
121. Molluginaceae	x		x				x		x		5	x	R
122. Illecebraceae	x		x				x		x		4,5	x	x

Sepals or Tepals						Petals										
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
x				x		x		5	x						x	
				x	R	x	R	5(0,3,4)	x						x	R
				x		x		5(4)	x						x	
				x		x		5(4)	x						x	
				x	R	x		5(-3)	x						x	R
				x		x	R	5(4,0)	x						x	
				x		x		5(4,6)	x	x	x				x	
x	R			x	R	x	x	5-0	x		x				x	x
				x		x	R	5(1,0)	R	x	x				x	R
R	x			x	R	x		5(3,4,6)	R	x		x			x	R
				x		x		3-5	x	x					x	x
				x		x		5(4)	x	x					x	
x				x		x		5,3	x						x	x
x				x		x	R	1-3(5,0)	x						R	x
				x	x	x	R	4-12(-16,0)	x				x	x	x	
					x	x		4	x	x					x	
			x			x		8(7,9)	x					x		
			R	x		x	R	4(-14,0)	x	x			R		x	
				x		x	R	4(0)	x						x	
x				x		x		5		x					x	
			x	x	x	x	R	2-8(0)	x	R				x	x	x
				x		x		5	x						x	
				x		x		5	x						x	
						x	x	4,0	x						x	
				x	R	x	R	5(3,0)	x						x	R
				x		x		5	x						x	
				x		x		5	x						x	
		x	R	R		x		∞,(8-10)	x	R						
			x	x		x	x	~30-40,0	x	x			x			
			R	R	x	x		4,5(2-16)	x	x			R	R	x	R
			R	x			x									
					x	x		4	x						x	
				x	x		x									
x			x	x			x									
x				x			x									
x				x			x									
				x			x									
				x			x									
			R	x	R		x									
				x		x		5	x						x	
		R	R	x		x	x	5(4-12),0	x				R	R	x	
				x		x	x	0,4,5	x	R					x	
				x		x	x	0,4,5	?						x	

Table 1b cont.

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
123. Amaranthaceae	x		x	R		R	x	R	x		3-5(0,1)	x	x
124. Chenopodiaceae	x			x	x		x	R	x		3-5(0-4)	x	x
Polygonales													
125. Polygonaceae	x		x	x	x	x	x		x		3-6	x	x
Primulales													
126. Plumbaginaceae	x		x				x		x		5		x
127. Primulaceae	x	R	x				x		x		5(4-9)		x
128. Tamaricaceae	x		x	R			x		x		4,5(6)	x	x
129. Frankeniaceae	x		x			R	x		x		4-6(7)		x
130. Myrsinaceae	x		x	R			x		x		5,4(3-6,9)	x	x
131. Theophrastaceae	x		x	x			x		x		5(4)	x	x
Plantaginales													
132. Plantaginaceae	x		x		x	x	x		x		4(3)	x	x
Proteales													
133. Proteaceae	x		x	x		x	x		x		4	x	x
Santalales													
134. Olacaceae	x		x			x	x		x		3-6		x
135. Aptandraceae	x		x	x			x		x		4-8		x
136. Octoknemaceae	x			x			x		x		5	?	?
137. Opiliaceae	x		x	x			x	x	x		4,5,0		x
138. Medusandraceae	x		x				x		x		5	x	x
139. Cardiopteridaceae ?	x		x			x	x		x		5(4)		x
140. Santalaceae	x		x	x	x		x		x		3-6	x	x
141. Loranthaceae	x		x	x			x	R	x		3,4(-6,0)	x	x
142. Misodendraceae	x			x				x					
143. Grubbiaceae ?	x		x				x		x		4	x	
Thymelaeales													
144. Geissolomataceae	x		x				x		x		4		x
145. Gonystylaceae ?	x		x				x		x		5		x
146. Thymelaeaceae	x	R	x	x		x	x		x		4,5(3-6)		x
Euphorbiales													
147. Euphorbiaceae	x			x	x		x	x	x		5,0(2-6)	x	x
148. Simmondsiaceae ?	x			x			x		x		5(4-7)		?
149. Callitrichaceae	x				x			x					
150. Aextoxicaceae	x			x			x		x		5(4-6)	x	
151. Pandaceae	x			x			x		x		5		x
Urticales													
152. Eucommiaceae ?	x			x				x					
153. Barbeyaceae	x			x			x		x		3,4		x
154. Urticaceae	x		R	x	x		x	R	x		4,5(0,2,3)	x	x
155. Theligonaceae	x				x		x		x		2-5		x
156. Cannabaceae	x			x			x		x		5		x
157. Moraceae	x			x	x		x	R	x		4(8-0)	x	x
158. Ulmaceae	x		x		x		x		x		4,5(3-8)	x	x
Malvales													
159. Sterculiaceae	x		x		x		x		x		5(3,4)	R	x
160. Elaeocarpaceae	x		x				x		x		4,5	x	x
161. Tiliaceae	x		x	R	R		x		x		5(3,4)	x	x
162. Sphaerosepalaceae	x		x				x		x		4(6)	x	
163. Malvaceae	x		x	R		R	x		x		5(-3)		x

Sepals or Tepals						Petals										
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
				x	x		x									
				x	x		x									
			x	x			x									
				x		x		5	R	x	x				x	
			R	x		x	R	5(3-9,0)	R	x				R	x	R
				x		x		4,5(6)	x						x	
	X			x		x		4-6(7)	x	R					x	
			R	x	R	x		5,4(3-7)	R	x				R	x	R
				x		x		5(4)		x					x	
				x	R	x		4(3)		x	x				x	R
	x			x			x									
			x	x		x		3-6	x	x	R	x		x	x	
			x	x		x		4-8	x			x		x	x	
				x		x	x	0,5							x	
				x		x	R	4,5(0)	x	x					x	
				x		x		5	x		x				x	
x				x		x		5(4)		x	x				x	
x	x		x	x			x									
			R	x		x	x	4-6(-9),0	x	x		x		R	x	
							x									
	x			x			x									
x				x			x									
x	R			x		x		7-40(sca?)								
x			R	x	R	x	x	4-12,0	x	x			x	x	x	
x	x		R	x	R	x	x	0,5(8-12)	x	R			R	R	x	
x			R	x			x									
							x									
x				x		x		5(4-6)	x		x				x	
				x		x		5	x		x				x	
							x									
	x			x	x		x									
				x	R		x									
				x	x		x									
				x			x									
			R	x			x									
			R	x	R		x									
	x			x	R	x	x	5,0	x						x	
x	x			x		x	x	4,5,0	x	R	x	x			x	
	x			x	R	x	R	5(3,4,0)	x						x	R
x			R	x		x		4(5-8)	x		x			R	x	
	x			x	R	x		5	x		x				x	

Table 1b cont.

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
164. Bombacaceae	x		x				x		x		5		x
Violales													
165. Flacourtiaceae	x		x	x	x	x	x		x		6-3 (2-15)	x	x
166. Lacistemataceae	x		x			x	x	x	x		4-6,0		x
167. Passifloraceae	x		x	x	x		x		x		5(3-8)	x	x
168. Malesherbiaceae	x		x				x		x		5		x
169. Turneraceae	x		x				x		x		5	R	x
170. Achariaceae	x				x		x		x		3-5	x	
171. Caricaceae	x		x	x	x		x		x		5		x
172. Violaceae	x	x	x	R		R	x		x		5	x	R
173. Stachyuraceae ?	x		x			x	x		x		4	x	
174. Scyphostegiaceae ?	x			x			x		x		3		x
175. Peridiscaceae	x		x				x		x		4,5(-7)	x	
176. Hoplestigmataceae ?	x		x				x		x		2-4		x
177. Loasaceae	x		x				x		x		5(4-7)	?	?
178. Cucurbitaceae	x		R	x	x		x		x		5(3-6)	x	x
Rhamnales													
179. Vitaceae	x		x	x		x	x		x		4,5		x
180. Leeaceae	x		x				x		x		5,4		x
181. Rhamnaceae	x		x			x	x		x		5(4)		x
182. Erythropalaceae	x		x				x		x		5		x
183. Aquifoliaceae	x			x		x	x		x		4(5-9)		x
184. Icacinaceae	x		x	R			x	R	x		4,5(0)		x
Celastrales													
185. Ctenolophonaceae	x		x				x		x		5		x
186. Ixonanthaceae	x		x				x		x		5	x	x
187. Irvingiaceae	x		x				x		x		5	x	x
188. Dichapetalaceae	x	x	x			x	x		x		5(4)	x	x
189. Celastraceae	x		x			x	x		x		4,5(3)	x	x
190. Goupiaceae	x		x				x		x		5		x
191. Siphonodontaceae	x		x				x		x		5	x	x
Dilleniales													
192. Dilleniaceae	x		x			R	x		x		5(3-17)	x	
193. Actinidiaceae	x		x	x		x	x		x		5	x	
194. Saurauiaceae	x		x				x		x		5	x	
Rosales													
195. Rosaceae	x		x	R			x		x		5(3-10)	x	x
196. Chrysobalanaceae	x	x	x			R	x		x		5(4)		x
197. Elaeagnaceae	x		x	x		x	x		x		4(2-8)		x
198. Neuradaceae	x		x				x		x		5		x
199. Corynocarpaceae ?	x		x				x		x		5	x	
200. Crossosomataceae ?	x		x				x		x		5(3-6)	x	
Myrtales													
201. Myrtaceae	x		x	R	R	R	x	R	x		4,5(0,3)	x	x
202. Lecythidaceae	x		x				x		x		4-6(2,3)		x
203. Barringtoniaceae	x		x				x		x		4(2,3,5)		
204. Asteranthaceae	x		x				x		x		3,5(10-12)		x
205. Dialypetalanthaceae	x		x				x		x		4	?	x
206. Sonneratiaceae	x		x				x		x		4-8		x
207. Punicaceae	x		x				x		x		5-8		x

Sepals or Tepals						Petals									
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
R	x			x		x	R	5(0)	x						x	
x	?	R	R	x	x	x	R	8-3(0-15)	x				R	x	x	
				x			x									
			R	x	R	x	R	5(0,3-8)	x	x				R	x	R
				x		x		5	x						x	
				x		x		5	x						x	
				x	x	x		3-5		x					x	x
				x		x		5	R	x					x	
x				x		x		5	x	R					x	
				x		x		4	x						x	
				x		x		3		x					x	
			R	x			x									
				x	x	x		11-14		x			x	x		
x	?		R	x		x		5(4-7)	x	x				R	x	
				x	R	x		5(4-6)	R	x	x	x			x	
				x		x		4,5	x	x		x			x	
				x		x		5,4		x		x			x	
	x			x		x	R	5(4,0)	x						x	
				x		x		5	x			x			x	
x			R	x		x	R	4(5-9,0)	x	x	x	x		R	x	
x	R			x		x	R	4,5(3,0)	x	R	x	x			x	R
x				x		x		5	x						x	
				x		x		5	x						x	
				x		x		5	x						x	
x				x		x		5(4)	x	x	x				x	
				x	R	x	R	4,5(3,0)	x	R	x	R			x	R
				x		x		5	x			x			x	
x				x		x		5	x		x				x	
x		R	R	x	R	x		5(-2)	x		x				x	R
x				x		x		5	x						x	
x				x		x		5	x	x					x	
x			R	x	R	x	R	5(0,3-10)	x		x			R	x	R
x				x		x	R	5(0,4)	x		x				x	
	x		R	x	R		x									
	x			x		x		5	x						x	
x				x		x		5	x		x				x	
				x	R	x		5(3-6)	x		x				x	R
x	x			x	R	x	R	4,5(0,6)	x	x					x	
x	x			x	R	x		4-6(8)	x	R				R	x	
x				x	R	x	R	4(5,0)	x						x	
x	x		R	x	x		x									
x				x		x		4	x					x	x	
	x		x	x		x	x	4-8,0	x					x	x	
	x		x	x		x		5-8	x					x	x	

Table 1b cont.

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
208. Rhizophoraceae	x		x			R	x		x		3-8(-14)		x
209. Lythraceae	x		x				x		x		4-6(8-16)		x
210. Crypteroniaceae	x		x			x	x		x		4,5		x
211. Oliniaceae	x		x				x		x		4,5		x
212. Penaeaceae	x						x		x		4		x
213. Melastomataceae	x		x	R			x		x		4,5(3-10)		x
214. Onagraceae	x		x			R	x		x		4(2-6)		x
215. Haloragaceae	x		x		x		x	x	x		2-4,0	x	
216. Hippuridaceae	x		x		R	R		x					
217. Trapaceae	x		x				x		x		4		x
218. Combretaceae	x		x	?	?	?	x		x		4,5(6-8)		x
Theales													
219. Theaceae	x		x	R			x		x		5(4-7)	x	x
220. Bonnetiaceae	x		x				x		x		5	x	
221. Pentaphylacaceae	x		x				x		x		5	x	
222. Pellicieraceae	x		x				x		x		5	x	
223. Medusagynaceae	x		x			x	x		x		5		x
224. Eucryphiaceae	x		x				x		x		4(5)		x
225. Paracryphiaceae	x		x		x	x	x		x		2-4(br.?)	x	
226. Symplocaceae	x		x			x	x		x		5(4)		x
227. Tetrameristaceae	x		x				x		x		4		x
228. Clusiaceae	x		x	x		x	x		x		6-2(-14)	x	x
229. Quiinaceae	x		x			x	x		x		4,5	x	
230. Hypericaceae	x		x				x		x		4,5	x	x
231. Elatinaceae	x		x				x		x		3-5(2-6)	x	x
232. Dipterocarpaceae	x		x				x		x		5		x
233. Humiriaceae	x		x				x		x		5		x
234. Ancistrocladaceae ?	x		x				x		x		5	x	
235. Marcgraviaceae	x		x				x		x		4,5	x	x
236. Caryocaraceae	x		x				x		x		5,6		x
237. Ochnaceae	x		x				x		x		5(3-10)	x	x
238. Strasburgeriaceae	x		x				x		x		8-10	x	
239. Diegodendraceae	x		x				x		x		5(6)	x	
240. Scytopetalaceae	x		x				x		x		3,4		x
241. Sarcolaenaceae	x		x				x		x		3-5	x	
Ericales													
242. Ericaceae	x	R	x	R			x		x		5(3-8)	x	x
243. Tremandraceae	x		x				x		x		5,4(3)	x	R
244. Epacridaceae	x		x		x		x		x		5(4)	x	
245. Clethraceae	x		x				x		x		5		x
246. Empetraceae	x		x	x	x	x	x		x		3(2)	x	
247. Pyrolaceae	x		x				x		x		5(4)		x
248. Monotropaceae	x		x				x		x		2-6	x	
249. Diapensiaceae	x		x				x		x		5	x	x
250. Cyrillaceae	x		x				x		x		5(6)	x	R
251. Lennoaceae	x		x				x		x		5-10	x	x
Ebenales													
252. Ebenaceae	x			x		x	x		x		3-7		x
253. Sapotaceae	x		x	x		x	x		x		4-8(-12)	x	x

Sepals or Tepals						Petals									
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
	x	R	x	x		x	R	3-8(-14,0)	x				R	x	x	
	x	R	R	x		x	R	4,6(8,0)	x					R	x	
	x			x			x									
				x		x		5(4)	x						x	
	x			x			x									
x	R		R	x	R	x		4,5(3-10)	x					R	x	R
	x		R	x	R	x	R	4(0,2-6)	x		x			R	x	R
				x	x	x	x	2-4,0	x						x	x
							x									
	x			x		x		4	x						x	
	x		R	x		x		4,5(6-8)	x					R	x	
x			R	x		x		5(4-8)	x	x				R	x	
x				x		x		5	x						x	
				x		x		5	x	x					x	
x				x		x		5	x						x	
x				x		x		5	x		x				x	
x				x		x		4(5)	x						x	
				(br?)	x		x									
				x		x		5(3-11)		x				R	x	R
x				x		x		4	x						x	
x		R	R	x	x	x	R	6-2(-14,0)	x				R	R	x	x
				x		x		4-8	x					x	x	
x				x		x		4,5	x						x	
x				x	x	x	R	3-5(2-6,0)	x						x	x
x	x			x		x		5	x	x					x	
x				x		x		5	x						x	
x				x		x		5	x	x					x	
x				x		x		4,5	x	x					x	
x				x		x		5,6	x	x					x	
x			R	x	R	x		5(4-12)	x					R	x	
			x			x		5	x						x	
x				x		x		4(5-8)	x					R	x	
				x	x	x		3-16	x	x		x	x	x	x	x
x				x	x	x		5,6	x						x	
x	x		R	x	R	x		5(3-8)	R	x	x	x		R	x	R
	x			x	R	x		4,5(3)	x			x			x	R
				x		x		5(4)	R	x	x	x			x	
x				x		x		5	x	R	x				x	
x					x	x	R	3(2,0)	x							x
				x		x		5(4)	x	R	x				x	
x				x	x	x	R	3-6(0)	x	x	x				x	x
x				x		x		5		x	x				x	
x				x		x		5(6)	x	x	x				x	
			x	x		x		5-8		x	x			x	x	
				x	x	x		3-7		x	x	R			x	x
		R	x	x		x		4-8		x	x			x	x	

Table 1b cont.

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
Styracales													
254. Styracaceae	x		x			x	x		x		4,5(-7)		X
255. Lissocarpaceae	x		x				x		x		4		X
256. Alangiaceae	x		x	R		R	x		x		4-10		x
Rafflesiales													
257. Hydnoraceae	x		x				x		x		3,4(5)		x
258. Rafflesiaceae	x		R	x	x	R	x			x	4-10	R	x
259. Balanophoraceae	x		R	x	x		x	R		x	3,4(0,2-8)	x	x
Araliales													
260. Araliaceae	x		x	x		x	x		x		5(3-10)		x
261. Apiaceae	x	R	x	R	R	R	x		x		5		x
Saxifragales													
262. Crassulaceae	x		x	R			x		x		4,5(3-30)	x	x
263. Saxifragaceae	x	R	x	R			x		x		5(4-7)	x	?
264. Parnassiaceae	x		x				x		x		5		x
265. Eremosynaceae	x		x				x		x		5		x
266. Francoaceae	x		x				x		x		4(5)		x
267. Davidsoniaceae	x		x				x		x		4,5		x
268. Hydrangeaceae	x		x			x	x		x		5(4-10)	x	x
269. Philadelphaceae	x		x				x		x		5,4		x
270. Pterostemonaceae	x		x				x		x		5	?	?
271. Iteaceae	x		x			x	x		x		5	x	
272. Baueraceae	x		x				x		x		6-8(4-10)	x	x
273. Bruniaceae	x		x				x		x		4,5	x	x
274. Vahliaceae	x		x				x		x		5	x	
275. Donatiaceae	x		x				x		x		5-7	x	
276. Tetracarpaeaceae	x		x				x		x		4		x
277. Escalloniaceae	x		x	R		R	x		x		4,5	R	x
278. Grossulariaceae	x		x	x			x		x		5(4)		x
279. Brunelliaceae	x		R	x		R	x		x		4,5(-7)		x
280. Cunoniaceae	x		x	x			x		x		4,5(3-6)	x	x
281. Greyiaceae	x	x	x				x		x		5	x	x
282. Cephalotaceae	x		x				x		x		6	x	
Begoniales													
283. Begoniaceae	x	x	x		x		x		x		2-5	x	R
284. Datiscaceae	x		R	x	R		x		x		3-6(-10)	?	
Droserales													
285. Dioncophyllaceae	x		x				x		x		5	x	x
286. Droseraceae	x		x				x		x		5(4,8)		x
287. Byblidaceae	x		x				x		x		5	x	x
288. Podostemaceae ?	x		x				x		x		2,3,5	x	x
289. Hydrostachyaceae ?	x			x	R			x					
Sarraceniales													
290. Sarraceniaceae	x		x				x		x		5(3-6)	x	
Nepenthales													
291. Nepenthaceae	x			x			x		x		4(3-6)	x	R
Polemoniales													
292. Polemoniaceae	x	R	x				x		x		5(4)		x
293. Hydrophyllaceae	x		x				x		x		5(6-8,10-12)	x	x
294. Boraginaceae	x	R	x	R		R	x		x		5(4-10)	x	x

Sepals or Tepals						Petals										
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
	x		R	x		x		4,5(-7)	R	x				R	x	
x				x		x		4		x					x	
			x	x		x		4-10	x	x		x		x	x	
	x			x			x									
			x	x		x		see sep	R	x						
	x		R	x	R	x	x	see sep	x	x		x				
			R	x	R	x	R	5(0,3-10)	x	R	x	x		R	x	R
				x		x	R	5(0)	x		x	x			x	
		R	R	x	R	x		4,5(3-30)	x	x			R	R	x	R
			R	x		x	R	5(4-7,0)	x	R				R	x	
				x		x		5	x						x	
	x			x		x		5	x						x	
	x			x		x		4(5)	x						x	
				x			x									
			R	x		x		5(4-10)	x	R				R	x	
				x		x		7-4	x					x	x	
	x			x		x		5	x						x	
	x			x		x		5	x			x			x	
			x	x		x		6-8(4-10)	x					x	x	
				x		x		4,5	x	R					x	
	x			x		x		5	x						x	
				x		x		5-10	x					x	x	
				x		x		4	x						x	
x	x			x		x		4,5	x	R	x	x			x	
				x		x	R	5(4,0)	x						x	
	x			x			x									
				x	R	x	R	4,5(3-6,0)	x						x	R
x				x		x		5	x						x	
	x			x			x									
				x	x	x	x	5-2,0	x	R					x	x
			R	x	x		x									
				x		x		5	x						x	
			R	x		x		5(4,8)	x					R	x	
x				x		x		5	x	x	x				x	
				x	x		x									
				x			x									
				x	R	x	R	5(4,6,0)	x						x	
				x	R		x									
				x		x		5(4)		x					x	
			R	x		x		5(6-8,10-12)		x	x			R	x	
			R	x		x		5(4-10)		x	x			R	x	

Table 1b cont.

Order Family	Flower		Sex				Sepals or Tepals						
	actinomorphic	zygomorphic	hermaphroditic	dioecious	monoecious	polygamous	present	absent	sepals	tepals	number	distinct	connate
295. Fouquieriaceae	x		x				x		x		5	x	
Gentianales													
296. Loganiaceae	x	R	x			R	x		x		5,4	x	x
297. Rubiaceae	x	R	x	R	R		x	R	x		4,5(0,3)		x
298. Columelliaceae		x	x				x		x		5(4,6)	x	
299. Gentianaceae	x		x			R	x		x		4,5(2-12)	R	x
300. Menyanthaceae	x		x				x		x		5	x	x
301. Convolvulaceae	x	R	x	R			x		x		5(4)	x	R
302. Cuscutaceae	x		x				x		x		5(4)	x	x
303. Apocynaceae	x		x				x		x		5(4)		x
304. Plocospermataceae	x		x				x		x		5(6)		x
305. Asclepiadaceae	x		x	R			x		x		5		x
Oleales													
306. Oleaceae	x		x	R		R	x	R	x		4(0-15)		x
307. Salvadoraceae	x		x	x			x		x		3,4(2,5)		x
Cornales													
308. Davidiaceae	x		x		x	x		x					
309. Nyssaceae	x		x			x	x		x		5	x	
310. Garryaceae	x			x			x	x	x		0,2-4	x	
311. Cornaceae	x		x	R	R	R	x		x		4,5		
Dipsacales													
312. Caprifoliaceae	x	x	x				x		x		5(4)		x
313. Adoxaceae	x	R	x				x		x		2,3(1-5)		x
314. Valerianaceae	R	x	x	R			x		x		5(2-4)		x
315. Dipsacaceae	R	x	x				x		x		5,4		x
Scrophulariales													
316. Solanaceae	x	R	x				x		x		5(4,6)		x
317. Nolanaceae	x		x				x		x		5		x
318. Scrophulariaceae	R	x	x				x		x		5(4-8)		x
319. Orobanchaceae		x	x				x		x		4,5(2)		x
320. Buddlejaceae ?	x	x	x				x		x		4(5)		x
321. Globulariaceae		x	x				x		x		5		x
322. Lentibulariaceae		x	x				x		x		5,4,2	x	x
323. Acanthaceae		x	x				x		x		4,5(3)		x
324. Bignoniaceae		x	x				x		x		5		x
325. Gesneriaceae		x	x				x		x		5(4,6)	x	x
326. Pedaliaceae		x	x				x		x		5		x
Lamiales													
327. Myoporaceae	R	x	x				x		x		5		x
328. Verbenaceae	x	x	x			x	x		x		4,5(-8)		x
329. Phrymaceae		x	x				x		x		5		x
330. Lamiaceae		x	x			x	x		x		5(4)		x
Campanulales													
331. Campanulaceae	x	x	x	R			x		x		5(3-10)	R	x
332. Goodeniaceae		x	x				x	R	x		5(3,0)	x	x
333. Brunoniaceae	x		x				x		x		5		x
334. Calyceraceae	x	x	x				x		x		5(4,6)		x
335. Stylidiaceae		x	x		x		x		x		5(4-9)	x	x
Asterales													
336. Asteraceae	x	x	x	R	x			x					

Sepals or Tepals						Petals										
imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous	present	absent	number	distinct	connate	imbricate	valvate	pleiomerous	diplomerous	haplomerous	oligomerous
x				x		x		5		x	x				x	
x				x		x		4,5(-16)		x	x	x	R	R	x	
				x	R	x		4,5(3-10)		x	x	x		R	x	R
				x		x		5(6)		x	x				x	
			R	x	R	x		4,5(-12)		x	R			R	x	
				x		x		5		x	R	x			x	
x				x		x		5(4)		x	R				x	
				x		x		5(4)		x	x				x	
x				x		x		5(4)		x	x	R			x	
				x		x		5(6)		x	x				x	
x				x		x		5		x	x	x			x	
		R	R	x		x	R	4(0-15)	R	x	x	x	R	R	x	
x				x	x	x		4(5)	x	x	x				x	
							x									
				x		x	x	5(4-8),0	x		x			R	x	
	x			x	x		x									
				x		x		4,5	x			x			x	
				x		x		5(4)		x	x				x	
				x	x	x		5(4,6)		x					x	
				x	R	x		5(-3)		x	x				x	R
				x		x		5,4		x	x				x	
				x		x		5(4,6)		x		x			x	
				x		x		5		x					x	
			R	x		x	R	5(4-8,0)		x	x			R	x	
				x	R	x		5		x	x				x	
				x		x		4(5)		x	x				x	
				x		x		5		x	x				x	
				x	x	x		5		x	x				x	
				x	R	x		4,5		x	x				x	
				x		x		5(6,7)		x	x	R			x	
				x		x		5(4,6)		x	x				x	
				x		x		5		x	x				x	
				x		x		5		x	x				x	
			R	x		x		4,5(-16)		x	x		R	R	x	
				x		x		5		x	x				x	
				x		x		5(4)		x	x				x	
			R	x	R	x		5(3-10)	R	x		x		R	x	R
				x	R	x		5		x		x			x	
				x		x		5		x		x			x	
				x		x		5(4,6)		x		x			x	
			R	x		x		5(4-9)		x	x			R	x	
				x		x		5(4)		x		x			x	

Table 1c. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; usu, usually; W.I., West Indies;

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
Trochodendrales													
1. Cercidiphyllaceae	8-20	x	x			x							x
2. Tetracentraceae	4			x		x							x
3. Eupteleaceae	~10		x			x							x
4. Trochodendraceae	20-40	x				x							x
Hamamelidales													
5. Platanaceae	3-7			x	x	x							x
6. Myrothamnaceae	4-8		x	x		x	x						x
7. Buxaceae	4,6(-30)	x		x		x							x
8. Hamamelidaceae	4,5(-32)	x	x	x		x							x
9. Daphniphyllaceae	6-14		x	x		x							x
10. Didymelaceae	2				x		x						x
Salicales													
11. Salicaceae	2,3(-60)	R	R	R	x	x	R						x
Balanopales													
12. Balanopaceae	3-6(1-12)	R	x	x	R	x							x
Fagales													
13. Leitneriaceae	3-12	x	x	x		x							x
14. Rhoipteleaceae	6		x			x							x
15. Myricaceae	4-8(2-16)	R	x	x	R	x	R						x
16. Betulaceae	(1)2-6			x	x	x	x						x
17. Ticodendraceae	6-~40	x	x	x		x							x
18. Juglandaceae	3-40(-105)	x	x	x		x							x
19. Fagaceae	(3)4-40	x	x	x		x							x
Casuarinales													
20. Casuarinaceae	1				x	x							x
Piperales													
21. Saururaceae	3-8		x	x		x							x
22. Piperaceae	1-10		x	x	x	x							x
23. Lactoridaceae	6		x			x							x
24. Chloranthaceae	1,3,50-250	x		x	x	x	x						x
Magnoliales													
25. Magnoliaceae	~30-50	x				x							x
26. Winteraceae	12-250+	x	x			x						R	x
27. Annonaceae	-~150(3,6,9)	x	R	R		x	R					R	x
28. Eupomatiaceae	-~50	x				x						x	
29. Degeneriaceae	20-30	x				x						x	
30. Austrobaileyaceae	7-11		x			x						x	
31. Himantandraceae	~40	x				x						x	
32. Schisandraceae	5-~60	x	x	x			x					R	x
33. Illiciaceae	4-50	x	x	x		x							x
34. Canellaceae	7-40	x	x	x			x						x
35. Myristicaceae	2-45	x	x	x	x		x						x
36. Trimeniaceae	6-22	x	x	x		x						S	x
37. Amborellaceae	~18	x				x							x

of dicotyledon families.

C, common; Cub, Cuba; diss, disseminate; fr, frequently; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

nodes	Anthers					Pollen												Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
		x		x				x							x		x		x	
		x		x				x				x					x		x	
		x		x				x							x		x		x	
		x		x				x				x					x	x	x	
	x			x				x			x						x		x	
		x		x				x							x		x		x	
		x		x										x	x			x	x	
	R	x		x				x	x				x	x	x		x	x	x	x
	x	x		x							x						x		x	
		x		x				x									x		x	
		x	x	x		x					x	x			x	R	x	x		
		x		x				x									x		x	
		x		x							x						x			
		x		x							x						x		x	
		x		x										x			x		x	
		?		x										x	x		x		x	
		x		x										x			x		x	
		x		x							x			x			x		x	
		x	x	x				x			x						x	x	x	
		x	x											x	x		x		x	
		x		x			x								x		x	x	x	
		x		x		x	x								x		x	x		
		x		x						x							x		x	
	x			x		x	x										x			
	x			x			x								x			x	x	
	x	x		x						x					x			x	x	R
	x	x		x		x	x								x			x	x	
	x			x			x											x	x	
9	x			x			x											x	x	
9-16	x			x			x								x			x	x	
	x			x			x											x	x	
	x	x		x				x							x			x	x	
	x	x		x				x			x				x			x	x	
	x				x		x								x			x	x	
		x		x	x		x											x	x	
	x	x		x										x			x		x	
		x		x		x											x			

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
38. Monimiaceae	(1) ~150	x	x	x	R	x	R						x
39. Calycanthaceae	5-30	x	x	x		x						x	
40. Idiospermaceae	13-15	x				x						x	
Laurales													
41. Gomortegaceae	8,9(7-11)		x			x						S	x
42. Lauraceae	(2)3-12(-36)	R	x	x	R	x						C	x
43. Hernandiaceae	3-6(7)		x	x		x						S	x
Aristolochiales													
44. Aristolochiaceae	(4-)6-40	x	x	x		x	x						x
Nymphaeales													
45. Cabombaceae	3-18(-40)	x	x	x		x							x
46. Nelumbonaceae	100-120	x				x							x
47. Nymphaeaceae	(15-)50-100	x				x		x	x		R		x
Ranunculales													
48. Ranunculaceae	5-110	x	x	x		x						R	x
49. Ceratophyllaceae	5-27	x	x	x		x							x
50. Coriariaceae	10(12)		x			x							x
51. Circaeasteraceae	2(1,3)				x	x							x
52. Nandinaceae	6			x		x							x
53. Paeoniaceae	45-75	x				x							x
54. Berberidaceae	6(4-15)		R	x		x							x
55. Podophyllaceae	12(18)		x	x		x							x
56. Sargentodoxaceae	6			x		x							x
57. Menispermaceae	6,3(2-24)		x	x	R	x	x						x
58. Lardizabalaceae	6			x		x	x						x
Gunnerales													
59. Gunneraceae	2				x	x							x
Geraniales													
60. Connaraceae	5(4),10(8)		x	x		x	x					S	x
61. Geraniaceae	5(4),10(8)(15)	R	x	x			x					S	x
62. Vivianiaceae	10(8)		x			x							x
63. Limnanthaceae	10,6		x	x		x							x
64. Oxalidaceae	10(15)	R	x				x					S	x
65. Tropaeolaceae	8		x			x							x
66. Balsaminaceae	5			x			x						x
67. Linaceae	5(4),10(8)(15)	R	x	x		R	x					S	x
68. Erythroxylaceae	10		x				x						x
69. Zygophyllaceae	10(8)(15)(3,4)	R	x	x	R	x							x
70. Balanitaceae	10		x			x							x
71. Malpighiaceae	10(15)	R	x			x	x					S	x
72. Stackhousiaceae	5			x		x	x		x	x			x
Rutales													
73. Meliaceae	8,10(3-25)	R	x	R	R	R	x						x
74. Simaroubaceae	3-10(12-18)	R	x	x	x	x						S	x
75. Rutaceae	(2)4-10(50-100)	R	x	x	R	x	R	x	x		R		x
76. Pittosporaceae	5			x		x							x
77. Cneoraceae	3(4)			x	x	x							x
78. Burseraceae	3-10		x	x	x	x	R						x
79. Anacardiaceae	5(3-~15)	R	R	x	R	x	R					S	x

nodes	Anthers					Pollen												Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
	x	x		x		x	2(3)								x		x	x		x
7-17	x			x			2(3?)								x			x		
	x			x			2								x			x		
3	x			x		x												x		
		x		x		x											x	x		R
		x		x		x												x		
	x			x	x	x	x								x			x		
		x		x			x											x		
		x		x				x										x		
		x		x		x	x								x	R		x		
		x		x		x		x						x	x	R	x	x		
	x			x		x									x				x	
		x	x	x							x			x	x	x	x		x	
		x		x				x							x		x		x	
	x			x				x										x		
		x		x							x	x			x			x		x
	x	x		x				x							x			x		
		x		x				x							x			x	x	
	x			x								x					x	x		
		x		x	x	x		R			x				x		x			
		x		x	x							x			x			x		
		x		x				x							x		x			
4,5			x	x				x			x	x						x	x	x
		R	x	x		x		x			x					x		x		x
			x	x										x		x		x		x
			x	x				x			x				x			x	x	x
5			x	x				x	x		x	x			x	R		x	x	
		x		x							x							x		
		x			x			x							x			x	x	
5,10		x		x		R		x					x			x		x	x	x
			x	x							x					x		x		x
		R	x	x				x			x	x			x	R		x	x	x
			x	x							x		x					x		x
5		x	x	x							x		x	x	x			x		x
		x		x							x				x	x		x		x
		x	x	x							x			x	x	x		x		x
5			x	x				x			x	x			x			x		x
		x	x	x							x				x	x		x		x
		x	x	x					x		x				x	x		x	x	R
			x	x							x					x		x		x
			x	x							x	R			x			x		x
		R	x	x					x		x		x	x	x			x		x

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
Sapindales													
80. Akaniaceae	8(9)		x			x							x
81. Sapindaceae	8(4,5,10,12-30)	R	x	R		x							x
82. Melianthaceae	4,5			x		x	x						x
83. Hippocastanaceae	(5)-8		x	R		x							x
84. Staphyleaceae	5			x		x							x
85. Aceraceae	8(4-10)		x	R		x							x
86. Sabiaceae	5(4-6)			x		x		x	x		S	S	x
Fabales													
87. Caesalpiniaceae	10(1-60)	R	x	R	R	x	x					S	x
88. Fabaceae	10(5,9)		x	R		R	x						x
89. Mimosaceae	4-500	x	x	x		R	x					R	x
Polygalales													
90. Polygalaceae	8(3,4,5,7,10)		x	R	R	R	x		x		x		?
91. Krameriaceae	4(3)			x	R	x		x	x		S		x
92. Trigoniaceae	3-12		x	x	x		x					x	
93. Vochysiaceae	1				x	x						x	
Papaverales													
94. Papaveraceae	4-~85	x	x	x		x							x
95. Fumariaceae	4,6		x	x		x	x						x
96. Tovariaceae	8(7,9)		x			x							x
97. Capparaceae	1-100+	x	x	x	x	x							x
98. Brassicaceae	6(4-16)	R	x	x		x	x						x
99. Pentadiplandraceae ?	9-13	x	x			x							x
100. Resedaceae	3-45	x	x	x	x	x							x
101. Moringaceae	5			x		x						x	
102. Bretschneideraceae	8		x			x							x
Batales													
103. Bataceae	4(2-5)			x	R	x							x
Cistales													
104. Cistaceae	~25-100(3-6)	x		R	R	x							x
105. Cochlospermaceae	~80	x				x							x
106. Bixaceae	~200	x				x	x						x
Caryophyllales													
107. Cactaceae	~30-700	x				x		x	x		S		x
108. Aizoaceae	~120,4,5,8,10,(1)	x	x	x	R	x	x					?	x
109. Portulacaceae	4,5(1~50)	R	R	x	R	x	R	x	x		R		x
110. Basellaceae	5			x		x	x	x	x	S			x
111. Didiereaceae	8-10		x				x						x
112. Gyrostemonaceae	6~100	x	x	x		x							x
113. Phytolaccaceae	5-30	x	x	x		x	x						x
114. Barbeuiaceae	~50-60	x				x							x
115. Achatocarpaceae	10-20	x	x				x						x
116. Petiveriaceae	4-25	x	x	x		x	x						x
117. Agdestidaceae	15-20	x					?						x
118. Nyctaginaceae	5(1-30)	R	R	x	R	x	x	x	x	R			x
119. Stegnospermataceae	10		x				x						x
120. Caryophyllaceae	10(3-13)		x	R	R	x	R						x
121. Molluginaceae	3-10(many)	R	x	x		x	x						x
122. Illecebraceae	usu 3-5			x	x	x	x						x

nodes	Anthers					Pollen													Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
			x	x				x										x	x	
			x	x							x			x	x		R	x		x
			x	x							x		x			x		x		x
			x	x							x				x			x		x
			x	x					x		x				x			x	R	x
			x	x				x			x	x			x		R	x	R	x
3	x		x	x							x	R			x			x		x
		x	x	x				x			x	x			x			x	x	x
		x	x	x							x	x		x	x	x	R	x		x
			x	x							x			R	x			x		x
		x		x							x				x	R		x	x	R
		x		x					x		x							x	x	
S -4			x	x							x			x				x		
1-4		x	R	x							x		x		x			x	x	
		x		x		x		x	x				x	x	x	x	x	x	x	
		x		x				x	x			x	x	x	x			x		
		x		x										x	x			x	x	x
			x	x							x	R			x	R		x		
			x	x				x							R	x		x		x
		x		x				x	x				x					x		x
		x	x	x				x				R			x			x		x
5			x	x							x				x	x		x		x
			x	x				x										x	x	
			x	x					x			x			x		x			
		x		x							x				x			x		x
		x		x							x				x	x		x		x
		x		x							x				x	x		x		x
		x	x	x				x					x			x		x		x
		x	x	x					x			x	x					x		x
				x				x					x		R	x		x		
		R	x	x									x	x		x		x	x	x
			x	x				x								x		x		x
		x		x							x						x	x		
			x	x				x	x								x	x	x	x
		x		x				x						x			x			
		x		x				x					x	x			x			
			x	x				x									x			x
			x	x				x					x	x	R	x	x	x		
			x	x				x									x	x		
			x	x				x						x		x	x	x		x
			x	x				x								x	x	x	x	x
			x	x				x						x		x	x			

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
123. Amaranthaceae	5(1-4)			x	R	x	x	x	x	S		oft	x
124. Chenopodiaceae	3-5(1,2)			x	x	x	x	x	x	S		R	x
Polygonales													
125. Polygonaceae	6-9(1-5,12-50)	R	x	x	R	x	x	x	x	S			x
Primulales													
126. Plumbaginaceae	5			x		x	x	x	x		S		x
127. Primulaceae	5(3-9)		R	x	R	x	x	x	x		S	R	x
128. Tamaricaceae	4-10(-~75)	R	x	x		x	x						x
129. Frankeniaceae	4-6(3-24)	R	R	x	R	x	x						x
130. Myrsinaceae	5,4(3,6)			x	R	x	x		x		x		x
131. Theophrastaceae	5(4)			x		x	x		x		x	x	
Plantaginales													
132. Plantaginaceae	4(1-3)			x	R	x		x	x		S		x
Proteales													
133. Proteaceae	4			x		x	R		x	x		R	x
Santalales													
134. Olacaceae	3-20	x	x	x		x		x	x		S	S	x
135. Aptandraceae	4,5			x			x						x
136. Octoknemaceae	5			x		x							x
137. Opiliaceae	4,5			x		x		x	x		S		x
138. Medusandraceae	5			x		x						x	
139. Cardiopteridaceae ?	5(4)			x		x			x		x		x
140. Santalaceae	3-6		x	x		x			x	x			x
141. Loranthaceae	3-6		x	x		x		x	x		S		x
142. Misodendraceae	2,3(1,4)			x	x	x		x	x		S		x
143. Grubbiaceae ?	8		x			x							x
Thymelaeales													
144. Geissolomataceae	8		x			x			x	x			x
145. Gonystylaceae ?	8-80	x	x			x	R		x	x			x
146. Thymelaeaceae	4-10(1,2)		x	x	R	x			x	x			x
Euphorbiales													
147. Euphorbiaceae	5,10(1-300?)	R	x	x	R	x	x						x
148. Simmondsiaceae ?	(8)10-12		x			x							x
149. Callitrichaceae	1				x	x							x
150. Aextoxicaceae	5			x		x							x
151. Pandaceae	10(5-15?)	R	x	R		x							x
Urticales													
152. Eucommiaceae ?	10(4-12)	R	x	R		x							x
153. Barbeyaceae	6-9(10,12)	R	x			x							x
154. Urticaceae	4,5(1-3)			x	R	x							x
155. Theligonaceae	7-12(2-30)	R	x	R	R	x							x
156. Cannabaceae	5			x		x							x
157. Moraceae	4(1,2)			x	R	x							x
158. Ulmaceae	4-8(10-16)	R	x	x		x		x	x	S			x
Malvales													
159. Sterculiaceae	5,10(4-~45)	R	x	x		R	x					oft	x
160. Elaeocarpaceae	~25-80	x				x							x
161. Tiliaceae	5-~85	x	x	x		x	x						x
162. Sphaerosepalaceae	25-160	x				x	x						x
163. Malvaceae	-~60(5,10)	x	R	R			x						x

nodes	Anthers					Pollen												Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
5			x	x										x	R	x	x	x	x	x
			x	x										x		x	x		x	x
			x	x				x	x		x	x	x		R	x	x	x		x
			x	x				x	x				x		R	x		x	x	
5			x	x				x			x	x			x			x		
			x	x				x							x		x	x		x
			x	x				x					x		x	x	x			
		R	x	x					x			x			x			x		
5(4)		x	x	x							x				x			x		
			x	x									x	x	x	x	x			
1,3	x	x	x	x	R						x			x	x			x	x	R
		x		x				x				x		x	x	x		x		x
				x										x				x		x
		x		x								x						x	x	x
		x		x							x	x			x			x		x
5			x	x								x							x	
			x	x							x	x						x		
		x	x	x				x			x	x		x	x	x		x		x
			x	x				x				x			x			x	x	x
		x		x							x			x				x		x
		x	x	x							x							x		x
			x	x							x							x		x
		x		x												x	x	x		x
	x	x	x	x										x		x		x	x	x
	x	x	x	x	R	x		x			x		x	x	x	x	x	x	x	x
		x		x				x							x		x		x	
		x		x		x						x			x	x	x		x	
		?		x				x										x		x
				x				x									x	x		x
		x		x								x			x		x		x	
		x		x								x					x		x	
			x	x										x	x		x		x	
			x	x				x						x		x	x		x	
		x		x										x	x		x		x	
			x	x										x	x		x	R	x	
		x	x	x				x						x	x	x	x		x	
5			x	x				x			x			x	x		x	x		
		x	x	x							x				x			x		x
			x	x					x		x		x		x			x		
			x	x								x						x	R	x
			x	x							x									

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
164. Bombacaceae	5-~100	x	x	x		x	x					S	x
Violales													
165. Flacourtiaceae	-100+(1)	x	R	R	R	x	x					S	x
166. Lacistemataceae	1				x	x							x
167. Passifloraceae	5(3-20)	R	R	x	R		x					S	x
168. Malesherbiaceae	5			x		x							x
169. Turneraceae	5			x		x			x	x			x
170. Achariaceae	3-5			x	x				x		x	x	
171. Caricaceae	(5)10		x	R		x	x		x		x		x
172. Violaceae	(3)5			x	R	x	x						x
173. Stachyuraceae ?	8		x			x							x
174. Scyphostegiaceae ?	3			x			x						x
175. Peridiscaceae	~16-20	x					x						x
176. Hoplestigmataceae ?	20-35	x				x			x		x		x
177. Loasaceae	(2,5,10)-~300	x	R	R	R	x	x	x	x		S	S	x
178. Cucurbitaceae	3(1-5)			x	R	R	x		x		x	R	x
Rhamnales													
179. Vitaceae	4,5			x		x							x
180. Leeaceae	4,5			x			x		x		x		x
181. Rhamnaceae	5(4)			x		x							x
182. Erythropalaceae	5			x		x							x
183. Aquifoliaceae	4(5-22)	R	R	x		x		x	x		S		x
184. Icacinaceae	4,5(3)			x	R	x		x	x		S		x
Celastrales													
185. Ctenolophonaceae	10		x			x							x
186. Ixonanthaceae	5,10,15,20	x	x	x		x							x
187. Irvingiaceae	10		x			x							x
188. Dichapetalaceae	5(4)			x		x		x	x		S	S	x
189. Celastraceae	4,5(2,3)			x	R	x	R						x
190. Goupiaceae	5			x		x							x
191. Siphonodontaceae	5			x		x	x					S	x
Dilleniales													
192. Dilleniaceae	7-10(-~160)	x	R			x	x					oft	x
193. Actinidiaceae	(10) -~50	x	R			x							x
194. Saurauiaceae	-~150	x				x			x		x		x
Rosales													
195. Rosaceae	(1-5)10 -~400	x	x	R	R	x	R						x
196. Chrysobalanaceae	2-100(-300)	x	x	R	R	x	x					S	x
197. Elaeagnaceae	(3-5)4,8		x	x	R	x							x
198. Neuradaceae	10		x			x							x
199. Corynocarpaceae ?	5			x		x			x		x	x	
200. Crossosomataceae ?	(7-)15-50	x	R			x							x
Myrtales													
201. Myrtaceae	-~400	x	R	R		x	x					R	x
202. Lecythidaceae	~60-300	x					x					oft	x
203. Barringtoniaceae	~100-300	x				R	x						x
204. Asteranthaceae	~10-200	x	x			x	x					x	
205. Dialypetalanthaceae	18(16-25)	x	x				x						x
206. Sonneratiaceae	12-~175	x				x							x

nodes	Anthers					Pollen													Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
			x	x				x			x			x	x			x		
		x	x	x							x				x		x	x		x
	x	x		x							x						x	x		x
5			x	x							x				x			x		x
			x	x							x							x		
			x	x							x				x			x		
3-5			x	x							x							x		
	x			x							x				x			x		
	x	x		x							x				x			x		
			x	x					x		x				x	x		x		
	x				x			x									x	x		x
			?	x								x					x	x		x
			x	x				x										x		
5		x	x	x							x				x	x		x	x	x
				x	x			x			x			x	x			x	x	x
			x	x							x				x	x		x		x
			x	x							x				R	x		x	R	x
		x	x	x							x				x			x	R	x
				x				x							x	x		x		x
		sub		x								x			x			x	x	
		x		x		x		x			x	x		x	x			x	x	R
			x	x							x	x						x		x
				x							x				x			x		x
		sub		x							x				x			x		x
				x							x							x		x
				x							x				x	x		x		x
				x								x			x	x		x		x
5		x		x										x	x	x		x		x
		x	x	x				x			x				x		x	x		
			x	x							x				x		x	x		
			x	x							x				x		x	x		
			x	x							x			R			x	x	x	x
			x					x			x							x		x
		sub	x	x					x		x				x			x	R	x
			x	x				x			x					x	x	x	x	x
5			x	x							x							x		x
		x		x							x				x			x		x
		R	x	x							x				x			x		x
		x	x	x				x			x	x				x		x		x
		x		x							x	x				x	x	x		x
		x		x				x			x					x		x		x
	x			x							x							x		x
			x	x							x			x	x		x	x		

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
207. Punicaceae	~75-125	x				x							x
208. Rhizophoraceae	8(-40)	R	x			x	R	x	x	R	R	R	x
209. Lythraceae	4-12(1-~200)	x	x	x	R				x	x			x
210. Crypteroniaceae	4,5			x		x			x	x			x
211. Oliniaceae	4,5			x		x			x	x			x
212. Penaeaceae	4			x		x			x	x			x
213. Melastomataceae	8,10(3-96)	R	x	R		x			x	x		R	x
214. Onagraceae	4-8(1-12)	R	x	x	R	x		x	x	S		R	x
215. Haloragaceae	2-8		x	x	x	x							x
216. Hippuridaceae	1				x	x							x
217. Trapaceae	4			x		x							x
218. Combretaceae	4-10(-20)	R	x	x		x		x	x	S			x
Thealeas													
219. Theaceae	(5,10,15)-~85	x	R	R		x	x	x	x		S		x
220. Bonnetiaceae	~100	x				x	x						x
221. Pentaphylacaceae	5			x		x		x	x		S		x
222. Pellicieraceae	5			x		x							x
223. Medusagynaceae	~100	x				x							x
224. Eucryphiaceae	~200	x				x							x
225. Paracryphiaceae	8-10(-16)	R	x			x							x
226. Symplocaceae	4-~100	x	x	x		x	x		x		x		x
227. Tetrameristaceae	4			x		x							x
228. Clusiaceae	(8)-~1000	x	R			x	x					oft	x
229. Quiinaceae	15-200+	x				x	x	x	x		S		x
230. Hypericaceae	(5,10)~50-200	x	R	R		x							x
231. Elatinaceae	3-10		x	x	x	x							x
232. Dipterocarpaceae	5,10,15-~100	x	x	x		x	x	x	x		S		x
233. Humiriaceae	10,20,30,50-180	x	x				x					S	x
234. Ancistrocladaceae ?	10(5,15)	R	x	R			x						x
235. Marcgraviaceae	3-~40	x	x	x	x	x	x	x	x		S		x
236. Caryocaraceae	~50-750	x				x	x					S	x
237. Ochnaceae	5,10-~80	x	x	x		x	x					S	x
238. Strasburgeriaceae	10		x			x							x
239. Diegodendraceae	-~434	x				x							x
240. Scytopetalaceae	(10)~80	x	R			x	x						x
241. Sarcolaenaceae	(5-10)-~100	x	R	R		x	x					x	
Ericales													
242. Ericaceae	10(6-20)	R	x	R		x	R	x	x		R		x
243. Tremandraceae	8,10(6)		x			x							x
244. Epacridaceae	5,4(2)			x	R	x		x	x		S		x
245. Clethraceae	10(12)		x			x							x
246. Empetraceae	2-4			x	x	x							x
247. Pyrolaceae	10(8)		x			x							x
248. Monotropaceae	6-12		x	x		x	x						x
249. Diapensiaceae	5			x		x	x	x	x		S	S	x
250. Cyrillaceae	5,10		x	x		x		x	x		R		x
251. Lennoaceae	5-10		x	x		x			x		x	S	x
Ebenales													
252. Ebenaceae	2-50(-120?)	x	x	x	x	x	x	x	x		S		x

nodes	Anthers					Pollen													Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
			x	x							x				x			x		
		x	x	x							x	x			x			x	R	x
		R	x	x							x			x	x			x		x
	x			x				x			x						x	x	x	
	x			x							x							x	x	
		x		x							x							x	x	
		x		x							x					x		x	x	R
			x	x				x			x				x			x		x
		x		x				x	x					x	x	x	x			
		x		x							x					x	x			
			x	x				x							x			x		x
			x	x							x				x	x		x		x
		x	x	x								x			x			x		
			x	x							x				x			x		
		x		x							x	x						x		x
		x		x							x							x		
		x		x										x			x	x		
			x	x				x							x		x	x		
		x		x							x						x	x		
		x		x							x				x			x		
				x							x							x		
	x	x		x							x				x			x		
			x	x							x							x		
			x	x							x				x			x		
				x							x				x	x		x		x
		x	x	x				x				x			x		x	x		
			x	x							x							x		x
		x		x				x			x	x			x			x		
			x	x					x		x						x	x		
		x		x					x		x				x	x		x		
			x	x							x							x		x
		x		x													x	x		
		x		x				x				x			x			x	x	x
		x	x	x							x						x	x		x
		R	x	x							x				x	x		x		x
		x		x							x				x			x	x	x
			x	x							x				x	x		x	R	x
			x	x							x				x			x	x	
			x	x							x				x		x	x	x	
			x	x							x				x			x	x	x
				x				x			x				x			x	x	x
5		x		x							x					x		x	x	
			x	x							x				x			x		x
2				x							x				x			x	x	
	x	x		x							x				x			x		

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
253. Sapotaceae	4-24(-40)	x	x	x		x	R		x		x	oft	x
Styracales													
254. Styracaceae	4-10(-14)	R	x	x		x	x	x	x		S		x
255. Lissocarpaceae	8		x				?		x		x		x
256. Alangiaceae	4-10(-32)	R	x	x		x	x	x	x		S		x
Rafflesiales													
257. Hydnoraceae	3,4(5)			x	x		x		x	x			x
258. Rafflesiaceae	8-~50	x	x				x						x
259. Balanophoraceae	1-10		x	x	x	x	x						x
Araliales													
260. Araliaceae	5(3-~100)	R	R	x	R	x							x
261. Apiaceae	5			x		x							x
Saxifragales													
262. Crassulaceae	4-10(-60)	R	x	x		x	R	x	x		S		x
263. Saxifragaceae	5-10(3)		x	x	R	x							x
264. Parnassiaceae	5			x		x						x	
265. Eremosynaceae	5			x		x							x
266. Francoaceae	4,8(5)		x	x		x							x
267. Davidsoniaceae	8,10		x			x							x
268. Hydrangeaceae	8,10,15,30	x	x			x	R						x
269. Philadelphaceae	4-200	x	x	x		x	x						x
270. Pterostemonaceae	5			x		x						x	
271. Iteaceae	5			x		x							x
272. Baueraceae	4-10(-~40)	R	x	x		x							x
273. Bruniaceae	4,5			x		x	R	x	x		R		x
274. Vahliaceae	5			x		x							x
275. Donatiaceae	2,3				x	x							x
276. Tetracarpaeaceae	8		x			x							x
277. Escalloniaceae	4,5(-9)		R	x		x						S	x
278. Grossulariaceae	5(4)			x		x			x	x			x
279. Brunelliaceae	8-10(-18)	R	x			x							x
280. Cunoniaceae	8-10(4-~50)	R	x	R		x							x
281. Greyiaceae	10		x			x						x	
282. Cephalotaceae	12		x			x							x
Begoniales													
283. Begoniaceae	(4)-~100	x	x	R		x	x						x
284. Datiscaceae	4-25	x	x	x		x							x
Droserales													
285. Dioncophyllaceae	10(-30)	R	x			x							x
286. Droseraceae	4-20	x	x	x		x	R						x
287. Byblidaceae	5			x		x	?	x	x		S		x
288. Podostemaceae ?	1-40	x	x	x	x	x	x						x
289. Hydrostachyaceae ?	1				x	x							x
Sarracenialas													
290. Sarraceniaceae	12-~80	x	x			x							x
Nepenthales													
291. Nepenthaceae	(4-6)8-24	x	x	R		x	x						x
Polemoniales													
292. Polemoniaceae	5			x		x			x		x		x
293. Hydrophyllaceae	5(4,6-8,10-12)		R	x		x			x		x		x

nodes	Anthers					Pollen													Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
		x	x	x					x		x				x	x		x	x	R
		x		x								x			x			x		
		x		x										x				x		
	x	x		x							x			x	x			x		x
					x		x								x			x		
		?		x		x		x						x	x			x	x	x
				x	x			x						x	x	x		x		
			x	x				x			x		x		R	x		x		x
		x	x	x							x					x		x		x
		?		x							x				x			x		
		x		x								x			x	x	x	x		x
5			x	x							x							x		
			x	x							x	R						x		
		?		x							x							x		x
			x	x								x						x		x
		x	x	x							x							x	x	
		?		x							x	x						x		
5			x	x							x				x			x	x	
			x	x										x	x			x		x
				x										x	x			x		x
			x	x							x							x	x	R
			x	x							x							x		x
				x							x							x		x
	x	x		x				x							x		x	x		
4,5			x	x							x				x			x		x
			x	x										x	x			x		
			x	x							x						x			x
			x	x				x			x				x			x	R	x
10		x		x							x							x		x
				x							x							x		x
	x	x	x								x				x		x	x	x	
		x	x								x						x		x	
		x		x								x						x		
		x	x	x				x						x		x				x
		x		x				x	x			x	x					x		
		x	x	x		x		x				x			x		x	x		
			x	x		x									x		x			
			x	x								x			x			x		
	?	?		x													x	x	x	
			x	x								x		x	x			x		x
			x	x				x				x	x					x	x	x

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
294. Boraginaceae	5(4-10)		R	x		x			x		x	R	x
295. Fouquieriaceae	10-15(-23)	x	x			x	x						x
Gentianales													
296. Loganiaceae	4,5(-16)(1)	R	R	x	R	x	x		x		x		x
297. Rubiaceae	4,5(2-12)		R	x	R	x	R		x		x		x
298. Columelliaceae	2(3)				x	x			x		x		x
299. Gentianaceae	4,5-12(1)		R	x	R	x			x		x	R	x
300. Menyanthaceae	5			x		x			x		x		x
301. Convolvulaceae	5(4)			x		x			x		x		x
302. Cuscutaceae	5(4)			x		x			x		x		x
303. Apocynaceae	5(4)			x		x	R		x		x		x
304. Plocospermataceae	5(6)			x		x			x		x		x
305. Asclepiadaceae	5			x		R	x		x		x		x
Oleales													
306. Oleaceae	2(4)			R	x	x		x	x		S		x
307. Salvadoraceae	4(5)			x		x	x	x	x		S		x
Cornales													
308. Davidiaceae	5,6(1-12)		R	x	R	x							x
309. Nyssaceae	10(5-16)	R	x	R		x							x
310. Garryaceae	4			x		x							x
311. Cornaceae	4,5			x		x							x
Dipsacales													
312. Caprifoliaceae	5(4)			x		x			x		x		x
313. Adoxaceae	5(4,6)			x			x		x		x		x
314. Valerianaceae	4-1			x	x	x			x		x		x
315. Dipsacaceae	4(2,3)			x	R	x	x		x		x		x
Scrophulariales													
316. Solanaceae	5(2,4,6)			x	R	x			x		x	R	x
317. Nolanaceae	5			x		x			x		x		x
318. Scrophulariaceae	4,2(3-8)		R	x	x	x			x		x	S	x
319. Orobanchaceae	4			x		x			x		x	S	x
320. Buddlejaceae ?	4(5?)			x		x			x		x	R	x
321. Globulariaceae	4(2)			x	R	x			x		x		x
322. Lentibulariaceae	2				x	x			x		x	S	x
323. Acanthaceae	4,2(5)			x	x	x	x		x		x	fr	x
324. Bignoniaceae	4,2			x	x	x			x		x	x	
325. Gesneriaceae	4,2(5)			x	x	x	R		x		x	S	x
326. Pedaliaceae	4,2			x	x	x			x		x	x	
Lamiales													
327. Myoporaceae	4(5)			x	R	x			x		x	S	x
328. Verbenaceae	4(2-16)	R	R	x	R	x			x		x	R	x
329. Phrymaceae	4			x		x			x		x		x
330. Lamiaceae	4,2			x	x	x	R		x		x	S	x
Campanulales													
331. Campanulaceae	5(3-10)		R	x	R	x	x	x	x		S		x
332. Goodeniaceae	5			x		x		x	x		R		x
333. Brunoniaceae	5			x		x			x		x		x
334. Calyceraceae	5(4,6)			x		x	x		x		x		x
335. Stylidiaceae	2				x		x						x

nodes	Anthers					Pollen													Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
		x	x	x	R			x			x	R			R	x		x	x	x
			x	x							x				x			x		
		R	x	x	R			x	x		x			x	x	x		x	x	x
		x	x	x	R	R		x			x			x	x	x	R	x		x
				x							x							x	x	
		x	x	x	R				x		x		x	R	x	x		x	R	x
			x	x							x		x			x		x		x
		x		x				x			x		x	x	x			x		x
		?		x				x	x				x		R	x		x		
		x	x	x	R						x			x		x		x	R	x
			x	x							x					x		x		x
		x		x	x									x		x		x	x	
		x	x	x				x	x			x			x		x	x	x	
				x					x			x	x					x	x	x
		x		x								x			x		x	x	x	
			x	x							x				x			x		x
		x		x							x				x		x		x	x
		x	x	x							x				x			x		x
		x	x	x							x	x				x		x	x	x
			x	x								x				x		x	x	
			x	x								x			x	x		x		
			x	x				x	x		x			x	x	x		x		
1		x	x	x		x		x			x	x	x		x	R		x		x
				x							x				x			x		x
1		?	x	x				x			x	x			x	R		x		x
1				x								x			x			x		
1(?)				x					x		x	R			x			x	x	x
			x	x							x				x			x	x	x
2		x	x	x					x		x	x			x	x		x	x	
1-3		x	x	x				x				x		x	x	x		x		x
1,3				x		x		x	x			x	x		x			x	R	x
1,3				R	x				x		x		x	x				x	R	x
1,2				x		x		x				x			x	x		x		x
1-3				x				x			x	x	x		x			x		
1,3			x	x				x			x	R	x		x	R		x	x	x
				x				x										x		
1,2				x				x				R			x	x		x		x
		?	?	x	x			x			x	x			x	x		x		x
		x		x	x				x		x				x			x		
		x			x						x				x			x		
				x	x						x				x			x	x	
				x				x							x	x		x	x	x

Table 1c cont.

Order Family	Stamens											Stami-	
	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth	episepalous	epipetalous	present	absent
Asterales													
336. Asteraceae	5(4)			x		x	R		x		x		x

nodes	Anthers					Pollen												Fl. disk	
number	adnate	basifixed	dorsifixed	distinct	connate	inaperturate	1(-3)-sulcate	colpate	rup(or)ate	ulcerate	colporate	colporoidate	rug(or)ate	poly-(2-4)porate	2 celled	3 celled	diss. by wind	diss. by animal	absent	present
		x	R	R	x			x			x	x	x	x		x	R	x	R	x

Table 1d. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; Rsu, rarely sub; S, sometimes; sca, scales; stds, stamindes; usu, usually; W.I., West Indies;

Order Family	Pistils									
		simple				compound				
	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil	pleiomerous	diplomerous	haplomerous	oligomerous
Trochodendrales										
1. Cercidiphyllaceae	4-6			x		1				
2. Tetracentraceae	1					4			x	
3. Eupteleaceae	6-18	x	x	x		1				
4. Trochodendraceae	1					6-11(4)		x	x	
Hamamelidales										
5. Platanaceae	~5-9		x	x		1				
6. Myrothamnaceae	1					3(4)			R	x
7. Buxaceae	1					3(2,4)			R	x
8. Hamamelidaceae	1					2				x
9. Daphniphyllaceae	1					2				x
10. Didymelaceae	1				x	1				
Salicales										
11. Salicaceae	1					2(-4)			R	x
Balanopales										
12. Balanopaceae	1					3(2)				x
Fagales										
13. Leitneriaceae	1				x	1				
14. Rhoipteleaceae	1					2				x
15. Myricaceae	1					2				x
16. Betulaceae	1					2				x
17. Ticodendraceae	1					2				x
18. Juglandaceae	1					2(cas-6)			R	x
19. Fagaceae	1					3(2,6)			R	x
Casuarinales										
20. Casuarinaceae	1					2				x
Piperales										
21. Saururaceae	3,4(1)			x	x	1,3,4				
22. Piperaceae	1				x	1-5			x	x
23. Lactoridaceae	3(1)				x	1,3				
24. Chloranthaceae	1				x	1,3				x
Magnoliales										
25. Magnoliaceae	~12-60-1	x	x	x	x	1(2-8)				
26. Winteraceae	1-24	x	x	x	x	1(sev)				
27. Annonaceae	~25-1	x	x	x	x	1(sev)				R
28. Eupomatiaceae	15-25	x				1				
29. Degeneriaceae	1(2)				x	1				
30. Austrobaileyaceae	6-14	x	x	x		1				
31. Himantandraceae	7-10(~25)	x	x	x		1				
32. Schisandraceae	20-30(12-120)	x	x			1				
33. Illiciaceae	5-15	x	x	x		1				
34. Canellaceae	1					2-6			x	x
35. Myristicaceae	1				x	1				
36. Trimeniaceae	1(2)				x	1				
37. Amborellaceae	5,6			x		1				
38. Monimiaceae	100-(-1)	x	x	x	x	1				

of dicotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
x			1						x				x	x	
x			4	x									x	x	
x			1						x		1-3			x	
x			(4)6-11	x									x	x	
x			1						x		1(2)			x	
x			3(4)	x									x	x	
x			3(2,4)	x							1,2			x	
R	x	x	2(1)	x	R						1-3	x	x	x	
x			1,2(4)	x	x		sub				(1)2			x	
x			1						x		1			x	
x			1		x	x						x	x	R	x
x			3(2)			x					2				x
x			1						x		1			x	x
x			2	x							1			x	
x			1			x					1				x
		x	2	x							2,1				x
		x	4	x			x				1				x
		x	1(2)			x					1				x
		x	2	x							2			x	x
x			2	x							2(-4)			x	
x			1,3,4	x	x						1-3	x		x	
x			1			x					1			x	x
x			1	x								x		x	
		x	1				x				1			x	
x			1(2-8)	x							2,3	x		x	
x			1	x							1-3	x	x	x	
x			1	x	x						(1-3)	x	x	x	
		x	1						x			x		x	
x			1						x				x	x	
x			1						x			x	x	x	
x			1						x		1(2)			x	
x			1						x		2,3	x		x	
x			1			sub			x		1			x	
x			1		x						2,3	x		x	
x			1			sub					1			x	
x			1				x				1			x	
x			1						x		1			x	
x			1			x	x		x		1			x	x

Table 1d cont.

Order Family	Pistils									
		simple					compound			
	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil	pleiomerous	diplomerous	haplomerous	oligomerous
39. Calycanthaceae	3-20	x	x	x	x	1				
40. Idiospermaceae	1(2)				x	1				
Laurales										
41. Gomortegaceae	1					2,3				x
42. Lauraceae	1				x	1(3)				R
43. Hernandiaceae	1				x	1(3)				R
Aristolochiales										
44. Aristolochiaceae	1					6(3-5)			x	R
Nymphaeales										
45. Cabombaceae	1-18	x	x	x	x	1				
46. Nelumbonaceae	6-25	x	x	x		1				
47. Nymphaeaceae	1					5-35(3)	x	x	x	R
Ranunculales										
48. Ranunculaceae	250-1	x	x	x	x	1(5)			R	
49. Ceratophyllaceae	1				x	1				
50. Coriariaceae	5-10(-12)		x	x		1				
51. Circaeasteraceae	1-3				x	1				
52. Nandinaceae	1				x	1				
53. Paeoniaceae	2-5(1-8)		x	x	x	1				
54. Berberidaceae	1				x	1(2-3)				x
55. Podophyllaceae	1				x	1				
56. Sargentodoxaceae	35 +	x				1				
57. Menispermaceae	3,6(1-30)	x	x	x	x	1				
58. Lardizabalaceae	3,6(-15)	x	x	x		1				
Gunnerales										
59. Gunneraceae	1					2				x
Geraniales										
60. Connaraceae	5(1-8)		x	x	x	1				
61. Geraniaceae	1					5(3,8)		R	x	R
62. Vivianiaceae	1					3(2,5)			R	x
63. Limnanthaceae	1					5,3(2,4)			x	x
64. Oxalidaceae	1					5			x	
65. Tropaeolaceae	1					3				x
66. Balsaminaceae	1					5			x	
67. Linaceae	1					5(3,4)			x	R
68. Erythroxylaceae	1					3(2)				x
69. Zygophyllaceae	1					5(2-12)		R	x	R
70. Balanitaceae	1					5			x	
71. Malpighiaceae	1(3)				x	3(1-5)			R	x
72. Stackhousiaceae	1					3(2-5)			R	x
Rutales										
73. Meliaceae	1					3-5(2-20)	R	R	x	x
74. Simaroubaceae	1-5			x	x	2-5(1,8)		R	x	x
75. Rutaceae	1(-8)			x	x	2-5(1-16)	R	R	x	x
76. Pittosporaceae	1					2(3-5)			R	x
77. Cneoraceae	1					3(4)			R	x
78. Burseraceae	1					2-5			x	x
79. Anacardiaceae	1(4-6)			x	x	1-3(5-12)		R	R	x
Sapindales										
80. Akaniaceae	1					3				x
81. Sapindaceae	1					3(2-10)		R	R	x

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
x			1						x		1,2			x	
x			1			x					1,2			x	
		x	2,3	x			sub				1				
x		R	1				sub				1			x	
		x	1				sub				1			x	
	x	x	6(3-5)	x	x							x	x	x	
x			1							x	1-3			x	
			1				x				1(2)			x	
x	x	x	5-35(3)							x	1-3		x	x	
x			1(5)			x	x		x			x	x	x	x
			1				x				1				x
x			1				x				1			x	
x			1				x		x		1				x
x			1						x		1,2			x	
x			1						x				x	x	
x			1		x	x					1-3	x		x	
x			1						x				x	x	
x			1				sub				1				
x			1						x		2,1			x	x
x			1						x	x	1-3	x	x	x	
		x	1				x				1			x	
x			1			sub			x		2(3)			x	
x			5(4,3,8)	x							1,2	R		x	
x			3(2,4,5)	x							1,2				
x			5,3(2,4)	x		x					1				x
x			5	x							1-3	x		x	
x			3	x							1			x	
x			5	x							2,3	x		x	
x			5(3,4)	x							2(1)			x	
x			3	x							1,2			x	
x			5(2-12)	x							1-3	x	x	x	
x			5	x			sub				1			x	
x			3(1-4)	x							1			x	
x			3(2-5)	x		x					1			x	
x			3-5(1-20)	x	R						2(1,3)	x	x	x	
x			1-5	x							1(2,3)	x		x	
x	R	R	2-5(1-16)	x	R						1-3	x		x	
x			1(2-5)	R	x	x					1-3	x	x		x
x			3(4)	x							2			x	
x			2-5	x							2(1)			x	R
x		R	1(2-12)	x		x	sub				1			x	x
x			3	x							2			x	
x			3(1-10)	x	R						1(2,3)	R		x	

Table 1d cont.

Order Family	Pistils									
		simple				compound				
	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil	pleiomerous	diplomerous	haplomerous	oligomerous
82. Melianthaceae	1					4,5(-2)			x	R
83. Hippocastanaceae	1					3				x
84. Staphyleaceae	1					3(2,4)			R	x
85. Aceraceae	1					2(cas 3-5)			R	x
86. Sabiaceae	1					2(3)				x
Fabales										
87. Caesalpiniaceae	1(2,3)				x	1				
88. Fabaceae	1				x	1				
89. Mimosaceae	1(-15)	R	R	R	x	1				
Polygalales										
90. Polygalaceae	1					2(3,5,7,8)		R	R	x
91. Krameriaceae	1					2(1 sterile)				x
92. Trigoniaceae	1					3				x
93. Vochysiaceae	1					3				x
Papaverales										
94. Papaveraceae	1					2-25	x	x	x	x
95. Fumariaceae	1					2				x
96. Tovariaceae	1					6-8		x	x	
97. Capparaceae	1					2(-12)	R	R	R	x
98. Brassicaceae	1					2(cas 3,4)			R	x
99. Pentadiplandraceae ?	1					5,4			x	
100. Resedaceae	1					2-7		x	x	x
101. Moringaceae	1					3(4)			R	x
102. Bretschneideraceae	1					3(-5)			R	x
Batales										
103. Bataceae	1					2				x
Cistales										
104. Cistaceae	1					3,5(-10)		R	x	x
105. Cochlospermaceae	1					3-5			x	x
106. Bixaceae	1					2				x
Caryophyllales										
107. Cactaceae	1					2-~10		x	x	x
108. Aizoaceae	1					2-5(-20)	R	R	x	x
109. Portulacaceae	1					3(2-8)		R	R	x
110. Basellaceae	1					3				x
111. Didiereaceae	1					3(2,4)			x	x
112. Gyrostemonaceae	1				R	(2,1)-19	x	x	x	R
113. Phytolaccaceae	4-12		x	x		1-12	R	R	R	R
114. Barbeuiaceae	1					2				x
115. Achatocarpaceae	1					2				x
116. Petiveriaceae	1				x	1-5			x	x
117. Agdestidaceae	1					3,4			x	x
118. Nyctaginaceae	1				x	1				
119. Stegnospermataceae	1					3-5			x	x
120. Caryophyllaceae	1					2-5(6-11)		R	x	x
121. Molluginaceae	1(5)			R		2-5			x	x
122. Illecebraceae	1					2,3(1)				x
123. Amaranthaceae	1					2				x
124. Chenopodiaceae	1					2(3-5)			R	x
Polygonales										
125. Polygonaceae	1					3(2,4)			R	x

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
x			4,5(-2)	x							1-3	x		x	
x			3	x							2			x	
x			3,2	x		sub					1-3	x		x	
x			2	x							2(1)			x	
x			2(3)	x			sub				2(1)				x
x			1						x		2,3	x	x	x	
x			1						x		2,3(1)	x	x	x	
x			1						x		2,3(1)	x	x	x	
x			2(1-5)	x	x						1	R		x	
x			1				x				2			x	
x			3,1	x							1-3	x	x	x	
x		x	1-3	x							1-3	x	x	x	
x			1(2-sev)		x	R					(1-2)	x	x	x	
x			1		x						1,2	x	x	x	
x			6-8		x								x	x	
x			1	R	x							x	x	x	
x			2(1)		x						(1-3)	x	x	x	
x			5,4	x								x			
x			1		x	x					1(2)	x	x	x	
x			1		x								x	x	
x			3	x							2				
x			4			x					1			x	
x			1		x						2	x	x	x	
x			1,3-5	x	x								x	x	
x			1		x								x	x	
R		x	1		x	R						x	x	x	
x		x	1-20	x		x	x				(1-3)	x	x	x	
x	x	x	1-8	x		x					1-3	x	x	x	
x			1(3)			x					1			x	
x			3			x					1			x	
x			19-1						x		1				
x			4-12	x		x			x		1			x	
x			2			x					1				
x			1			x					1				
x			1			x					1			x	
	x		3,4	x		sub					1				
x			1			x					1			x	x
x			1			x					3	x			
x			1(2-5)	x		x		x			(1-3)	R	x	x	
x			2-5	x		x					1			x	
x			1			x					1(-3)	x		x	
x			1			x					1-3	x		x	
x	R		1			x					1			x	
x			1			x					1			x	R

Table 1d cont.

Order Family	Pistils									
		simple					compound			
	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil	pleiomerous	diplomerous	haplomerous	oligomerous
Primulales										
126. Plumbaginaceae	1					5			x	
127. Primulaceae	1					5(3-9)		R	x	R
128. Tamaricaceae	1					3(2-5)			R	x
129. Frankeniaceae	1					3(2,4)			R	x
130. Myrsinaceae	1					5,4(3-6)			x	R
131. Theophrastaceae	1					5(2-4)			x	R
Plantaginales										
132. Plantaginaceae	1					2				x
Proteales										
133. Proteaceae	1				x	1				
Santalales										
134. Olacaceae	1					2-5			x	x
135. Aptandraceae	1					2				x
136. Octoknemaceae	1					3-5			x	x
137. Opiliaceae	1					1(from 4)			R	x
138. Medusandraceae	1					3(4)			R	x
139. Cardiopteridaceae ?	1					2				x
140. Santalaceae	1					3-5(2)			x	x
141. Loranthaceae	1					3(?)				x
142. Misodendraceae	1					3				x
143. Grubbiaceae ?	1					2				x
Thymelaeales										
144. Geissolomataceae	1					4			x	
145. Gonystylaceae ?	1					5(2-12)		x	x	R
146. Thymelaeaceae	1					1,2				x
Euphorbiales										
147. Euphorbiaceae	1					3(1-20)	R	R	R	x
148. Simmondsiaceae ?	1					3				x
149. Callitrichaceae	1					2				x
150. Aextoxicaceae	1					2				x
151. Pandaceae	1					3,4(2)			x	x
Urticales										
152. Eucommiaceae ?	1					2				x
153. Barbeyaceae	1-3				x	1(3)				
154. Urticaceae	1				x	1				
155. Theligonaceae	1				x	1				
156. Cannabaceae	1					2				x
157. Moraceae	1					2				x
158. Ulmaceae	1					2				x
Malvales										
159. Sterculiaceae	1-5(-65)	R	R	x	x	5(1-12)		R	x	R
160. Elaeocarpaceae	1					2-5(-7)			x	x
161. Tiliaceae	1					2-10		x	x	x
162. Sphaerosepalaceae	1					2-4(5)			x	x
163. Malvaceae	1					5(1–20)	R	R	x	R
164. Bombacaceae	1					2-5			x	x
Violales										
165. Flacourtiaceae	1					2-10		x	x	x
166. Lacistemataceae	1					3(2)				x
167. Passifloraceae	1					3(4,5)			R	x

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
x			1			x					1			x	
x	R		1			x		x				x	x	x	R
x			1		x	x					2	x	x	x	
x			1		x	x					3	x	x	x	
x	R		1			x		x				x	x	x	R
x			1			x		x				R	x	x	
x			2(1-4)	x		x					1-3		x		x
x			1			sub	sub				1-3	x	x	x	
x	R		1-5	x							1	x		x	x
x			2,1					x			2(?)				
		x	1,3(4)				x				3(4)	x			
x	x		1			x					1				x
x			1	x			x	x				x			
x			1				x				2				
R	x	x	1			x					1-3	x			x
		x	1			x									
		x	1,3			x					1				
		x	2	x		x		x			2				x
x			4	x			x				2			x	
x			3,5(2-12)	x		sub					1			x	
x			1(2)	x			x				1			x	
x			3(1-20)	x							1,2			x	R
x			3				sub				1			x	
x			4	x							1				x
x			1				sub				2			x	
x			3,4(2)	x			x				1			x	
x			1				x				2				x
x			1				sub				1				x
x		x	1			x					1			x	
x			1			x					1				x
x			1				sub				1			x	
x		x	1(2)			R	x				1			x	
x			1(2)				x				1			x	
x			5(1-12)	x							2	x	x	x	
x			2-5(1-7)	x			sub				2	x		x	
x	R	R	2-10(1)	x	R						2(1)	x		x	
x			2-4(5)	x		x					2,3	x			
x			5(1-~20)	x							1-3	x	x	x	
x	R		2-5	x							2	x	x	x	
x	R	R	1(2-6)	R	x		R				3	x	x	x	
x			1		x						3			x	
x			1		x		R				(3)		x	x	

Table 1d cont.

Order Family	Pistils: number	simple: pleiomerous	simple: diplomerous	simple: haplomerous	simple: oligomerous	carpels per pistil	compound: pleiomerous	compound: diplomerous	compound: haplomerous	compound: oligomerous
168. Malesherbiaceae	1					3(4)			R	x
169. Turneraceae	1					3				x
170. Achariaceae	1					3-5			x	x
171. Caricaceae	1					5			x	
172. Violaceae	1					3(2-5)			R	x
173. Stachyuraceae ?	1					4			x	
174. Scyphostegiaceae ?	1					8-12(-16)	x	x		
175. Peridiscaceae	1					3,4			x	x
176. Hoplestigmataceae ?	1					2				x
177. Loasaceae	1					3-5(1-7)			x	x
178. Cucurbitaceae	1					3(2-5)			R	x
Rhamnales										
179. Vitaceae	1					2				x
180. Leeaceae	1					3-8		x	x	x
181. Rhamnaceae	1					3(2-5)			R	x
182. Erythropalaceae	1					3				x
183. Aquifoliaceae	1					4(3-22)	R	R	x	R
184. Icacinaceae	1					3(2-5)			R	x
Celastrales										
185. Ctenolophonaceae	1					2				x
186. Ixonanthaceae	1					5,4,3,2			x	x
187. Irvingiaceae	1					5,4,2			x	x
188. Dichapetalaceae	1					2,3(4)			R	x
189. Celastraceae	1					2-5			x	x
190. Goupiaceae	1					5			x	
191. Siphonodontaceae	1					5			x	
Dilleniales										
192. Dilleniaceae	20-(1)	x	x	x	x	1				
193. Actinidiaceae	1					5-16	x	x	x	
194. Saurauiaceae	1					3-5			x	x
Rosales										
195. Rosaceae	~150-1	x	x	x	x	1,5(2-15)	R	R	x	R
196. Chrysobalanaceae	1				x	1(3)				x
197. Elaeagnaceae	1				x	1				
198. Neuradaceae	1					3-10		x	x	x
199. Corynocarpaceae ?	1					2				x
200. Crossosomataceae ?	3-5(1-9)		R	x	x	1				
Myrtales										
201. Myrtaceae	1					2-3(1?-16)	R	R	R	x
202. Lecythidaceae	1					2-6(7)			x	x
203. Barringtoniaceae	1					2-4			x	x
204. Asteranthaceae	1					3,5(-8)			x	x
205. Dialypetalanthaceae	1					2				x
206. Sonneratiaceae	1					4-20	x	x	x	
207. Punicaceae	1					9		x		
208. Rhizophoraceae	1					2-5(6)			x	x
209. Lythraceae	1					2-6			x	x
210. Crypteroniaceae	1					2				x
211. Oliniaceae	1					3-5			x	x
212. Penaeaceae	1					4			x	
213. Melastomataceae	1					4,5(2-22)	R	R	x	R

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
x			1		x								x		
x			1		x						3	x	x	x	
x			1		x						3	x	x		
x			1,5		x							x	x	x	
x			1		x						3	x	x	x	
x			4	x	x								x	x	
x			1			x							x	x	
x			1				x					x			
x			1		x						4				x
	x	x	1(-3)	R	x		R				3	x	x		x
		x	1	R	x		sub				1-3	x	x	x	
x			2	x							2			x	
x			3-8	x		x					1			x	
x		x	3(1-5)	x		sub					1(2)			x	
	x		3(1)				x				3,2				x
x			4(3-22)	x			x				1(2)				x
x			1(2-5)				x				2				x
x			2	x			sub				2				
x			5,4,3,2	x			sub				2,1			x	
x			5,4,2	x			sub				1			x	
x		x	2,3	x			sub				2			x	
x	R		1-5	x			R				2(1,3)	x	x	x	
x	x		5	x		x						x			
x			10	x							2,3	x			
x			1	x		x					1-3	x		x	
x			5-16	x									x		x
x			3-5	x									x		x
x		x	1,5(2-15)	x							2(1,3)	x	x	x	x
x			1(2-3)			x					2			x	
x			1			x					1(2)			x	
		x	3-10	x							1,2			x	
x			1				x				1			x	
x			1						x			x		x	
x	x	x	1-3(-16)	x	R						(1-3)	R	x	x	R
	R	x	2-6(7)	x							1-3	x	x	x	
	R	x	2-4	x							1-3	x			
	x	x	3,5(-8)	x								x			
		x	2	x									x	x	
x	x		4-20	x									x	x	
	x	x	9(7-13)	x	x	x							x	x	
R	R	x	2-5(1-12)	x							2(3)	R		x	
x			2-6(1)	x	R	R					(2,3)	R	x	x	
x			2	x									x		
		x	3-5	x							2,3			x	
x			4	x		x					2,3	x		x	
x	x	x	4,5(1-22)	x	R	R					(2,3)	R	x	x	

Table 1d cont.

Order Family	Pistils									
		simple					compound			
	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil	pleiomerous	diplomerous	haplomerous	oligomerous
214. Onagraceae	1					4(2-6)			x	R
215. Haloragaceae	1					2-4			x	x
216. Hippuridaceae	1				x	1				
217. Trapaceae	1					2				x
218. Combretaceae	1					1(from 2,3)				x
Theales										
219. Theaceae	1					3-5(2-10)		R	x	x
220. Bonnetiaceae	1					3-5			x	x
221. Pentaphylacaceae	1					5			x	
222. Pellicieraceae	1					2				x
223. Medusagynaceae	1					17-25	x			
224. Eucryphiaceae	1					5-12(4-18)	R	x	x	
225. Paracryphiaceae	1					12-15	x	x		
226. Symplocaceae	1					2-5			x	x
227. Tetrameristaceae	1					4			x	
228. Clusiaceae	1				R	5,3(1-15)	R	R	x	x
229. Quiinaceae	1,3					2-14	x	x	x	x
230. Hypericaceae	1					3-5(2)			x	x
231. Elatinaceae	1					3-5(2-6)			x	x
232. Dipterocarpaceae	1					3(2)				x
233. Humiriaceae	1					5-7			x	
234. Ancistrocladaceae ?	1					3				x
235. Marcgraviaceae	1					2-8		x	x	x
236. Caryocaraceae	1					4-20	x	x	x	
237. Ochnaceae	1					2-5(-15)	R	R	x	x
238. Strasburgeriaceae	1					5			x	
239. Diegodendraceae	1					2(-4)			R	x
240. Scytopetalaceae	1					3-8		x	x	x
241. Sarcolaenaceae	1					3-5			x	x
Ericales										
242. Ericaceae	1					5(2-20)	R	R	x	R
243. Tremandraceae	1					2				x
244. Epacridaceae	1					5(2-10)		R	x	R
245. Clethraceae	1					3				x
246. Empetraceae	1					2-9		x	x	x
247. Pyrolaceae	1					5(4)			x	
248. Monotropaceae	1					4-6			x	
249. Diapensiaceae	1					3				x
250. Cyrillaceae	1					2-4(5)			x	x
251. Lennoaceae	1					6-15	x	x	x	
Ebenales										
252. Ebenaceae	1					2-16	x	x	x	x
253. Sapotaceae	1					4-12		x	x	
Styracales										
254. Styracaceae	1					3-5			x	x
255. Lissocarpaceae	1					4			x	
256. Alangiaceae	1					2,3				x
Rafflesiales										
257. Hydnoraceae	1					3,4(5)			x	x
258. Rafflesiaceae	1					4-20	x	x	x	
259. Balanophoraceae	1					1-3(-5)			R	x

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
	R	x	4(2-6)	x							1-3	x	x	x	
		x	3,4(2)	x			sub				1(2)			x	
		x	1				x				1				x
	x		2	x			sub				1			x	
	R	x	1				x				2(3)	x		x	
x	R	R	3-5(2-10)	x							(1)2,3	x		x	
x			3,5	x									x	x	
x			5	x			sub				2			x	
x			2	x							1				
x			17-25	x							2(3)				
x			5-12(4-18)	x								x		x	
x			12-15	x								x			x
	x	x	2-5	x							2-4				x
x			4			x					1			x	
x			3,5(1-15)	x	R	x					1-3	x	x	x	
x			2-14			x					2				
x			1,3-5(2)	x	R							x	x	x	
x			3-5(2-6)	x									x	x	
x	R	R	3	x	x						2			x	
x			5-7	x							1-3			x	
	x	x	3			x					1			x	
x			1	x									x	x	
x			4-20	x							1			x	
x			2-5(1-15)	x	x						1-3	x	x	x	
x			5	x							2				
x			2(-4)			x					2				
x			3-8	x			sub				2,3	x			x
x			3-5(1)	x							2,3	x			
x		R	5(2-10)	x		R					1-3	x	x		x
x			2	x			sub				1-4			x	
x		R	1-10	x							1-3	x			x
x			3	x									x		x
x			2-9	x							1				x
x			5(4)	x	x								x		x
x			1-6	x	x								x		x
x			3	x								x	x	x	x
x			2-4(5)	x			sub				1,2(3)				x
x			6-15	x							2				x
x			2-16	x			sub				1(2)			x	
x			4-12(2)	x							1				x
x	x	x	3-5,1	x							1-3	x		x	x
		x	4	x			sub				2				
		x	1(-3)				x				1				x
		x	1		x		x						x		x
R	x	x	1		x								x	x	x
x		x	1-3(-5)				x				1				x

Table 1d cont.

Order Family	Pistils									
		simple					compound			
	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil	pleiomerous	diplomerous	haplomerous	oligomerous
Araliales										
260. Araliaceae	1				x	5(1-~160)	R	R	x	R
261. Apiaceae	1					2(1)				x
Saxifragales										
262. Crassulaceae	4,5(1-30)	R	R	x	R	1(4,5)			R	
263. Saxifragaceae	1(-5)			R		2(-5)			R	x
264. Parnassiaceae	1					3,4			x	x
265. Eremosynaceae	1					2				x
266. Francoaceae	1					4(2)			x	R
267. Davidsoniaceae	1					2				x
268. Hydrangeaceae	1					2-6			x	x
269. Philadelphaceae	1					3-7			x	x
270. Pterostemonaceae	1					5			x	
271. Iteaceae	1					2				x
272. Baueraceae	1					2				x
273. Bruniaceae	1					2(3)				x
274. Vahliaceae	1					2(3)				x
275. Donatiaceae	1					2,3				x
276. Tetracarpaeaceae	4			x		1				
277. Escalloniaceae	1					4,5(2-6)			x	R
278. Grossulariaceae	1					2				x
279. Brunelliaceae	4,5(2,3)			x	R	1				
280. Cunoniaceae	1,2(3-5)			R	x	2(3-5)			R	x
281. Greyiaceae	1					5			x	
282. Cephalotaceae	6			x		1				
Begoniales										
283. Begoniaceae	1					3(2-5)			R	x
284. Datiscaceae	1					3-5			x	x
Droserales										
285. Dioncophyllaceae	1					2,5			x	x
286. Droseraceae	1					3,5			x	x
287. Byblidaceae	1					2,3				x
288. Podostemaceae ?	1					2,3				x
289. Hydrostachyaceae ?	1					2				x
Sarraceniales										
290. Sarraceniaceae	1					3,5(6)			x	x
Nepenthales										
291. Nepenthaceae	1					4(3)			x	R
Polemoniales										
292. Polemoniaceae	1					3(2,4,5)			R	x
293. Hydrophyllaceae	1					2(3)				x
294. Boraginaceae	1					2				x
295. Fouquieriaceae	1					3				x
Gentianales										
296. Loganiaceae	1					2(3-5)			R	x
297. Rubiaceae	1					2(3-16)	R	R	R	x
298. Columelliaceae	1					2				x
299. Gentianaceae	1					2				x
300. Menyanthaceae	1					2				x
301. Convolvulaceae	1					2(3-5)			R	x
302. Cuscutaceae	1					2				x

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
R	R	x	5(1-~160)	x			x				1				x
		x	2(1)	x			x				1				x
x			1(5)									R	x	x	
x	x	x	1,2(-5)	x	x								x	x	R
x	x		1		x								x	x	
	x		2	x		sub					1				
x			4(2)	x									x	x	
x			2	x								x		x	
	x	x	2-6	x	x								x		x
x	x	x	7-1	x	R		R				(1)		x		x
		x	5	x								x			
	x		2	x								x	x		
x	x		2	x							2,3	x		x	
R	x	x	2(1-3)	x			sub				1-3	x			x
		x	1				x						x	x	
		x	2,3	x									x		
x			1						x				x		
x	x	x	1-5(6)	x	x								x	x	x
		x	1		x							x	x	x	
x	R		1	x							2			x	
x	x	x	2(3-5)	x			x				(1)	x	x	x	
x			1		x								x	x	
x			1			x					1(2)			x	
	R	x	3(1-5)	x	R								x	x	
		x	1		x								x	x	
x			1		x								x	x	
x			1(3,5)	R	x	x		R			(3)	x	x	x	
x			2,3	x			sub				1-3	x		x	x
x			2(1,3)	x				R			(2)	R	x	x	
x			1		x								x		x
x			3,5(6)	x									x	x	x
x			4(3)	x									x	x	
x			3(2,4)	x							1-3	x			x
x	R		1,2(3)	x	x						2		x		x
x			2,4(10)	x		sub					2				x
x			1		x							x		x	
x	R		2(1-5)	x	x	R					(1)		x		x
R	R	x	2(1,4-9)	x	R	x	x				1-3	x	x		x
		x	2		x								x		x
x			1(2)	R	x								x		x
x	x		1		x								x		x
x			2(1-5)	x		sub					1,2		R		x
x			2,1	x							2				x

Table 1d cont.

Order Family	Pistils									
		simple					compound			
	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil	pleiomerous	diplomerous	haplomerous	oligomerous
303. Apocynaceae	1					2(3-5)			R	x
304. Plocospermataceae	1					2				x
305. Asclepiadaceae	1					2				x
Oleales										
306. Oleaceae	1					2				x
307. Salvadoraceae	1					2				x
Cornales										
308. Davidiaceae	1					6-10			x	x
309. Nyssaceae	1					1,2(3)				x
310. Garryaceae	1					2(3)				x
311. Cornaceae	1					2(-4)			R	x
Dipsacales										
312. Caprifoliaceae	1					3(2-8)		R	R	x
313. Adoxaceae	1					3-5(2)			x	x
314. Valerianaceae	1					3				x
315. Dipsacaceae	1					2				x
Scrophulariales										
316. Solanaceae	1					2(3-5)			R	x
317. Nolanaceae	1					5(3)			x	R
318. Scrophulariaceae	1					2(3)				x
319. Orobanchaceae	1					2(3)				x
320. Buddlejaceae ?	1					2				x
321. Globulariaceae	1					2				x
322. Lentibulariaceae	1					2				x
323. Acanthaceae	1					2				x
324. Bignoniaceae	1					2				x
325. Gesneriaceae	1					2				x
326. Pedaliaceae	1					2				x
Lamiales										
327. Myoporaceae	1					2				x
328. Verbenaceae	1					2(3-5)			R	x
329. Phrymaceae	1					2				x
330. Lamiaceae	1					2				x
Campanulales										
331. Campanulaceae	1					2-5(-10)		R	x	x
332. Goodeniaceae	1					2				x
333. Brunoniaceae	1					2				x
334. Calyceraceae	1					2				x
335. Stylidiaceae	1					2				x
Asterales										
336. Asteraceae	1					2				x

Ovary				Placentation							Ovules per locule				
superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	free-central	ventral	laminar	1-3(4)	few to sev	many	bittegmic	unitegmic
x	R		1,2	x	x				x		1-3	x	x		x
x			1			sub	sub				2				
x	R		1,2						x		2(1)		x		x
x			2	x							2(1,3)	x			x
x			1,2			x					1,2			x	
		x	6-10	x			x				1				x
		x	1,2				x				1				x
			1				x				2				x
		x	2(1-4)				x				1				x
	R	x	1-3(-8)	x							1(-3)	x			x
	x		3-5	x			sub				1				x
		x	3,2,1	x			sub				1				x
		x	1	x			sub				1				x
x			2(1-5)	x							(1-3)		x		x
x			5	x		x					1-3	x			x
x			2(1)	x							(1-3)	R	x		x
x			1		x								x		x
x			2(4)	x									x		x
x			1				x				1				x
x			1			x					(2)		x		x
x			2(1)	x	R						2(1,3)	R			x
x			2(1,4)	x	R								x		x
x	R	R	1(2)	R	x								x		x
x		R	1,2,4	x	x						1-3	x	x		x
x			2(3-10)	x			x				1-3	x			x
x			2(1,4,5)	R		x		R			1-2				x
x			1			x					1				x
x			2	x		x					2				x
R	x	x	2-5(1-10)	x	R	x	x				(1)	R	x		x
R	x	x	1,2(4)	x		x					1-3	x			x
x			1			x					1				x
		x	1				x				1				x
		x	1,2					x					x		x
		x	1			x					1				x

Table 1e. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; stds, stamindes; usu, usually; W.I., West Indies;

	Ovules		Styles					Stigmas		
				compound					position	
Order Family	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
Trochodendrales										
1. Cercidiphyllaceae	x		1					1	x	
2. Tetracentraceae	x		4			x		4	x	
3. Eupteleaceae	x		0					1	x	
4. Trochodendraceae	x		6-11(4)		x	R		6-11(4)	x	
Hamamelidales										
5. Platanaceae	x		1					1	x	
6. Myrothamnaceae	x		3(4)			R	x	3(4)	x	
7. Buxaceae	x		3(2,4)			R	x	3(2-4)	x	
8. Hamamelidaceae	x		2(0)				x	2	x	x
9. Daphniphyllaceae	x		1,2(4)			R	x	2(1-4)	x	x
10. Didymelaceae	x		1,0					1		
Salicales										
11. Salicaceae	x		2(-4)			R	x	2(-4)	x	
Balanopales										
12. Balanopaceae			3(2)				x	6(4)	x	
Fagales										
13. Leitneriaceae	x		1					1	x	
14. Rhoipteleaceae	x		2				x	2		
15. Myricaceae	x		2				x	2	x	
16. Betulaceae	x		2				x	2		
17. Ticodendraceae	x		2				x	2		
18. Juglandaceae	x		1				x	2	x	
19. Fagaceae	x		3(6)			R	x	3(6)	x	x
Casuarinales										
20. Casuarinaceae	x		2				x	2	x	
Piperales										
21. Saururaceae	x	x	4,3			x		3,4	x	
22. Piperaceae	x		0-5			x	x	1-5	x	x
23. Lactoridaceae	x		3			x		3	x	
24. Chloranthaceae	x		0,3			x		3		
Magnoliales										
25. Magnoliaceae	x		1			R		1	x	
26. Winteraceae	x		1			R		1	x	x
27. Annonaceae	x		0,1			R		1(3)	x	sub
28. Eupomatiaceae	x		0					1		
29. Degeneriaceae	x		0					1	x	
30. Austrobaileyaceae	x		1					2	x	
31. Himantandraceae	x		1					1	x	
32. Schisandraceae	x		1					1	x	
33. Illiciaceae	x		1					1	x	
34. Canellaceae	x		1				x	2-5		x
35. Myristicaceae	x		0					1	R	

of dicotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

Stigmas				Fruit										dehiscence		
compound																
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
				x										x		
		x		x										x		
												x				
	x	R			x									x	x	
											x					
		R	x	x						x					x	x
		R	x		x	x	x									x
			x		x										x	x
		R	x				x									
							x									
		R	x		x											x
	x	R					x			x						
							x									
			x									x				
			x				x				x					
			x								x	x				
			x				x									
			x							x		x				
		R	x							x						
			x									x				
		x			x				x					x		
		x	x					x								
		x		x										x		
		x						x								
		R		x	x							x			x	x
		R		x		x								x		
		R		R	R	x										
											x		x			
						x										
						x										
						x										
						x	x									
				x										x		
		x	x			x										
						x										

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
36. Trimeniaceae	x		0					1		x
37. Amborellaceae	x		0					1	x	
38. Monimiaceae	x		1					1		x
39. Calycanthaceae	x		1					1		x
40. Idiospermaceae			0					1	x	
Laurales										
41. Gomortegaceae			1				x	2,3		
42. Lauraceae	x		1(0)				R	1(2,3)		x
43. Hernandiaceae	x		1				R	1		sub
Aristolochiales										
44. Aristolochiaceae	x		6,1(3-25)	R	R	x	x	6(1-25)		
Nymphaeales										
45. Cabombaceae	x		1					1	x	x
46. Nelumbonaceae	x		0					1		x
47. Nymphaeaceae	x		0					5-35(3)	x	
Ranunculales										
48. Ranunculaceae	x	x	1(5)			R		1(5)	x	x
49. Ceratophyllaceae	x		1					1	x	
50. Coriariaceae	x		1					1		
51. Circaeasteraceae		x	1					1		
52. Nandinaceae			1					1		x
53. Paeoniaceae	x		1					1	x	
54. Berberidaceae	x		0,1				x	1(3)		x
55. Podophyllaceae	x		1					1		
56. Sargentodoxaceae			1					1	x	
57. Menispermaceae	x		1					1		x
58. Lardizabalaceae	x		1,0					1		x
Gunnerales										
59. Gunneraceae	x		2				x	2	x	
Geraniales										
60. Connaraceae	x		1					1		x
61. Geraniaceae	x		5(1,3,8)		R	x	R	5(3,8)	x	
62. Vivianiaceae			1				x	2-5	x	
63. Limnanthaceae		x	1				x	5,3(2,4)	x	x
64. Oxalidaceae	x	x	5,1			x	x	5		x
65. Tropaeolaceae		x	1				x	3		x
66. Balsaminaceae		x	1				x	5		x
67. Linaceae	x	x	5(1,3,4)			x	R	5(3,4)		x
68. Erythroxylaceae	x		3(1)(2?)				x	3(2)		x
69. Zygophyllaceae	x		1				x	5(2-12)		x
70. Balanitaceae	x		1				x	1		x
71. Malpighiaceae	x		3(1-5)			R	x	3(-5)		x
72. Stackhousiaceae		x	3(1-5)			R	x	3(2-5)	x	
Rutales										
73. Meliaceae	x		1(0)				x	3-5(2-20)		x
74. Simaroubaceae	x		1-5			x	x	1-5	x	x
75. Rutaceae	x		1-5			x	x	2-5(1-16)		x
76. Pittosporaceae		x	1				x	1(2-5)		x

Stigmas				Fruit													
compound														dehiscence			
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
						x		x								
								x								
								x								
											x		x			
											x					
			x				x									
			x			x	x									
			x								x	x				
R	R	x	R	x	x						x			x		
											x					
											x		x			
x	x	x	R		x	x										
		R		x	R	x							x	x		
											x					
													x			
													x			
						x										
				x										x		
		R	x		R	x					R					
						x										
						x										
							x									
				x		x										
			x					x			x					
				x										x		R
	R	x	R						x					x	x	
		x	x		x											x
		x	x						x		x				x	
		x			x	R			R							x
			x			R			x			R			x	
		x			x	R										x
		x	R		x		x								x	
			x				x									
	R	x	R		x	R	R		x						x	x
			x				x									
		R	x		x		R		x			x		x		x
		R	x						x						x	
R	R	x	x		x	x	R								x	x
		x	x		x		x		x			x				
x	x	x	x	x	x	x	x		x			R			R	x
		R	x		x	x									x	x

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
77. Cneoraceae	x		1				x	3(4)		x
78. Burseraceae	x		1				x	2-5		x
79. Anacardiaceae	x		1(5-12)		R	R	x	1-3(4-12)		x
Sapindales										
80. Akaniaceae	x		1				x	3		x
81. Sapindaceae	x		1(2-4)			R	x	3(2-4)		x
82. Melianthaceae	x		1				x	1		x
83. Hippocastanaceae	x		1				x	1		x
84. Staphyleaceae	x		3,2,1				x	2,3		x
85. Aceraceae	x		2,1				x	2	x	
86. Sabiaceae	x		2,1				x	1-3		x
Fabales										
87. Caesalpiniaceae	x		1					1		x
88. Fabaceae	x		1					1		x
89. Mimosaceae	x		1					1		x
Polygalales										
90. Polygalaceae	x		1				x	1,2		x
91. Krameriaceae			1				x	1		x
92. Trigoniaceae	x		1				x	1		x
93. Vochysiaceae	x		1				x	1		x
Papaverales										
94. Papaveraceae	x		0,1(-18)	R	R	R	x	2-20	R	x
95. Fumariaceae	x		1				x	2		x
96. Tovariaceae	x		0					6-8		x
97. Capparaceae	x		1,0				x	2,1		x
98. Brassicaceae	x	x	1				x	2,1		x
99. Pentadiplandraceae ?			1				x	5,4		x
100. Resedaceae	x	x	0					2-7		x
101. Moringaceae	x		1				x	1		x
102. Bretschneideraceae			1				x	1		x
Batales										
103. Bataceae	x		0					2		x
Cistales										
104. Cistaceae	x		1,0				x	3,5,1		x
105. Cochlospermaceae	x		1				x	1(?)		x
106. Bixaceae	x		1				x	2		x
Caryophyllales										
107. Cactaceae	x		1				x	2-10		
108. Aizoaceae	x		1-5(-20),0	R	R	x	x	2-5(-20)	x	x
109. Portulacaceae	x		1-8		x	x	x	2-8	x	
110. Basellaceae	x		1,3				x	3	x	x
111. Didiereaceae	x		1				x	3,4		x
112. Gyrostemonaceae			1-19	x	x	x	x	1-19	x	x
113. Phytolaccaceae	x		4-12	x	x	x		4-12	x	
114. Barbeuiaceae			2				x	2	x	
115. Achatocarpaceae			2				x	2	x	
116. Petiveriaceae	x		1-5			x	x	1-5	x	
117. Agdestidaceae			3,4			x	x	3,4	x	

Stigmas				Fruit													
compound														dehiscence			
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
		R	x				x		x							
		x	x		x	x	x									
	R	R	x				x									
			x		x											x
		R	x		x	x	x		x	x		x				
			x		x											x
			x		x											x
			x	x	x	x	x							x		
			x						x			x			x	
			x					x	x							
				R			R					R		x		x
						R	R					R		x		x
						R								x		x
			x		x	x	x			x		x				x
			x										x			
			x		x							R			x	
			x		x											x
x	x	x	x		x											x
			x		x						x					
	x	x				x										
			x		x	x	R				R					
			x		x											
		x				x										
		x	x		x	x			x		R					
			x		x											x
			x		x											x
			x				sub				x					
		x	x		x											x
			x		x											x
			x		x											x
	x	x	x			x										
R	R	x	x		x	R	x		x	x					x	x
	x	x	x		x				x	R						
			x			x	x									
		x	x								x					
x	x	x	x		x				x					x		x
x	x	x				x	x									
			x		x											
			x			x										
		x	x			x					x	x				
		x	x								x					

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
118. Nyctaginaceae	x		1					1	R	
119. Stegnospermataceae			3-5			x	x	3-5	x	
120. Caryophyllaceae	x		2-5(-11)		R	x	x	2-5(-11)	x	
121. Molluginaceae	x		2-5,0			x	x	2-5	x	
122. Illecebraceae	x		1-3				x	2,3		x
123. Amaranthaceae	x		1-3				x	2,3	x	x
124. Chenopodiaceae	x		2(1-5)			R	x	2(3-5)	x	
Polygonales										
125. Polygonaceae	x		3(1-4)			x	R	3(2-4)	x	x
Primulales										
126. Plumbaginaceae	x		5,1			x	x	5	x	x
127. Primulaceae		x	1				x	1		x
128. Tamaricaceae	x	x	3(0-5)			R	x	3(2-5)	x	x
129. Frankeniaceae	x		1				x	3(2-4)	x	
130. Myrsinaceae	R	x	1				x	1,5,4(3,6)		x
131. Theophrastaceae		x	1				x	1		x
Plantaginales										
132. Plantaginaceae		x	1				x	1		x
Proteales										
133. Proteaceae	x		1					1	x	x
Santalales										
134. Olacaceae		x	1				x	2-5		x
135. Aptandraceae			0,1				x	2		x
136. Octoknemaceae			1				x	3-5		x
137. Opiliaceae		x	1,0				x	4		x
138. Medusandraceae			3(4)			R	x	3(4)		x
139. Cardiopteridaceae ?			2,1				x	2		x
140. Santalaceae		x	1				x	1(2),3-5		x
141. Loranthaceae			0,1				x	1		x
142. Misodendraceae			1				x	3	x	
143. Grubbiaceae ?		x	1				x	2		x
Thymelaeales										
144. Geissolomataceae			4			x		1		x
145. Gonystylaceae ?	x		1				x	1(2-12)		x
146. Thymelaeaceae	x		1				x	1		x
Euphorbiales										
147. Euphorbiaceae	x		3(1-20)	R	R	R	x	3(1-20)	x	x
148. Simmondsiaceae ?	x		3				x	3	x	
149. Callitrichaceae		x	2				x	2	x	
150. Aextoxicaceae	x		1				x	2		x
151. Pandaceae			(2)3,4,0			x	x	(2)3,4		x
Urticales										
152. Eucommiaceae ?	x	x	2				x	2	x	
153. Barbeyaceae			2,3				x	2,3	x	
154. Urticaceae	x		1					1(2)		x
155. Theligonaceae		x	1					1		x
156. Cannabaceae	x		2				x	2	x	
157. Moraceae	x		2(1)				x	2(1)	x	x

Stigmas				Fruit										dehiscence		
compound																
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
											x		x			
		x	x		x											
	R	x	x		x	R										
		x	x		x				R		R					x
			x								x					
			x			x					x					
		R	x			R					x		x			
		R	x								x					
		x			x						x					
			x		x											
		R	x		x											x
		R	x		x											x
		x	x		R	x	x									
			x			x	R									
			x								x					
				x			x			x				x		
		x	x				x			x						
			x				x									
		x	x				x									
		x					x									
		R	x		x											
			x									x				
		x	x				x			x						
			x			x	x					x				
			x								x		x			
			x				x				x					
			x		x											x
	R	R	x		x											x
			x		R	x	x			x			x			R
R	R	R	x				R		x					x	x	
			x		x											x
			x						x						x	
			x				x			x						
		x	x				x									
			x									x				
			x								x					
			x					x					x			
								x			x					
			x										x			
			x					x			x		x			

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
158. Ulmaceae	x		2(1)				x	2(1)	x	
Malvales										
159. Sterculiaceae	x		5(1-12)	R?	R	x	R	5(1-12)		x
160. Elaeocarpaceae	x		1(0)				x	1,2-5(7)		x
161. Tiliaceae	x		1(0)				x	1-5(-10)		x
162. Sphaerosepalaceae			1				x	1-3,4		x
163. Malvaceae	x		5(1-~20)	R	R	x	R	5(1-~20)	x	x
164. Bombacaceae	x		1				x	1-5	x	x
Violales										
165. Flacourtiaceae	x		1-10		x	x	x	2-10		x
166. Lacistemataceae	x		1,0				x	3(2)		x
167. Passifloraceae	x		3(4,5),1			R	x	3(4,5),1		x
168. Malesherbiaceae			3(4)			R	x	3(4)		x
169. Turneraceae	x		3				x	3		x
170. Achariaceae			3-5			x	x	3-5		x
171. Caricaceae	x		5			x		5		x
172. Violaceae	x		1				x	1(3-5)		x
173. Stachyuraceae ?	x		1				x	4		x
174. Scyphostegiaceae ?	x		0					8-12(16)		x
175. Peridiscaceae			3,4			x	x	3,4		x
176. Hoplestigmataceae ?			2				x	2		x
177. Loasaceae		x	1				x	1,3-5(-7)	x	x
178. Cucurbitaceae	x		1(3)				x	3(2-5)	x	x
Rhamnales										
179. Vitaceae	x		1				x	1		x
180. Leeaceae	x		1				x	1		x
181. Rhamnaceae	x		1				x	2-5		x
182. Erythropalaceae		x	1				x	3,1		x
183. Aquifoliaceae	x	x	0(1)				R	4(3-22)		x
184. Icacinaceae	x	x	1				x	1(2-5)		x
Celastrales										
185. Ctenolophonaceae			2,1				x	2		x
186. Ixonanthaceae	x		1,5			x	x	1-5		x
187. Irvingiaceae			1				x	1		x
188. Dichapetalaceae		x	1-3				x	2,3		x
189. Celastraceae	x	x	1,5			x	x	2-5		x
190. Goupiaceae			5			x		5		x
191. Siphonodontaceae			5			x		5	x	x
Dilleniales										
192. Dilleniaceae	x		1					1		x
193. Actinidiaceae		x	1,5-16	x	x	x	x	5-16	x	x
194. Saurauiaceae		x	1,3-5			x	x	3-5		x
Rosales										
195. Rosaceae	x		1-5(-15)	R	R	x	x	1-5(-15)	R	x
196. Chrysobalanaceae	x		1				x	1(3)		x
197. Elaeagnaceae	x		1					1	x	
198. Neuradaceae	x		3-10		x	x	x	3-10		x
199. Corynocarpaceae ?	x		1				x	1		x

Stigmas				Fruit												
compound														dehiscence		
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
			x								x	x				
	R	x	R		x	R			x			x		x	x	
		x	x		x	x	x								x	x
	R	x	x		x	sub R			x	x		x				x
		x	x			x			x	x						
R	R	x	R		x	R			x							x
		x	x		x	x	x					x				x
	x	x	x		x	x	R					R				x
			x		x											x
		R	x		x	x										x
		R	x		x											x
			x		x											x
		x	x		x											
		x				x										
		R	x		x	R					R					x
		x				x										
R	x				x	x										
		x	x				x									
			x				x									
		x	x		x					x					x	x
		R	x		R	x						R				
			x			x										
			x			x										
		x	x		R	x	x		x	x		R			x	
			x				x									
R	R	x	R				x									
		R	x				x					R				
			x		x											
		x	x		x										x	
			x				x					x				
			x				x									
		x	x		x	x	x		x			x			R	x
		x				x										
		x				x										
				x		x								x		
x	x	x				x										
		x	x			x										
R	R	x	x	x	R	pom	x							x		
			x				x									
													x			
	x	x	x		x									x		
			x				x									

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
200. Crossosomataceae ?	x		1					1		x
Myrtales										
201. Myrtaceae	x		1				x	1		x
202. Lecythidaceae		x	1				x	1(3,4)		x
203. Barringtoniaceae			1				x	1		x
204. Asteranthaceae			1				x	5		x
205. Dialypetalanthaceae			1				x	2		x
206. Sonneratiaceae	x		1				x	1		x
207. Punicaceae	x		1				x	1		x
208. Rhizophoraceae	x		1(0,3-5)			R	x	1(3-6)		x
209. Lythraceae	x		1				x	1(2)		x
210. Crypteroniaceae			1				x	1,2		x
211. Oliniaceae	x		1				x	1		x
212. Penaeaceae	x		1				x	1,4		x
213. Melastomataceae	x		1				x	1,4		x
214. Onagraceae	x		1				x	4(1-6)		x
215. Haloragaceae	x		0-4			x	x	2-4		x
216. Hippuridaceae		x	1					1		
217. Trapaceae	x		1				x	1		x
218. Combretaceae	x		1				x	1(4)		x
Theales										
219. Theaceae		x	1,3-5(2-10)		R	x	x	3-5(2-10)	x	x
220. Bonnetiaceae		x	1				x	3,5		x
221. Pentaphylacaceae	x		1				x	5		x
222. Pellicieraceae			1				x	2		x
223. Medusagynaceae			17-25	x				17-25		x
224. Eucryphiaceae			5-12(4-18)	R	x	x		5-12(4-18)		x
225. Paracryphiaceae	x		0					12-15		x
226. Symplocaceae		x	1				x	1-5		x
227. Tetrameristaceae			4			x		4		x
228. Clusiaceae	x	x	5,3(1-15),0	R	R	x	x	5,3(1-15)		x
229. Quiinaceae			2-14	x	x	x	x	2-14		x
230. Hypericaceae		x	3-5(1,2)			x	x	3-5(2)		x
231. Elatinaceae	x	x	3-5(2,6)			x	x	3-5(2,6)		x
232. Dipterocarpaceae	x		1				x	1-3		x
233. Humiriaceae	x		1				x	5-7		x
234. Ancistrocladaceae ?			1				x	3		
235. Marcgraviaceae		x	1,0				x	1-8(?)		x
236. Caryocaraceae			4-20	x	x	x		4-20		x
237. Ochnaceae		x	1				x	2-5(-15)		x
238. Strasburgeriaceae			1				x	1		x
239. Diegodendraceae			1				x	1		x
240. Scytopetalaceae		x	1				x	3-8		x
241. Sarcolaenaceae			1				x	3-5		x
Ericales										
242. Ericaceae		x	1				x	1-20(?)		x
243. Tremandraceae	x		1				x	1(2)		x
244. Epacridaceae		x	1				x	1		x

Stigmas				Fruit										dehiscence		
compound																
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
				x										x		
			x		x	x	x			x						x
		R	x		x	x										
			x			x	x					x				
		x			x	x										x
			x		x										x	x
			x		x	x										x
			x			x										
		R	x		R	x	x			x		x			x	
			x		x											
			x		x											x
			x				x									
		x	x		x											x
		x	x		x	x										x
		x	R		x	R					R					x
		x	x								x				x	
			x					x					x			
			x							x						
		R	x				x			x		x				
	R	x	x		x	x	x								x	x
		x	x		x										x	
		x			x											x
			x							x						
x					x										x	
R	x	x			x									x	x	
x	x				x										x	
		x	x			x	x									
		x				x										
R	R	x	x		x	x	R								x	
x	x	x	x		x	x										
		x	x		x	x									x	x
		x	x		x										x	
			x							x						
		x					x									
			x							x						
		x	x			x										
x	x	x					x									
R	R	x	x		x	x	x								x	
			x			x										
			x						x							
	x	x	x		x		R									x
		x	x		x											x
x	x	x	x		x	x	x								x	x
			x		x											
			x		x		x									x

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
245. Clethraceae		x	1				x	3		x
246. Empetraceae		x	1				x	2-9		x
247. Pyrolaceae		x	1				x	5(4)		x
248. Monotropaceae		x	1				x	4-6		x
249. Diapensiaceae		x	1				x	3		x
250. Cyrillaceae		x	1				x	2-4(5)		x
251. Lennoaceae		x	1				x	6-15		x
Ebenales										
252. Ebenaceae		x	2-8		x	x	x	2-8		x
253. Sapotaceae		x	1				x	1-30(?)		x
Styracales										
254. Styracaceae		x	1				x	1,3-5		x
255. Lissocarpaceae			1				x	1,4		x
256. Alangiaceae	x		1				x	1(-3)	x	x
Rafflesiales										
257. Hydnoraceae		x	0					3-4(5)		x
258. Rafflesiaceae		x	1				x	4-20		x
259. Balanophoraceae			1-3(-5),0			R	x	1-3(-5)		x
Araliales										
260. Araliaceae	x	x	5(0-~160)	R	R	x	R	2-5(-~160)		x
261. Apiaceae	x	x	2				x	2		x
Saxifragales										
262. Crassulaceae	x		(5-7)		R?	R		(5-7)		x
263. Saxifragaceae	x		2(-5)			R	x	2(-5)		x
264. Parnassiaceae		x	1				x	3,4		x
265. Eremosynaceae			2				x	2		x
266. Francoaceae	x		0					4		x
267. Davidsoniaceae			2				x	2		x
268. Hydrangeaceae		x	1-6			x	x	2-6		x
269. Philadelphaceae		x	3-7		x	x	x	3-7		
270. Pterostemonaceae			1				x	5		x
271. Iteaceae			1				x	2		x
272. Baueraceae	x		2				x	2		x
273. Bruniaceae	x		1,2				x	2		x
274. Vahliaceae		x	2(3)				x	2(3)		x
275. Donatiaceae			2,3				x	2,3		x
276. Tetracarpaeaceae			1					1		x
277. Escalloniaceae	x	x	1(2-6)			R	x	1(2-6 ?)		x
278. Grossulariaceae	x		1,2				x	2		x
279. Brunelliaceae			1					1	x	
280. Cunoniaceae	x		2(3-5)			R	x	2(3-5)		x
281. Greyiaceae	x		1				x	1,5		x
282. Cephalotaceae	x		1					1		x
Begoniales										
283. Begoniaceae	x	x	3(2-5)			R	x	3(2-5)	x	
284. Datiscaceae	x		3-5			x	x	6-10	x	
Droserales										
285. Dioncophyllaceae	x		2,5			x	x	2,5		x

Stigmas				Fruit										dehiscence		
compound																
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
			x		x											x
	x	x	x				x									
		x			x											x
		x			x	x										x
			x		x											
		x	x		x						x	x				
x	x	x			x		x									
	x	x	x			x										
x	x	x	x		R	x										
		x	x				R		x	x						x
		x	x				x									
			x				x									
		x	x			x										
x	x	x				x										
		R	x					x			x					
R	R	x	x			x	x		R							
			x						x						x	
	R?	R		x	R									x		
		R	x	R	x									R	x	
		x	x		x											x
			x		x											x
		x			x										x	x
			x				x									
		x	x		x	R										x
	x	x	x		x	R									x	x
		x			x										x	
			x		x										x	
			x		x											x
			x						x		x			x		
			x		x											
			x		x											
				x										x		
		R	x		x	x									x	
			x			x										
				x										x		
		R	x	R	x		R			R		R		x		
		x	x		x									x	x	
				x										x		
		R	x		x	R									x	x
	x	x			x											
		x	x		x											x

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
286. Droseraceae	x	x	3,5(1)			x	x	3,5		x
287. Byblidaceae		x	1				x	1-3		x
288. Podostemaceae ?		x	2(1,3)				x	2,3	x	x
289. Hydrostachyaceae ?		x	2				x	2		x
Sarraceniales										
290. Sarraceniaceae		x	1				x	3,5		x
Nepenthales										
291. Nepenthaceae	x		0					4(3)		x
Polemoniales										
292. Polemoniaceae		x	1				x	3(2,4)		x
293. Hydrophyllaceae		x	2,1				x	2		x
294. Boraginaceae		x	1(2)				x	1,2(4)		x
295. Fouquieriaceae		x	1				x	3		x
Gentianales										
296. Loganiaceae		x	1(2)				x	1-4(5)		x
297. Rubiaceae	x	x	1(0,2)				x	2(3,4)	x	x
298. Columelliaceae		x	1				x	2,4		x
299. Gentianaceae		x	1				x	1,2		x
300. Menyanthaceae		x	1				x	2		x
301. Convolvulaceae	x	x	1(0,2)				x	2,1(-8)		x
302. Cuscutaceae		x	2(1)				x	2		x
303. Apocynaceae		x	1				x	1,2		x
304. Plocospermataceae			1				x	4		x
305. Asclepiadaceae	x	x	1,2				x	1,2		x
Oleales										
306. Oleaceae		x	1				x	2	x	x
307. Salvadoraceae	x		1				x	1,2		x
Cornales										
308. Davidiaceae	x		1				x	6-10	x	
309. Nyssaceae	x	x	1				x	1,2(3)	x	
310. Garryaceae	x		2				x	2	x	
311. Cornaceae	x	R	1				x	1,2		x
Dipsacales										
312. Caprifoliaceae	R	x	1				x	1-5		x
313. Adoxaceae		x	3-5			x	x	3-5		x
314. Valerianaceae		x	1				x	1-3		x
315. Dipsacaceae		x	1				x	1,2		x
Scrophulariales										
316. Solanaceae		x	1				x	1,2(-5)		x
317. Nolanaceae		x	1				x	1(2-5)		x
318. Scrophulariaceae		x	1				x	2,1		x
319. Orobanchaceae		x	1				x	1(2-4)		x
320. Buddlejaceae ?		x	1				x	2		x
321. Globulariaceae		x	1				x	2,1		x
322. Lentibulariaceae		x	1(0)				x	2,1		x
323. Acanthaceae		x	1				x	2		x
324. Bignoniaceae		x	1				x	2		x
325. Gesneriaceae		x	1				x	2		x

Stigmas				Fruit												
compound														dehiscence		
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
		x	x		x											x
			x		x											x
			x		x										x	
			x		x										x	
		x	x		x											x
		x	R		x											x
		R	x		x										R	x
			x		x										R	x
		R	x			x	x				x					
			x		x											x
		x	x		x	x	x								x	x
		R	x		x	x	x		x						x	x
		x	x		x										x	
			x		x	R									x	
			x		x	R										
	R	R	x		x	R			R	R		R				x
			x		x	x										
			x	x	x	x	x		x					x	x	
		x			x											
			x	x										x		
			x		x	x	x		x			x				x
			x			x	x									
	x	x					x									
			x				x									
			x			x										
			x			x	x									
		x	x		x	x	x						x			
		x	x				x									
			x								x		x			
			x								x		x			
		R	x		x	x	R								x	
		R	x						x		x					
			x		x	R					R				x	x
		R	x		x											x
			x		x	R	R								x	
			x								x					
			x		x								R			
			x		x		R									x
			x		x	R									x	x
			x		x	R									R	x

Table 1e cont.

Order Family	Ovules		Styles					Stigmas		
				compound					position	
	crassinucellar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally	apical
326. Pedaliaceae		x	1				x	2,1		x
Lamiales										
327. Myoporaceae		x	1				x	2		x
328. Verbenaceae		x	1			R	x	2(1,3-5)		x
329. Phrymaceae		x	1				x	2		x
330. Lamiaceae		x	1				x	2		x
Campanulales										
331. Campanulaceae		x	1		R	x	x	2-5(-10)		x
332. Goodeniaceae		x	1				x	2		x
333. Brunoniaceae		x	1				x	1		x
334. Calyceraceae		x	1				x	1		x
335. Stylidiaceae		x	1				x	2		x
Asterales										
336. Asteraceae		x	1				x	2	x	x

Stigmas				Fruit												
compound														dehiscence		
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	druplet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal
			x		x		sub			x						x
			x				x				x					
		R	x		R		x				x					
			x								x					
			x					R			x					
	R	x	x		x	R										
			x		x		x			x						
			x								x		x			
			x								x		x			
			x		x										x	
			x				R						x			

Table 1f. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; stds, stamindes; usu, usually; W.I., West Indies;

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ lemgth of endosperm	½ length of endosperm	more than ½ length of endosperm
Trochodendrales											
1. Cercidiphyllaceae		x		x				x			x
2. Tetracentraceae		x		x		x			x		
3. Eupteleaceae	1,2			x		x				x	
4. Trochodendraceae		x		x		x			x		
Hamamelidales											
5. Platanaceae	1			x				x			x
6. Myrothamnaceae			x	x		x			x		
7. Buxaceae	2			x		x			x		x
8. Hamamelidaceae	1-3			x		x		x			x
9. Daphniphyllaceae	1(2)			x		x			x		
10. Didymelaceae	1				x						x
Salicales											
11. Salicaceae		x			x						
Balanopales											
12. Balanopaceae	1,2			x				x			x
Fagales											
13. Leitneriaceae	1			x				x			x
14. Rhoipteleaceae	1				x						
15. Myricaceae	1				x						
16. Betulaceae	1				x						
17. Ticodendraceae	1			x	x			x			
18. Juglandaceae	1				x						
19. Fagaceae	1				x						
Casuarinales											
20. Casuarinaceae	1				x						
Piperales											
21. Saururaceae	1,2	x		x		peri		x	x		
22. Piperaceae	1			x		peri		x	x		
23. Lactoridaceae		x		x		x			x		
24. Chloranthaceae	1			x		x			x		
Magnoliales											
25. Magnoliaceae	1-2	x		x		x			x		
26. Winteraceae	1-3	x		x		x			x		
27. Annonaceae		x		x		x			x		
28. Eupomatiaceae	1			x		x			x		
29. Degeneriaceae		x		x		x			x		
30. Austrobaileyaceae		x		x		x			x		
31. Himantandraceae	1			x		x			x		

of dicotyledon families.

C, common; Cub, Cuba; diss, disseminate; fr, frequently; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
x			x		x	x		x				
x								x				
x				x	x			x				
x								x				
x			x		x		x	x	x			
x					x						x	
x		x		x		x	x	x	x	x	x	
x				x		x		x	x	x	x	x
x				x	x			x				
x				x							x	
x			x	x		x	x	x	x	x	x	
x				x								x
				x					x			
x				x		x		x				
x				x		x	x	x	x	x	x	
x				x		x	x	x	x	x		
x									x			
	x			x		x	x	x	x	x		
x	x			x		x	x	x	x	x	x	x
x				x		x		x				x
								x	x			
		x						x	x	x	x	x
										x		
		x						x	x	x		x
x		x				x		x	x	x		
x								x	x	x	R	x
x		x			x			x	x	x	x	x
x												x
x		x			x							Fiji
x		x										Aus
x												x

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ lemgth of endosperm	½ length of endosperm	more than ½ length of endosperm
32. Schisandraceae	1			x		x			x		
33. Illiciaceae	1			x		x			x		
34. Canellaceae	2	x		x		x			x		
35. Myristicaceae	1			x		x			x		
36. Trimeniaceae	1			x		x			x		
37. Amborellaceae	1			x		x			x		
38. Monimiaceae	1			x		x			x		
39. Calycanthaceae	1			x	x			x			
40. Idiospermaceae	1				x						
Laurales											
41. Gomortegaceae	1			x		x			x		
42. Lauraceae	1				x						
43. Hernandiaceae	1				x						
Aristolochiales											
44. Aristolochiaceae		x	x	x		x			x		
Nymphaeales											
45. Cabombaceae	2-4			x		peri		x	x		
46. Nelumbonaceae	1				x						
47. Nymphaeaceae			x	x		peri		x	x		
Ranunculales											
48. Ranunculaceae	1-3	x	x	x		x			x		
49. Ceratophyllaceae	1				x						
50. Coriariaceae	1			x	x			x			x
51. Circaeasteraceae	1			x		x			x		
52. Nandinaceae	1			x		x			x		
53. Paeoniaceae	3	x		x		x			x		
54. Berberidaceae	1,2	x		x		x			x		x
55. Podophyllaceae			x	x		x			x		
56. Sargentodoxaceae	1			x		x			x		
57. Menispermaceae	1			x	x	x		x			x
58. Lardizabalaceae		x	x	x		x			x		
Gunnerales											
59. Gunneraceae	1			x		x			x		
Geraniales											
60. Connaraceae	1(2)			x	x	x		x	x		x
61. Geraniaceae	1,2	R		x	x			R			x
62. Vivianiaceae	1,2			x		x					x
63. Limnanthaceae	1				x						
64. Oxalidaceae	1,2	x		x			x				x
65. Tropaeolaceae	1				x						
66. Balsaminaceae	1	x			x						
67. Linaceae	1,2			x		x		x			x
68. Erythroxylaceae	1			x	R	x					x
69. Zygophyllaceae	1	x	x	x	x			x			x

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
X			x		x			x	x			
x								x	x			
x		x			x				x	x	x	
	x							x		x	x	x
x								x				x
												N.Cal
x		x		x		x		x		x	x	x
	x			x		x		x	x			
x				x		x						Aus
x				x		x				x		
x				x		x		x	x	x	x	x
	x			x		x		x	x	x	x	x
x		x			x		x	x	x	x	x	
x								x	x	x	x	x
x				x				x	x	x		x
x				x			x	x	x	x	x	x
x		x		x	x	x	x	x	x	x	x	x
x				x			x	x	x	x	x	x
x				x		x	x	x	x	x		x
x		x			x			x				
x								x				
x		x			x		x	x	x			
x		x		x	x	x	x	x	x	x	x	
x		x			x			x	x			
x			x		x			x				
	x	x		x				x	x	x	x	x
x		x						x		x		
x		x			x			x	x	x	x	x
x				x		x		x	x	x	x	x
	x		x			x	x	x	x	x	x	x
	x	x			x					x		
x				x		x			x			
x	x		x	x		x	x	x	x	x	x	x
x				x		x			x	x		
x				x		x	x	x	x		x	
x				x		x	x	x	x	x	x	x
x		x	x	x		x		x	x	x	x	x
x	R		x	x		x	x	x	x	x	x	x

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ length of endosperm	more than ½ length of endosperm
70. Balanitaceae	1				x						
71. Malpighiaceae	1				x						
72. Stackhousiaceae	1			x			x				x
Rutales											
73. Meliaceae	1-3	x	x	x	x		x				x
74. Simaroubaceae	1-3	x		x	x		x	x			x
75. Rutaceae	1-3	x		x	x	x		x			x
76. Pittosporaceae	1-3	x	x	x		x			x		
77. Cneoraceae	1-4			x		x					x
78. Burseraceae	1-3				x						
79. Anacardiaceae	1			x	x			x			x
Sapindales											
80. Akaniaceae	2				x						
81. Sapindaceae	1-2	x			x						
82. Melianthaceae	2	x		x		x				x	
83. Hippocastanaceae	1				x						
84. Staphyleaceae	1	x		x			x				x
85. Aceraceae	1				x						
86. Sabiaceae	1,2			x	x			x			
Fabales											
87. Caesalpiniaceae	1	x	x	x	R		x	x			x
88. Fabaceae	1	x	x	x	x		x	x			x
89. Mimosaceae	1	x	x	x	x		x	x			x
Polygalales											
90. Polygalaceae	1	R		x	R	x	x				x
91. Krameriaceae	1			x	x			x			
92. Trigoniaceae	1	x	x	x	x			x			x
93. Vochysiaceae	1	x	x	x	x			R			
Papaverales											
94. Papaveraceae	(1)	x	x	x		x			x		x
95. Fumariaceae	1	x	x	x		x			x		
96. Tovariaceae			x	x				x			x
97. Capparaceae	(1)	x	x	x	x			x			x
98. Brassicaceae	(1)	x	x	x	x			R			
99. Pentadiplandraceae ?		x		x	x			x			
100. Resedaceae	1	x	x	x	x			x			x
101. Moringaceae			x		x						
102. Bretschneideraceae	1,2				x						
Batales											
103. Bataceae	1-4				x						
Cistales											
104. Cistaceae	1-3	x	x	x			x				x
105. Cochlospermaceae			x	x		x					x
106. Bixaceae			x	x		x					x

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
	x							x			x	
x	x		x	x		x		x	x	x	x	x
x				x				R				x
x				x		x		x	x	x	x	x
x	x			x		x		x	x	x	x	x
x	x	x	x	x		x	x	x	x	x	x	x
x								x			x	x
	x		x	x	x		x		Cub			
R	x			x		x		x	x	x	x	x
	x			x		x	x	x	x	x	x	x
x				x		x						x
x	x			x				x	x	x	x	x
x			x		x						x	
	x			x		x	x	x	x	x		
x				x		x	x	x	x	x		
	x			x		x	x	x	x		R	
	x	x	x			x		x	x	x		
x	R			x		x	x	x	x	x	x	x
R	x			x	x	x	x	x	x	x	x	x
x				x		x		x	x	x	x	x
x			x	x		x	x	x	x	x	x	x
x				x		x			x	x		
x				x		x		x	x	x	Mad	
x	x			x		x			x	x	R	
x	x	x	x		x		x	x	x	x	x	x
x		x				x	x	x	x		x	
	x	x							x	x		
	x	x		x			x	x	x	x	x	x
	x	x		x		x	x	x	x	x	x	x
	x	x									x	
	x	x		x	x		x	x	x		x	
x				x		x		x			x	
x				x		x		x				
x	sl			x		x		x	x	x		x
R	x			x		x	x	x	x	x		
x	x			x		x		x	x	x	x	x
	x			x		x			x	x		

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ length of endosperm	more than ½ length of endosperm
Caryophyllales											
107. Cactaceae		x	x	peri	peri		peri	peri			peri
108. Aizoaceae	(1)	x	x	peri			peri				peri
109. Portulacaceae	1	x	x	peri		peri		peri R			peri
110. Basellaceae	1			peri		peri		peri			peri
111. Didiereaceae	1			x	x			x			
112. Gyrostemonaceae	1			x		x		x			
113. Phytolaccaceae	1			peri		peri					peri
114. Barbeuiaceae	1			x		x					x
115. Achatocarpaceae	1			peri		peri					x
116. Petiveriaceae	1			peri			peri				
117. Agdestidaceae	1			peri				peri			
118. Nyctaginaceae	1			peri		peri		R			peri
119. Stegnospermataceae	1	x		peri		peri					x
120. Caryophyllaceae	1	x	x	peri	peri	peri		peri			peri
121. Molluginaceae	1		x	peri		peri					peri
122. Illecebraceae	1			peri		peri		peri			peri
123. Amaranthaceae	1	R		peri		peri					peri
124. Chenopodiaceae	1			peri	peri	peri		peri			peri
Polygonales											
125. Polygonaceae	1			x		x				x	x
Primulales											
126. Plumbaginaceae	1			x	x	x		x			x
127. Primulaceae		x	x	x		x			x		x
128. Tamaricaceae	2	x	x	x	x	x					x
129. Frankeniaceae	(1)	x	x	x		x					x
130. Myrsinaceae	1	x		x	x	x					x
131. Theophrastaceae	1		x	x		x					x
Plantaginales											
132. Plantaginaceae	1		x	x		x	x				x
Proteales											
133. Proteaceae	1	x	x	x	x			x			
Santalales											
134. Olacaceae	1			x		x			x		
135. Aptandraceae	1			x		x			x		
136. Octoknemaceae	1			x		x			x		
137. Opiliaceae	1			x		x				x	
138. Medusandraceae	1			x		x			x		
139. Cardiopteridaceae ?	1			x		x			x		
140. Santalaceae	1			x		x			x		x
141. Loranthaceae	1			x	x	x			x		x
142. Misodendraceae	1			x		x			x		
143. Grubbiaceae ?	1			x		x					x

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
R	x	x		x					x	x	R	
	x	x	x		x	x		x	x	x	x	x
	x	x	x		x		x	x	x	x	x	x
	x		x		x			x	x	x	x	
	x		x								Mad	
	x	x			x							x
	x	x			x	x	x	x	x	x	x	x
	x	x			x						Mad	
	x			x	x				x	x		
x	x					x			x	x		
	x			x		x			x	x		
R	x		x			x	R	x	x	x	x	x
	x			x	x				x			
R	x		x		x	x	x	x	x	x	x	x
	x	x			x				x		x	
	x	x	x	x	x	x	x	x	x	x	x	x
	x		x	x	x	x	x	x	x	x	x	x
	x		x		x	x	x	x	x	x	x	x
x	x	x		x	x	x	x	x	x	x	x	x
x		x	x	x		x	x	x	x	x	x	x
x		x	x		x	x	x	x	x	x	x	x
x		x	x				x	x			x	
x		x	x	x	x	x	x	x	x	x	x	x
x	x	x				x		x	x	x	x	x
x		x	x						x	x		
x	x	x		x	x	x	x	x	x	x	x	x
x				x		x		x	x	x	x	x
x								x	x	x	x	x
								x	x	x	x	
x		x									x	
			x		x			x	x	x	x	x
x		x			x						x	
								x				
x		x	x	x			x	x	x	x	x	x
x		x	x				x	x	x	x	x	x
x		x								x		
		x			x						x	

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ length of endosperm	more than ½ length of endosperm
Thymelaeales											
144. Geissolomataceae	1			x		x					
145. Gonystylaceae ?	1				x						
146. Thymelaeaceae	1			x	x	R		x			x
Euphorbiales											
147. Euphorbiaceae	1			x	R	x		R			x
148. Simmondsiaceae ?	1				x						x
149. Callitrichaceae	1			x			x	x			x
150. Aextoxicaceae	1			x		x				x	
151. Pandaceae	1			x		x					x
Urticales											
152. Eucommiaceae ?	1			x		x					x
153. Barbeyaceae	1				x						
154. Urticaceae	1			x				x			x
155. Theligonaceae	1			x		x					x
156. Cannabaceae	1			x			x	x			x
157. Moraceae	1			x	R		x	x			x
158. Ulmaceae	1			x	x		x				x
Malvales											
159. Sterculiaceae	1	x		x	x	x					x
160. Elaeocarpaceae	1	x		x		x					x
161. Tiliaceae	1	x		x	R	x					x
162. Sphaerosepalaceae	1			x			x				
163. Malvaceae	1	x	x	x	x			x			x
164. Bombacaceae	(1)	x	x	x				x			x
Violales											
165. Flacourtiaceae	(1)	x	x	x		x		R	R		x
166. Lacistemataceae	1			x		x					x
167. Passifloraceae	(1)		x	x			x				x
168. Malesherbiaceae			x	x		x					x
169. Turneraceae	1	x	x	x			x				x
170. Achariaceae	1	x	x	x		x			x		
171. Caricaceae			x	x		x	x				x
172. Violaceae	1	x	x	x		x	x	R			x
173. Stachyuraceae ?			x	x		x		x			x
174. Scyphostegiaceae ?			x	x				x			
175. Peridiscaceae	1			x		x			x		
176. Hoplestigmataceae ?	2			x				x	x		
177. Loasaceae	(1)	x	x	x	x	x	x		x		x
178. Cucurbitaceae	(1)	x	x	x	x			R			
Rhamnales											
179. Vitaceae	2			x		x			x		
180. Leeaceae	1			x		x					
181. Rhamnaceae	1			x	x		x	x			x

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
x											x	
				x		x		x				
x				x		x	x	x	x	x	x	x
x	R		x	x	x	x	x	x	x	x	x	x
				x					x			
		x					x	x	x	x	x	x
	x			x		x				x		
	x			x		x		x			x	
x				x		x		x				
x				x		x		x			x	
x			x	x		x	x	x	x	x	x	x
	x		x	x			x	x			Nor	
	x		x	x		x	x	x	x			
	x		x	x		x	x	x	x	x	x	x
x	x			x		x	x	x	x	x	x	x
x	x		x	x		x		x	x	x	x	x
x			x	x		x		x	x	x		x
x	x		x			x	x	x	x	x	x	x
x				x		x					Mad	
	x		x	x		x	x	x	x	x	x	x
	x		x			x		x	x	x	x	x
x		R		x		x		x	x	x	x	x
x		x		x		x			x	x		
x				x		x		x	x	x	x	x
x		x	x							x		
x				x		x			x	x	x	
x		x			x						x	
x				x		x			x	x	x	
x		x		x			x	x	x	x	x	x
x				x				x				
x			x		x			Bor				
x			x			x				x		
x				x		x					x	
x	x	x		x	x	x		x	x	x	R	R
x				x		x	x	x	x	x	x	x
x		x	x			x	x	x	x	x	x	x
x		x						x				
x	R			x		x	x	x	x	x	x	x

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ length of endosperm	more than ½ length of endosperm
182. Erythropalaceae	1			x		x			x		
183. Aquifoliaceae	1			x		x			x		
184. Icacinaceae	1			x	R	x			x		
Celastrales											
185. Ctenolophonaceae	1			x		x					
186. Ixonanthaceae	1			x	x			x			
187. Irvingiaceae	1			x	x			x			x
188. Dichapetalaceae	1				x						
189. Celastraceae	1	x		x	x	x	x				x
190. Goupiaceae		x		x		x					x
191. Siphonodontaceae	1	x		x		x	x				
Dilleniales											
192. Dilleniaceae	1-3	x		x		x			x		
193. Actinidiaceae			x	x		x					x
194. Saurauiaceae			x	x		x					x
Rosales											
195. Rosaceae	1,2	x	x	x	x			x			x
196. Chrysobalanaceae	1				x						
197. Elaeagnaceae	1			x	x			x			x
198. Neuradaceae	1,2				x						
199. Corynocarpaceae ?	1				x						
200. Crossosomataceae ?	3	x		x		x					
Myrtales											
201. Myrtaceae	1-3	x	R	x	x			x			
202. Lecythidaceae	1-3	x	x		x						
203. Barringtoniaceae	1-3	x		x		x					x
204. Asteranthaceae		x		x		x					
205. Dialypetalanthaceae			x	x				x			
206. Sonneratiaceae			x		x						
207. Punicaceae			x		x						
208. Rhizophoraceae	1			x	x	x					
209. Lythraceae			x	x	x			R			
210. Crypteroniaceae			x		x						
211. Oliniaceae		x			x						
212. Penaeaceae	1				x						
213. Melastomataceae		x	x		x						
214. Onagraceae	(1)	x	x		x						
215. Haloragaceae	1			x			x	x			x
216. Hippuridaceae	1			x				x			x
217. Trapaceae	1				x						
218. Combretaceae	1				x						
Theales											
219. Theaceae	1-3	x		x	x		x				x
220. Bonnetiaceae	3		x	x	x			x			

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
				x	x			x				
							x	x	x	x	x	x
x	x			x		x		x	x	x	x	x
x								x			x	
								x	x	x	x	
		x				x		x			x	
x				x		x		x	x	x	x	x
x				x			x	x	x	x	x	x
x			x		x					x		
x				x		x		x				x
x		x	x		x			x	x	x	R	x
x		x	x			x		x				
x	x	x			x			x	x	x		
x	R			x	x	x	x	x	x	x	x	x
x	R			x		x		x	x	x	x	x
x				x		x	x	x	x			x
	x		x			x	x	x			x	
x				x								x
	x			x		x			x			
x	x	x	x	x	x	x	x	x	x	x	x	x
	x		x	x		x			x	x		
			x			x		x			x	x
	x									x	x	
x		x								x		
	x	x						x			x	x
	x			x		x	x	x				
x	x	x						x	x	x	x	x
x		x		x		x	x	x	x	x	x	x
x			x	x	x			x				
	x			x							x	
x		x			x						x	
x	x	x		x				x	x	x	x	x
x				x		x	x	x	x	x	x	x
x		x					x	x	x	x	x	x
x		x	x				x	x	x	x		
				x		x	x	x			x	
x	x			x				x	x	x	x	x
x	x		x	x	x	x		x	x	x	x	x
x		x			x			x	x	x		

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ length of endosperm	more than ½ length of endosperm
221. Pentaphylacaceae	2			x				x			
222. Pellicieraceae	1				x						
223. Medusagynaceae	2			x				x			
224. Eucryphiaceae		x		x				x			x
225. Paracryphiaceae	2,3	x		x		x			x		
226. Symplocaceae		x		x		x					x
227. Tetrameristaceae	1				x						
228. Clusiaceae	1-3	x	x		x						
229. Quiinaceae	1-3				x						
230. Hypericaceae			x		x						
231. Elatinaceae			x		x						
232. Dipterocarpaceae	1			x	x			x			
233. Humiriaceae	1,2			x		x					
234. Ancistrocladaceae ?	1			x		x				x	
235. Marcgraviaceae			x		x						
236. Caryocaraceae	1			x	x			x			
237. Ochnaceae	1	x	x	x	x	x					
238. Strasburgeriaceae	1										
239. Diegodendraceae	1				x						
240. Scytopetalaceae	(1)2,3	x		x		x					x
241. Sarcolaenaceae	1	x		x		x				x	
Ericales											
242. Ericaceae	1	x	x	x	x	x	x			x	x
243. Tremandraceae	1,2	R		x		x					x
244. Epacridaceae	1	x		x		x			x		
245. Clethraceae			x	x			x				x
246. Empetraceae	1			x		x					x
247. Pyrolaceae			x	x		x	x				x
248. Monotropaceae			x	x		x	x		x		
249. Diapensiaceae		x	x	x		x				x	
250. Cyrillaceae	1			x		x					x
251. Lennoaceae	1			x		x			x		
Ebenales											
252. Ebenaceae	1,2			x		x				x	x
253. Sapotaceae	1			x	x		x				x
Styracales											
254. Styracaceae	1	x	R	x		x					x
255. Lissocarpaceae	1,2			x		x				x	
256. Alangiaceae	1			x		x	x				x
Rafflesiales											
257. Hydnoraceae			x	x		x			x		
258. Rafflesiaceae			x	x				x			
259. Balanophoraceae	1			x		x			x		

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
	x		x		x			x				
x				x		x			x	x		
			x								Sey	
x				x		x				x		x
x		x										N.Cal
x	x	x						x	x	x		x
		x						x				
x		x		x	x	x		x	x	x	x	x
x									x	x		
x	R	x			x		x	x	x	x	x	x
x	x	x		x	x		x	x	x	x	x	x
	x			x		x		x				
x	sl	x		x		x				x	R	
		x			x			x			x	
x	x	x		x		x			x	x		
	x	x							x	x		
x			x	x		x		x	x	x	x	x
				x		x						N.Cal
				x							Mad	
				x		x					x	
			x			x					Mad	
x	R	x	x		x	x	x	x	x	x	x	x
x		x	x		x							x
x				x	x					R		x
x		x			x			x	x	x	Mda	
x	x	x			x		x	x	x	x		
							x	x	x			
		x					x	x	x	x		
x	x	x			x		x	x	x			
		x		x		x			x	x		
									x	x		
x			x	x		x		x	x	x	x	x
x			x	x		x		x	x	x	x	x
x	x	R	x	x	R	x	x	x	x	x		
x										x		
x				x		x		x			x	x
										x	x	
							x	x	x	x	x	x
								x	x	x	x	x

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ length of endosperm	more than ½ length of endosperm
Araliales											
260. Araliaceae	1			x		x			x		x
261. Apiaceae	1			x		x			x		x
Saxifragales											
262. Crassulaceae		R	x	x	R			x			x
263. Saxifragaceae			x	x		x			x		x
264. Parnassiaceae			x	x	x			x			x
265. Eremosynaceae	1			x		x					
266. Francoaceae			x	x		x			x		
267. Davidsoniaceae	2				x						
268. Hydrangeaceae			x	x		x			x		x
269. Philadelphaceae	(1)		x	x		x					x
270. Pterostemonaceae	1	x		x		x					x
271. Iteaceae		x	x	x		x	x				x
272. Baueraceae	1	x		x		x					
273. Bruniaceae	1	x		x		x			x		
274. Vahliaceae			x	x		x					x
275. Donatiaceae		x		x		x			x		
276. Tetracarpaeaceae			x	x		x			x		
277. Escalloniaceae			x	x		x			x		
278. Grossulariaceae			x	x		x			x		
279. Brunelliaceae	1,2			x		x					x
280. Cunoniaceae	(1)	x	x	x		x				x	x
281. Greyiaceae			x	x		x			x		
282. Cephalotaceae	1(2)			x		x				x	
Begoniales											
283. Begoniaceae			x	x	x			x			
284. Datiscaceae			x		x						
Droserales											
285. Dioncophyllaceae		x		x		x					x
286. Droseraceae		x	x	x		x			x		
287. Byblidaceae	1	x		x		x			x		x
288. Podostemaceae ?	(2)	R	x		x						
289. Hydrostachyaceae ?			x		x						
Sarraceniales											
290. Sarraceniaceae			x	x		x			x		x
Nepenthales											
291. Nepenthaceae			x	x		x					x
Polemoniales											
292. Polemoniaceae	1	x		x	x	x		R			x
293. Hydrophyllaceae	2		x	x		x		x	x		x
294. Boraginaceae	1-4			x	x		x	x			x
295. Fouquieriaceae		x		x				x			x

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
x		x				x	x	x	x	x	x	x
x		x	x	x	x	x	x	x	x	x	x	x
x			x	x		x	x	x	x	x	x	x
x		x			x	x	x	x	x	x	x	x
x		x			x	x	x	x	x			
												x
x			x		x					x		
x				x		x						x
x		x			x			x	x	x		
x		x	x		x	x	x	x	x			
									x			
x		x			x			x	x			
		x			x							x
x			x		x						x	
		x						x			x	
										x		
												x
		x			x			x		x	x	x
x		x			x		x	x	x	x	x	
x				x		x			x	x		
x		x	x	x		x		x	x	x	x	x
x											x	
x				x		x						x
x		x	x		x			x	x	x	x	
x			x		x		x	x	x			
											x	
x		x					x	x	x	x	x	x
x		x			x						x	x
x				x		x		x	x	x	x	x
x				x	x						x	
x		x	x		x				x	x		
x		x		x				x			Mad	x
x	x	x	x	x	x	x	x	x	x	x		
x		x			x	x		x	x	x	x	R
x	x	x	x	x	x	x	x	x	x	x	x	x
x				x		x			x			

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ length of endosperm	more than ½ length of endosperm
Gentianales											
296. Loganiaceae	(1)		x	x		x	x		x		x
297. Rubiaceae	1	x	x	x	x	x		x	x		x
298. Columelliaceae			x	x		x			x		
299. Gentianaceae			x	x		x			x		x
300. Menyanthaceae		x	x	x		x				x	x
301. Convolvulaceae	1		R	x			x	x			x
302. Cuscutaceae	1,2			x			x				x
303. Apocynaceae	1	x	x	x	x	x		x	x		
304. Plocospermataceae	1			x				x			
305. Asclepiadaceae			x	x			x				x
Oleales											
306. Oleaceae	1	x		x	x	x		x	x		x
307. Salvadoraceae	1				x						
Cornales											
308. Davidiaceae	1			x			x				x
309. Nyssaceae	1			x		x		x			x
310. Garryaceae	1,2			x		x			x		
311. Cornaceae	1			x		x			x		x
Dipsacales											
312. Caprifoliaceae	1	x		x		x			x		x
313. Adoxaceae	1	x		x		x			x		
314. Valerianaceae	1				x						
315. Dipsacaceae	1			x			x	x	x		x
Scrophulariales											
316. Solanaceae	(1-4)		x	x	x	x		x			x
317. Nolanaceae		x		x		x		x			x
318. Scrophulariaceae		R	x	x	x	x		x	x		x
319. Orobanchaceae			x	x		x			x		
320. Buddlejaceae ?	(1)	x	x	x		x	x	x		x	
321. Globulariaceae	1			x		x					x
322. Lentibulariaceae	(1,2)		x		x						
323. Acanthaceae		x		x	x		x	x			x
324. Bignoniaceae		R	x		x						
325. Gesneriaceae			x	x	R	x					x
326. Pedaliaceae	1	x	x	x	x			x			x
Lamiales											
327. Myoporaceae	1			x	x			x			x
328. Verbenaceae	1-4			x	x		R	x			x
329. Phrymaceae	1				x						
330. Lamiaceae	(1)-4			x	x			R			x
Campanulales											
331. Campanulaceae	(1)	R	x	x		x			x		x
332. Goodeniaceae	1	x		x		x					x

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
x	R	x	x	x	x	x		x	x	x	x	x
x	R	x	x	x	x	x	x	x	x	x	x	x
x		x			x					x		
x		x	x		x	x	x	x	x	x	x	x
x		x			x		x	x	x	x	x	x
R	x			x	x	x	x	x	x	x	x	x
	x	x	x	x	x		x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x	x
x									x			
x				x		x	x	x	x	x	x	x
x	R		x	x		x	x	x	x	x	x	x
x				x		x		x			x	
x				x		x		x				
x				x		x		x	x			
x			x			x			x			
x		x	x	x		x	x	x	x	x	x	
x		x	x		x	x	x	x	x	x	R	x
x		x			x		x	x	x			
x			x	x	x	x	x	x	x	x	R	
x		x	x	x		x	x	x			x	
R	x	x	x	x	x	x	x	x	x	x	x	x
	x			x	x					x		
x	x	x	x	x	x	x	x	x	x	x	x	x
							x	x	x	x	x	x
x		x			x			x	x	x	x	
x			x	x	x	x	x	x			x	
x		x			x		x	x	x	x	x	x
	x			x		x	x	x	x	x	x	x
x				x		x		x	x	x	x	x
x		x	x		x		R	x	x	x	x	x
x				x		x		x	x	x	x	x
x	sl	x			x			x	W.I.	?	?	x
x			x	x		x	x	x	x	x	x	x
	x			x		x		x	x			
x	R		x	x		x	x	x	x	x	x	x
x		x	x		x	x	x	x	x	x	x	x
x		x	x			x		x	x	x	x	x

Table 1f cont.

Order Family	Seeds per locule			Endosperm					Embryo		
	1-3(4)	few to sev	many	present	absent	abundant	moderate	scant	less than ½ lemgth of endosperm	½ length of endosperm	more than ½ length of endosperm
333. Brunoniaceae	1				x						
334. Calyceraceae	1			x		x		x			x
335. Stylidiaceae			x	x		x			x		
Asterales											
336. Asteraceae	1				x						

Embryo		Cotyledons					Distribution					
straight	curved or contorted	shorter than radicle	equal in length to radicle	longer than radicle	as wide as radicle	wider than radicle	Europe	Asia	North America	South America	Africa	Australia and Pacific
x			x	x		x						x
x		x			x					x		
								x		x		x
x		x	x	x		x	x	x	x	x	x	x

Table 2a. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; usu, usually; W.I., West Indies;

	Habitat									Xylem perforations				Leaves		
	Moisture			Temperature		Habit										
Order Family	wet	mesic	dry	temperate	hot	trees	shrubs	lianas	herbs	present	absent	sclariform	simple	alternate	opposite	whorled
Pandanales																
1. Pandanaceae	×	×			×	×	×		×	×	×	×		×		
Arecales																
2. Arecaceae	×	×	×	R	×	×	×	×		×	R	×	×	×		
Cyclanthales																
3. Cyclanthaceae		×			×	R	×	×	×	×	×	×		×		
Arales																
4. Araceae	×	×		R	×		R	×	×	×	×	×		×		
5. Lemnaceae	×			×	×				×		×					
Alismatales																
6. Alismataceae	×			×	×				×	×	×	×	×	×		
7. Butomaceae	×			×					×	×	×	×	×	×		
8. Hydrocharitaceae	×			×	×				×	×	×	×		×	×	
Juncaginales																
9. Scheuchzeriaceae	×			×					×	×	×	×		×		
10. Juncaginaceae	×			×					×	×	×	×		×		
11. Lilaeaceae	×			×					×	×	×	×		×		
Najadales																
12. Aponogetonaceae	×				×				×		×			×		
13. Zosteraceae	×			×	R				×		×			×		
14. Potamogetonaceae	×			×	×				×	×	×	×		×	×	
15. Zannichelliaceae	×			×	×				×		×			×	×	×
16. Najadaceae	×			×	×				×		×					sub
17. Posidoniaceae	×			×					×		×			×		
Triuridales																
18. Triuridaceae		×		R	×				×		×			×		
Typhales																
19. Sparganiaceae	×			×	×				×	×		×		×		
20. Typhaceae	×			×	×				×	×		×		×		
Juncales																
21. Juncaceae	×	×		×	R		R		×	×		×	×	×		
22. Thurniaceae	×				×				×	×		×	×	×		
23. Restionaceae	R		×	×	×				×	×	×	×	×	×		
24. Centrolepidaceae	×			×	×				×	×		×		×		
25. Flagellariaceae		×			×		R		×	×		×	×	×		
Cyperales																
26. Cyperaceae	×	×		×	×		R		×	×		×	×	×		
Poales																
27. Poaceae	×	×	×	×	×	R	×		×	×		×	×	×		

of monocotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

Leaves								Intra-vaginal scales		Stomates						Crystals		
		sheath				margins												
spiral	distichous	open	closed	simple	compound	entire	dentate or serrate	Absent	present	present	absent	anomocytic	paracytic	tetracytic	hexacytic	raphids	silica	calcium oxalate
×		×		×		×	×	×		×				×		×		
×			×	×		R		×		×				×	×	×	×	
×	×			×		×		×		×				×		×		×
×	×	×	×	×	×	×			R	×			×	×	×	×		
				×				×		×		×				S		
		×		×		×			×	×			×	×		×		×
				×		×			×	×			×					
				×		×	R		×	×			×					
		×		×		×		×		×				×				×
		×		×		×			×	×				×				×
		×		×		×		×		×								×
				×		×			×	×			×					×
×	×	×	×	×		×	×		×		×							
	×	×		×		×	R		×	×			×					
	×	×		×		×	×		×		×							
	×	×		×		×	×	×			×							
		×		×		×			×		×							
				×		×		×			×							
	×	×		×		×		×		×			×			×		×
	×	×		×		×		×		×			×			×		×
×		×	R	×		×		×		×			×					
×		×		×		×		×		×			×	×			×	
	×	×		×		×		×		×			×				×	R
×	×	×		×		×		×		×			×					
	×	×	×	×		×		×		×			×				S	
×	R	R	×	×		×		×		×			×	R			×	
R	×	×	R	×		×		×		×			×				×	

Table 2a cont.

Order Family	Habitat: Moisture: wet	Habitat: Moisture: mesic	Habitat: Moisture: dry	Habitat: Temperature: temperate	Habitat: Temperature: hot	Habit: trees	Habit: shrubs	Habit: lianas	Habit: herbs	Xylem perforations: present	Xylem perforations: absent	Xylem perforations: sclariform	Xylem perforations: simple	Leaves: alternate	Leaves: opposite	Leaves: whorled
Liliales																
28. Trilliaceae		×		×					×	×	×	×			×	×
29. Liliaceae		×	R	×	×				×	×	×	×	×	×		×
30. Smilacaceae		×	×	×	×		×	×	×	×	×	×		×	R	
31. Agavaceae			×	×	×	×	×		×	×	×	×	×	×		
32. Xanthorrhoeaceae			×	×	×		×		×	×	×	×	×	×		
33. Philesiaceae		×		×	×		×	×		×	×	×	×	×		
34. Stemonaceae		×		×	×				×	×	×	×		×	×	×
35. Dioscoreaceae		×		R	×		×	×	×	×		×		×	R	
36. Taccaceae		×			×				×	×	×	×		×		
37. Pontederiaceae	×			×	×				×	×	×	×		×		
38. Amaryllidaceae		R	×	×	×				×	×	×	×		×		
39. Velloziaceae			×		×		×		×	×	×	×	×	×		
Bromeliales																
40. Bromeliaceae		×	×	×	×		R		×	×	×	×	×	×		
Commelinales																
41. Commelinaceae	R	×	R	×	×				×	×	×	R	×	×		
42. Xyridaceae	×			×	×				×	×			×	×		
43. Mayacaceae	×			R	×				×	×		×		×		
44. Rapateaceae	×				×				×	×	×	×	R	×		
45. Eriocaulaceae	×			R	×				×	×		×	×	×		
Zingiberales																
46. Musaceae		×			×				×	×	×	×	×	×		
47. Strelitziaceae		×			×	×			×	×	×	×	×	×		
48. Lowiaceae		×			×				×	×	×	×		×		
49. Zingiberaceae		×			×				×	×	×	×	×	×		
50. Cannaceae	×	×			×				×	×	×	×	×	×		
51. Marantaceae	×	×		R	×		R		×	×	×	×	×	×		
Iridales																
52. Haemodoraceae		×		R	×				×	×	×	×	×	×		
53. Philydraceae	×				×				×	×	×	×		×		
54. Iridaceae	R	×		×	×		R		×	×	×	×	×	×		
55. Burmanniaceae		×		R	×				×	×		×		×		
Orchidales																
56. Corsiaceae		×			×				×		×			×		
57. Orchidaceae	×	×	×	×	×		R		×	×	×	×	×	×	R	

Leaves								Intra-vaginal scales		Stomates						Crystals		
		sheath				margins												
spiral	distichous	open	closed	simple	compound	entire	dentate or serrate	Absent	present	present	absent	anomocytic	paracytic	tetracytic	hexacytic	raphids	silica	calcium oxalate
				×		×		×		×		×				×		
×	×			×		×		×		×		×				S		
				×		×	×	×		×		×				×		
×		×		×		×	×	×		×		×	R	×		×		
×		×		×		×		×		×		×	×			×		
×	×			×		×		×		×		×				S		
×	×			×		×		×		×		×				S		
×				×	R	×		×		×		×				×		
×				×		×		×		×		×				×		
R	×	R	×	×		×			S	×			×			×		
		×	×	×		×		×		×		×				S		
×				×		×	×	×		×			×	R		S		
×	R	×		×		×	×	×		×				×	×	×	×	
×	×		×	×		×		×		×			×	×	×	×	S	
×	×	×		×		×		×		×		×	×					S
×				×				×		×			×					
	×	×		×		×		×		×		×	×	×			×	
×	R			×		×		×		×			×				R	×
×		×		×		×		×		×				×	×	×	×	
	×			×		×		×		×			×	×		×	×	
	×	×		×		×		×		×			×			×	×	
×	×	×	×	×		×		×		×			×	×	×		×	×
×		×		×		×		×		×			×				×	×
×	×	×		×		×		×		×			×	×	×		×	×
	×	×	×	×		×		×		×		sub	×			×		
	×	×		×		×		×		×			×	×				×
	×	×		×		×		×		×		×						×
	×	×		×		×		×		×		×				×		
				×		×		×			×							
×	×	R	×	×		×		×		×		×	×	R		×	R	

Table 2b. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; usu, usually; W.I., West Indies;

Order Family	Inflorescences										Flowers	
	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme	actinomorphic	zygomorphic
Pandanales												
1. Pandanaceae				×			×					
Arecales												
2. Arecaceae			×	×			R			×	×	R
Cyclanthales												
3. Cyclanthaceae			spa								×	
Arales												
4. Araceae			spa								×	
5. Lemnaceae									×			
Alismatales												
6. Alismataceae	×			×						×	×	
7. Butomaceae						×				×	×	
8. Hydrocharitaceae						×		×		×	×	
Juncaginales												
9. Scheuchzeriaceae	×										×	
10. Juncaginaceae			×								×	
11. Lilaeaceae			×									
Najadales												
12. Aponogetonaceae			×									
13. Zosteraceae			spa									
14. Potamogetonaceae			×								×	
15. Zannichelliaceae								1pa		×		
16. Najadaceae								1pa	×			
17. Posidoniaceae			×								×	
Triuridales												
18. Triuridaceae	×	×									×	
Typhales												
19. Sparganiaceae			×	×			×					
20. Typhaceae			spa									
Juncales												
21. Juncaceae		×		×			×	×		×	×	
22. Thurniaceae							×				×	
23. Restionaceae			×	×				R			×	
24. Centrolepidaceae			×				×	R				
25. Flagellariaceae			×	×							×	
Cyperales												
26. Cyperaceae			×	×		×						
Poales												
27. Poaceae			×	×			×					

of monocotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

Sex				Sepals											Petals		
hermaphroditic	dioecious	monoecious	polygamous	present	absent	number	corolline	green or glumaceous	distinct	connate	imbricate	not imbricate	diplomerous	haplomerous	oligomerous	present	absent	number
	×				×												×	
×	×	×	×	×		3(2)	R	×	×	×	×	×		×	R	×	×	3(2,0)
		×		×	×	0,4,8			×	×		×	×	×			×	
×	para R	×		×	×	0,2,3(4)			×	×		×		×	×	×	×	0,2,3(4)
	R	×			×												×	
×	R	×	×	×		3		×	×		×	×		×		×	×	3(0)
×				×		3	×		×		×			×		×		3
R	×	×	×	×		3(2)		×	×		×			×	R	×	R	3(0)
×				×		3			×					×		×		3
×	×	×		×		3			×		×	×		×		×		3
×		×			×												×	
×	R			×	×	0-3			×			×		×	×		×	
	×	×			×												×	
×				×	×	4,0			×		×	×		×			×	
	×	×		×	×	3,0			×			×		×			×	
	R	×		×		2(?)				×					×		×	
			×	×	×	0,3			×			×		×			×	
	×	×	R	×		6(3-8)	×		×	×		×	×	R			×	
		×		×		3		×	×			×		×		×	×	0,3
		×			×												×	
×	R			×		3		gl	×		×	×		×		×		3
×				×		3			×			×		×		×		3
R	×	R		×	R	3(0)		gl	×	R		×		×		×	R	3(0)
×		×			×												×	
×				×		3		×	×	×				×		×		3
×	R	×			×												×	
×	R	R			×												×	

Table 2b cont.

Order Family	Inflorescences raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme	Flowers actinomorphic	zygomorphic
Liliales												
28. Trilliaceae						×		×			×	
29. Liliaceae	×		×			R		×		×	×	R
30. Smilacaceae	×		×	R		×					×	
31. Agavaceae	×		×	×	×		R	R		×	×	R
32. Xanthorrhoeaceae			×	×			×	R			×	
33. Philesiaceae	×							×	×	×	×	
34. Stemonaceae	×					sub		×		×	×	
35. Dioscoreaceae	×		×	×			×			×	×	
36. Taccaceae						×				×	×	
37. Pontederiaceae	×			×	×			R		×	×	×
38. Amaryllidaceae						×	R sub	R		×	×	R
39. Velloziaceae								×			×	
Bromeliales												
40. Bromeliaceae	×		×	×			×	R			×	
Commelinales												
41. Commelinaceae			R		×			R	×	×	×	×
42. Xyridaceae			×	R			×	R			×	R
43. Mayacaceae						sub		×			×	
44. Rapateaceae						sub	×				×	
45. Eriocaulaceae							×				×	×
Zingiberales												
46. Musaceae	×		×							×		×
47. Strelitziaceae										×		×
48. Lowiaceae										×		×
49. Zingiberaceae	×		×				×	×		×		×
50. Cannaceae	×			×						×		×
51. Marantaceae	×		×	×			×			×		×
Iridales												
52. Haemodoraceae	×			×			sub			×	×	×
53. Philydraceae			×									×
54. Iridaceae	×		×	×				×		×	×	×
55. Burmanniaceae								×		×	×	R
Orchidales												
56. Corsiaceae								×				×
57. Orchidaceae	×		×	×			R	×				×

Sex				Sepals												Petals		
hermaphroditic	dioecious	monoecious	polygamous	present	absent	number	corolline	green or glumaceous	distinct	connate	Imbricate	not Imbricate	diplomerous	haplomerous	oligomerous	present	absent	number
×				×		3(2,4,5)		×	×		×	×		×	R	×		3(2,4,5)
×			R	×		3(2,4,5)	×		×	×	×	×		×	R	×		3(2,4,5)
R	×			×		3		×	×	R		×		×		×	R	3(0)
×	R		R	×		3	×		×	×		×		×		×		3
×	×			×		3	R	gl	×	×	×			×		×		3
×				×		3	×		×	R	×			×		×		3
×				×		2(5)	×		×	×		×		R	×	×		2
	×			×		3				×		×		×		×		3
×				×		3	×			×		×		×		×		3
×				×		3(2)	×		R	×		×		×	R	×		3(2)
×				×		3	×		×	×	×	×		×		×		3
×	R			×		3	×		×	×		×		×		×		3
×	R		R	×		3	×	×	×	×	×			×		×		3
×			R	×		3	×	×	×	R	×			×		×		3
×				×		3(2)	×	2 gls	×	R	×	×		×	R	×		3
×				×		3		×	×			×		×		×		3
×				×		3		gl	×	×		×		×		×		3
	R	×		×	R	2,3(0)			×	×		×		×	×	×	R	2,3(0)
×		×		×		3(?)	×			×		×		×		×		3(?)
×				×		3(?)	×			×	×			×		×		3(?)
×				×		3	×			×				×		×		3
×			R	×		3		×		×		×		×		×		3
×				×		3		×	×		×			×		×		3
×				×		3		×	×		×			×		×		3
×				×		3	×		×	×		×		×		×		3
×				×		2	×		×	×	×				×	×		2
×				×		3	×		×	×	×	×		×		×		3
×				×		3	×			×		×		×		×	R	3(0)
×				×		3	×		×		×			×		×		3
×	R	R	R	×		3	×	R	×	×		×		×		×		3

Table 2c. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; usu, usually; W.I., West Indies;

Order Family	Petals				Stamens								
	distinct	connate	haplomerous	oligomerous	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth
Pandanales													
1. Pandanaceae					9-~300	×				×	×		
Arecales													
2. Arecaceae	×	×	×	R	6(3-~400)	R	×	R		×	×	×	R
Cyclanthales													
3. Cyclanthaceae					6-~150	×	×				×	×	
Arales													
4. Araceae	×	×	×	×	4,6(1-8)	R	×	×	R	×	×	×	
5. Lemnaceae					1,2				×	×			
Alismatales													
6. Alismataceae	×		×		6(3-~40)	R	×	R		×		×	
7. Butomaceae	×		×		9	×				×		×	
8. Hydrocharitaceae	×		×		12-1	×	×	×	×	×	×	×	
Juncaginales													
9. Scheuchzeriaceae	×		×		6(more)	×	×			×		×	
10. Juncaginaceae	×		×		6,3(4)		×	×		×		×	
11. Lilaeaceae					1				×	×			
Najadales													
12. Aponogetonaceae					6-12(-16)	×	×			×		×	
13. Zosteraceae					1				×	×			
14. Potamogetonaceae					4,2			×	×	×			
15. Zannichelliaceae					3,2,1			×	×	×	R		
16. Najadaceae					1				×	×			
17. Posidoniaceae					3(4)			×		×			
Triuridales													
18. Triuridaceae					3,6(1-5)		×	×	R		×	×	
Typhales													
19. Sparganiaceae	×		×		3-6(-8)	R	×	×		×	×		
20. Typhaceae					2-5(-8)	R	×	×	×	×	×		
Juncales													
21. Juncaceae	×		×		6(3)		×	R		×			
22. Thurniaceae	×		×		6		×			×			×
23. Restionaceae	×	R	×		3,2(1)			×	×	×	R		
24. Centrolepidaceae					1(2)				×	×			
25. Flagellariaceae	×	×	×		6		×			×		×	×
Cyperales													
26. Cyperaceae					3(1-22)	R	R	×	R	×			
Poales													
27. Poaceae					3,6(1-120)	R	×	×	R	×	R		

of monocotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume;
N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome;
see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix;
1pa, 1 per axil; ~, about; and ∞, many.

Staminodes			Anthers			Pollen											
present	absent	number	adnate	basifixed	dorsifixed	with apertures	inaperturate	1(-3)-sulcate	ulcerate	poly-(2-4)porate	trichotomosulcate	spirapertur ate	2 celled	3 celled	diss by wind	diss by animals	diss by water
	×			×		×		?	×				×		×	×	
	×			×	×	×		1,2		R	×		×		R	×	
×		4		×	×	×		×	×				×			×	
	×		R	×		×		×	×	×			×	×	R	×	
	×					×			×					×			
	×			×	×	×				×				×	R?	×	
	×			×		×		×						×		×	
×		3				×	×	×					R	×	R	×	R
	×			×			×							×	×		
	×						×						×	×	×		
	×						×						×		×		
	×			×		×		×						×		×	
	×				×		×						×				×
	×						×							×	×		
	×			×			×						×	×			×
	×			×			×							×			×
	×		×				×							×			×
×		3					×							×	×		
	×			×		×			×					×	×		
	×			×		×			×				×		×		
	×			×		×			×					×	×		
	×			×		×			?						×		
×		3			×	×		×	×				×	×	×		
	×			×	×	×		×	×					×	×		
R	×	1		×	×	×			×				×		×		
	×			×		×		×	×	×				×	×	R	
	×			×		×			×					×	×	R	

Table 2c cont.

Order Family	Petals				Stamens								
	distinct	connate	haplomerous	oligomerous	number	pleiomerous	diplomerous	haplomerous	oligomerous	distinct	connate	free from perianth	adnate to perianth
Liliales													
28. Trilliaceae	×		×	R	6(2-20)	R	×	R	R	×		×	
29. Liliaceae	×	×	×	R	6(3,4,8,9,12)	R	×	R		×	×	×	×
30. Smilacaceae	×	R	×		6(3,9-18)	R	×	R		×	×		×
31. Agavaceae	×	×	×		6		×			×		R	×
32. Xanthorrhoeaceae	×	×	×		6		×			×		×	×
33. Philesiaceae	×	R	×		6		×			×	×	×	R
34. Stemonaceae	×	×		×	4(5)			×		×	×	×	×
35. Dioscoreaceae		×	×		6,3		×	×		×	×		×
36. Taccaceae		×	×		6,3(1)		×			×			×
37. Pontederiaceae	R	×	×	R	6(3-~48)		×	×	R	×		R	×
38. Amaryllidaceae	×	×	×		6(-~48)	R	×	R		×	×	×	×
39. Velloziaceae	×	×	×		6	R	×			×	×	×	×
Bromeliales													
40. Bromeliaceae	×	×	×		6		×			×	×	×	×
Commelinales													
41. Commelinaceae	×	R	×		6(3-1)		×	R	R	×	R	×	R
42. Xyridaceae	×	×	×		3(6)		R	×		×			×
43. Mayacaceae	×		×		3			×		×		×	
44. Rapateaceae		×	×		6		×			×		×	
45. Eriocaulaceae	×	×	×	×	4,6(1-3)		×	×	R	×	R	×	×
Zingiberales													
46. Musaceae		×	×		5(6)		×			×		×	
47. Strelitziaceae	×	×	×		5(6)		×			×			×
48. Lowiaceae	×		×		5		×			×		×	
49. Zingiberaceae		×	×		1				×				×
50. Cannaceae		×	×		1				×				×
51. Marantaceae		×	×		1				×				×
Iridales													
52. Haemodoraceae	×	×	×		3,6(1)		×	×	R	×			×
53. Philydraceae	×	×		×	1				×	×		×	×
54. Iridaceae	×	×	×		3			×		×	×	×	×
55. Burmanniaceae		×	×		3,6		×	×		×	×		×
Orchidales													
56. Corsiaceae	×		×		6		×			×	×	×	R
57. Orchidaceae	×	×	×		2,1(3)			R	×			×	

Staminodes			Anthers			Pollen											
present	absent	number	adnate	basifixed	dorsifixed	with apertures	inaperturate	1(-3)-sulcate	ulcerate	poly-(2-4)porate	trichotomosulcate	spiraperturate	2 celled	3 celled	diss by wind	diss by animals	diss by water
	×			×		×		×								×	
R	×	3		×	×	×	×	×		R	×		×	R		×	
×				×		×	×	×					×			×	
	×			R	×	×		1,2					×			×	
	×			×	×	×		1,2				×			×	×	
	×				×	×	×	×			×		×			×	
	×		×	×	×	×	R	×					×			×	
×		3(S)		×		×		1,2,3					×			×	
	×		×	×		×		×					×			×	
×		1,2(S)		×	×	×		2(1,3)					×			×	
	×			R	×	×		1,2					×			×	
	×			×	×		×	×								×	
	×			×	×	×		×					×		R	×	
S	×	2-4		×	×	×		×					×	R		×	
×		3			×	×		×					×	×		×	
	×			×			×	1,2,3					×			×	
	×			×		×		1,2								×	
	×					×						×		×	×	×	
S	×	1		×			×									×	
oft	×	1		×			×									×	
R	×	1(R)		×			×									×	
×		usu 2,4	×		R	×	×			R		R	×			×	
×		3(1,4)	×				×							×		×	
×		2-4	×				×									×	
S	×	2,3		×	×	×				2,-4			×			×	
	×					×		1(3)					×			×	
R	×	(1)		×	×	×	R	1(2)				R	×	R		×	
	×						×	?	1(-3)				×	×		×	
	×				×	×		×								×	
×		1,2	×	×		×	×	1,2		3,4			×			×	

Table 2d. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; usu, usually; W.I., West Indies;

Order Family	Nectaries						Pistils					
								simple				
	absent	present	septal	on pistils	on perianth	epigynous	number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil
Pandanales												
1. Pandanaceae		×	?				1-~80	×	×	×	×	
Arecales												
2. Arecaceae		×	×				1(3)			R		3(1-10)
Cyclanthales												
3. Cyclanthaceae	×						1					4(1,3)
Arales												
4. Araceae		×			R		1				×	3(1-9)
5. Lemnaceae	×						1				×	1
Alismatales												
6. Alismataceae		×		×	R		6-~100(3)	×	×	R		1
7. Butomaceae		×		×			6		×			1
8. Hydrocharitaceae		×			R	R	1					3-6(2-15)
Juncaginales												
9. Scheuchzeriaceae	×						1					3(2-6)
10. Juncaginaceae	×						1(-6)		R	R		3-6(1)
11. Lilaeaceae	×						1				×	1(?)
Najadales												
12. Aponogetonaceae		×		×			3-6(-9)	R	×	×		1
13. Zosteraceae	×						1					2
14. Potamogetonaceae	×						4(1-10)		R	×	R	1
15. Zannichelliaceae	×						2,4(1-9)	R	R	×	R	1
16. Najadaceae	×						1					2,3
17. Posidoniaceae	×						1				×	1
Triuridales												
18. Triuridaceae	×						6-50	×	×			1
Typhales												
19. Sparganiaceae	×						1				×	1(2,3)
20. Typhaceae	×						1				×	1
Juncales												
21. Juncaceae	×						1					3
22. Thurniaceae	×						1					3
23. Restionaceae	×						1				×	3,2,1
24. Centrolepidaceae	×						1				×	1-3
25. Flagellariaceae	×						1					3
Cyperales												
26. Cyperaceae	×						1					3,2(-9)
Poales												
27. Poaceae	×						1					2,3

of monocotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

Pistils				Ovary				Placentation						Ovules per locule		
compound																
pleiomerous	diplomerous	haplomerous	oligomerous	superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	ventral	laminar	1,2(3,4)	few to sev	many
				×					×	×				1		×
R	R	×	R	×			1-3(4-10)	×		×	×			1		
		×	R	×		×	1		×		×					×
R	R	×	R	×		×	3(1-9)	×	×	×	×			1	×	×
				×			1			×				1	×	
				×			1			×			×	2	×	×
				×			1						×			×
R	×	×	R			×	1		×				×		R	×
	R	×	R	×			3(2-6)			×				2	×	
	×	×	R	×			3(4)			×				1		
				×			1			×				1		
				×			1			×				2	×	
			×	×			1				sub			1		
				×			1				sub			1		
				×			1				×			1		
		×	×	×			1			×				1		
				×			1					×		1(2)		
				×			1	×		×				1		
		R	R	×			1(2)				sub			1(2)		
				×			1				×			1		
		×		×			1,3	×	×	×				1	×	×
		×		×			1(3)	×		sub				1	×	
		×	×	×			3,2,1	×			×			1		
		×	×	×			1-3				×			1		
		×		×			3	×						1		
R	R	×	×	×			1			×				1		
		×	×	×			1			×	×			1		

Table 2d cont.

Order Family	Nectaries						Pistils					
								simple				
	absent	present	septal	on pistils	on perianth	epigynous	Number	pleiomerous	diplomerous	haplomerous	oligomerous	carpels per pistil
Liliales												
28. Trilliaceae		×	×				1					3(-10)
29. Liliaceae	R	×	×		R		1					3(2,4)
30. Smilacaceae		×			×		1				×	3(1)
31. Agavaceae		×	×				1					3
32. Xanthorrhoeaceae	×						1					3
33. Philesiaceae		×			×		1					3
34. Stemonaceae	×						1					2(3)
35. Dioscoreaceae		×	×		×		1					3
36. Taccaceae	×	×	×				1					3
37. Pontederiaceae	R	×	×				1					3
38. Amaryllidaceae		×	×		×		1					3
39. Velloziaceae		×	×				1					3
Bromeliales												
40. Bromeliaceae		×	×				1					3
Commelinales												
41. Commelinaceae	×						1					3(2)
42. Xyridaceae	×						1					3
43. Mayacaceae	×						1					3
44. Rapateaceae	×						1					3
45. Eriocaulaceae	×						1					2,3
Zingiberales												
46. Musaceae		×	×				1					3
47. Strelitziaceae		×	×				1					3
48. Lowiaceae		×	×				1					3
49. Zingiberaceae		×	×		×	×	1					3(2)
50. Cannaceae		×	×				1					3
51. Marantaceae		×	×				1					3
Iridales												
52. Haemodoraceae	×	×	×				1					3
53. Philydraceae	×						1					3
54. Iridaceae	R	×	×		×	×	1					3
55. Burmanniaceae		×	×			×	1					3
Orchidales												
56. Corsiaceae		×			×		1					3
57. Orchidaceae		×	×		×		1					3

Pistils				Ovary				Placentation						Ovules per locule		
compound																
pleiomerous	diplomerous	haplomerous	oligomerous	superior	semi-inferior	inferior	locule number	axile	parietal	basal	apical	ventral	laminar	1,2(3,4)	few to sev	many
R	R	×		×			3(-10)	×								×
		×	R	×	R		3(1,2,4)	×	R					(1,2)	R	×
		×	R	×			3(-1)	×						1,2		
		×		×		×	3(1)	×		R				1		×
		×		×			3,1			×				1	×	
		×		×		R	3,1	×	×						×	×
		R	×	×	×	×	1		×	×	×			2		×
		×				×	3	×						2,4	×	
		×				×	1		×							×
		×		×			3,1	×						1		×
		×				×	3(1)	×	R					(1)	R	×
		×				×	3	×								×
		×		×	×	×	3	×								×
		×	R	×			3(2)	×						1	×	R
		×		×			1(3)	R	×						×	×
		×		×			1		×						×	
		×		×			3(1)	×		×				1	×	
		×	×	×			2,3	×			sub			1		
		×				×	3	×								×
		×				×	3	×		×				1		×
		×				×	3	×								×
		×	R			×	3(2,1)	×	×	R					×	×
		×				×	3	×								×
		×				×	1(3)	×		×				1		
		×		×	×	×	3(1,2)	×						1		×
		×		×			3	×	×							×
		×		R		×	3(1)	×	R					(1)	R	×
		×				×	3,1	×	×							×
		×				×	1		×							×
		×				×	1(3)	R	×							×

Table 2e. Common character states

Aus, Australia; Bor, Borneo; br, bracts; cas, casual; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; usu, usually; W.I., West Indies;

Order Family	Ovules					Styles					Stigmas	
							compound					position
	bitegmic	unitegmic	crassinucellar	pseudocrassinuclar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally
Pandanales												
1. Pandanaceae	×		×			0						
Arecales												
2. Arecaceae	×		×			1-3(0)			×	×	3(1-10)	×
Cyclanthales												
3. Cyclanthaceae	×		×			1,0				×	4(1,2)	
Arales												
4. Araceae	×		×		R	1,0				×	3(1-9)	
5. Lemnaceae	×		×			1				×	1	
Alismatales												
6. Alismataceae	×			×		1				×	1	×
7. Butomaceae	×			×		1				×	1	×
8. Hydrocharitaceae	×		×			3-6(2-15)	R	×	×	R	3-6(2-30)	
Juncaginales												
9. Scheuchzeriaceae	×		×			0					3(2-6)	
10. Juncaginaceae	×		×			0,3					3-6(1)	×
11. Lilaeaceae	×		×			1				×	1	
Najadales												
12. Aponogetonaceae	×		×			1				×	1	×
13. Zosteraceae	×			×		1				×	2	
14. Potamogetonaceae	×		×			1,0				×	1	×
15. Zannichelliaceae	×		×			1				×	1	
16. Najadaceae	×		×			3(2)			×	R	3(2)	×
17. Posidoniaceae						0					1	
Triuridales												
18. Triuridaceae	×				×	1				×	1	×
Typhales												
19. Sparganiaceae	×		×			1(-3)			R	×	1(-3)	×
20. Typhaceae	×		×			1					1	×
Juncales												
21. Juncaceae	×		×			1,3			×	×	3	×
22. Thurniaceae						3			×		3	×
23. Restionaceae	×		×		×	3,2,1(0)			×	×	3,2,1	S
24. Centrolepidaceae	×		×			1-3			×	×	1-3	×
25. Flagellariaceae						1				×	3	×
Cyperales												
26. Cyperaceae	×		×			1				×	2,3(-9)	×
Poales												
27. Poaceae	×	R		×	R	2(1,3)			R	×	2(1,3)	

of monocotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume;
N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome;
see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix;
1pa, 1 per axil; ~, about; and ∞, many.

Stigmas				Fruit											Seeds		
compound													dehiscence			per locule	
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	drupelet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal	1,2(-3)	few to sev	many
						×	×										1		
R	R	×	R			×	×										1		
		×	R			×													×
R	R	×	R			×											×	×	×
																	1	×	
				×									×				×	×	×
				×															×
R	×	×	R			×												×	×
	R	×	R	×													1-2		
	×	×	R						×		×						1		
											×						1		
				×													2	×	
			×					×			×		×				1		
								×			×		×				1		
											×		×				1		
		×	R								×						1		
								×									1		
											×						1		
		R	×								×						1		
											×		×				1		
		×			×											×	1	×	×
		×			×											×	1(3)		
		×	×		×						×					×	1		
		×	×		×											×	1		
		×						×									1		
R	R	×	×				R						×				1		
		R	×			R	R			R							1		

Table 2e cont.

Order Family	Ovules					Styles					Stigmas	
							compound					position
	bitegmic	unitegmic	crassinucellar	pseudocrassinucllar	tenuinucellar	styles per pistil	pleiomerous	diplomerous	haplomerous	oligomerous	stigmas per pistil	decurrent ventrally
Liliales												
28. Trilliaceae	×		×			3(1-10)	R	R	×	R	3(-10)	×
29. Liliaceae	×		×		×	1(3)			R	×	3	×
30. Smilacaceae						3(-1)			×	R	3(-1)	×
31. Agavaceae	×		×			1(0)				×	3	
32. Xanthorrhoeaceae	×		×			3,1			×	×	3	
33. Philesiaceae	×		×			1				×	3	
34. Stemonaceae	×		×			1,0				×	1	
35. Dioscoreaceae	×		×			1,3			×	×	3	
36. Taccaceae	×		×			1				×	3(6)	
37. Pontederiaceae	×		×			1				×	1,3,6	
38. Amaryllidaceae	×	×		×		1				×	3	S
39. Velloziaceae	×			×		1				×	3	
Bromeliales												
40. Bromeliaceae	×		×			1				×	3	S
Commelinales												
41. Commelinaceae	×		×		R	1				×	1(3)	
42. Xyridaceae	×				×	1				×	1,3	
43. Mayacaceae	×				×	1				×	1,3	
44. Rapateaceae						1				×	1	
45. Eriocaulaceae	×				×	1				×	2,3	
Zingiberales												
46. Musaceae	×		×			1				×	3	
47. Strelitziaceae	×		×			1				×	3	
48. Lowiaceae	×		×			1				×	3	
49. Zingiberaceae	×		×			1				×	1,2	
50. Cannaceae	×		×			1				×	1	
51. Marantaceae	×		×			1				×	1	
Iridales												
52. Haemodoraceae	×		×			1				×	1(3)	
53. Philydraceae	×		×			1				×	1	
54. Iridaceae	×		×			1,3			×	×	3(6)	×
55. Burmanniaceae	×		×			1				×	3(6)	
Orchidales												
56. Corsiaceae						1				×	3	
57. Orchidaceae	×	R			×	1				×	3,2	

Stigmas				Fruit										Seeds					
compound														dehiscence			per locule		
pleiomerous	diplomerous	haplomerous	oligomerous	follicle	capsule	berry	drupe	drupelet	schizocarp	nut	nutlet	samara	achene	ventricidal	septicidal	loculicidal	1,2(-3)	few to sev	many
R	R	×			R	×										×		×	
		×			×	×								R	×	×	×	×	×
		×	R			×											1,2		
		×			×	×										×	×		×
		×			×						R					×	1	×	
		×				×												×	×
			×		×												×		×
		×			×	×						×					2,4		
	R	×			R	×										×			×
	×	×	×		×											×	×		×
		×			×	R										×	R	R	×
		×			×											×			×
		×			×	×									×	R			×
		R	×		×	R										×	×	×	R
		×	×		×											×		×	×
		×	×		×											×		×	
			×		×											×		×	
		×	×		×											×	1		
		×				×													×
		×			×				×							×	×		×
		×			×											×			×
			×		×	R										×		×	×
			×		×														×
			×		×	×										×	1		
		R	×		×											×	×	×	×
			×		×											×			×
	R	×			×											×	(1)	R	×
	R	×			×														×
		×			×														×
		×	×		×	R													×

Table 2f. Common character states

Aus, Australia; B, basal; Bor, Borneo; br, bracts; cas, casual; M, moderate; Mad, Madagascar; Mda,Madeira; Med, Mediterranean; R, rarely; rad, radical; S, sometimes; sca, scales; stds, stamindes; usu, usually; W.I., West Indies;

Order Family	Endosperm					Embryo										
	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ the length of endosperm	more than ½ length of endosperm	straight	curved or contorted	1-2 times as long as wide	2.3-3 times as long as wide	3.3-6 times as long as wide	more than 6 times as long as wide	1-3 times as wide as long	more than 3 times as wide as long
Pandanales																
1. Pandanaceae	×		×			×			×			×				
Arecales																
2. Arecaceae	×		×			×	×		×		×	×	×			
Cyclanthales																
3. Cyclanthaceae	×		×			×			×	×	×	×	×			
Arales																
4. Araceae	×	×	×		×			×	×	×				×		
5. Lemnaceae	×	×			×			×	×			×				
Alismatales																
6. Alismataceae		×								×				×		
7. Butomaceae		×							×				×			
8. Hydrocharitaceae	×	×			R				×			×				
Juncaginales																
9. Scheuchzeriaceae		×							×		×					
10. Juncaginaceae		×							×					×		
11. Lilaeaceae		×							×				×			
Najadales																
12. Aponogetonaceae		×							×			×				
13. Zosteraceae		×								×	×					
14. Potamogetonaceae		×								×		×	×			
15. Zannichelliaceae		×								×				×		
16. Najadaceae		×							×				×			
17. Posidoniaceae		×							×			×				
Triuridales																
18. Triuridaceae	×		×			×										
Typhales																
19. Sparganiaceae	×		×					×	×					×		
20. Typhaceae	×		×				×	×	×				×	×		
Juncales																
21. Juncaceae	×		×			×			×		×					
22. Thurniaceae	×		×			×			×					×		
23. Restionaceae	×		×			×			×							×
24. Centrolepidaceae	×		×			×			×		×					
25. Flagellariaceae	×		×			×			×							×
Cyperales																
26. Cyperaceae	×		×			×	×		×		×					
Poales																
27. Poaceae	×	R	×			×	×	×	×				×	×		

of monocotyledon families.

C, common; Cub, Cuba; diss, disseminate; gl, glume; N.Cal, New Caledonia; Nor, North; oft, often; peri, perisperm; pom, pome; see sep, see sepals; sev, several; Sey, Seychelles; sl, slight; spa, spadix; 1pa, 1 per axil; ~, about; and ∞, many.

Distribution					
Europe	Asia	North America	South America	Africa	Australia and Pacific
	×			×	×
R	×	×	×	×	×
		×	×		
×	×	×	×	×	×
×	×	×	×	×	×
×	×	×	×	×	×
×	×				
×	×	×	×	×	×
×	×	×			
×	×	×	×		×
		×	×		
	×			×	×
×	×	×		×	×
×	×	×	×	×	×
×	×	×	×	×	×
×	×	×	×	×	×
Med	Med			Med	×
	×	×	×	×	×
×	×	×		×	×
×	×	×	×	×	×
×	×	×	×	×	×
			×		
	×		×	×	×
	×		×		×
	×			×	×
×	×	×	×	×	×
×	×	×	×	×	×

Table 2f cont.

Order Family	Endosperm					Embryo										
	present	absent	abundant	moderate	scant	less than ½ length of endosperm	½ the length of endosperm	more than ½ length of endosperm	straight	curved or contorted	1-2 times as long as wide	2.3-3 times as long as wide	3.3-6 times as long as wide	more than 6 times as long as wide	1-3 times as wide as long	more than 3 times as wide as long
Liliales																
28. Trilliaceae	×		×			×			×		×					
29. Liliaceae	×		×			×	×	×	×	×	×	×	×	×		
30. Smilacaceae	×		×			×			×			×				
31. Agavaceae	×		×			×	×	×	×				×			
32. Xanthorrhoeaceae	×		×						×	R						
33. Philesiaceae	×					×	×	×	×							
34. Stemonaceae	×		×			×	×	×	×		×	×	×	×		
35. Dioscoreaceae	×		×			×			×		×	×				
36. Taccaceae	×		×			×			×		×					
37. Pontederiaceae	×		×					×	×				×	×		
38. Amaryllidaceae	×		×					×	×				×			
39. Velloziaceae	×		×			×			×			×	×			
Bromeliales																
40. Bromeliaceae	×		×			×	×	×	×	×	×	×	×	×		
Commelinales																
41. Commelinaceae	×		×			×			×		×					
42. Xyridaceae	×		×			×	×		×						×	
43. Mayacaceae	×		×			×			×		×				×	
44. Rapateaceae	×		×			×			×						×	
45. Eriocaulaceae	×		×			×			×						×	
Zingiberales																
46. Musaceae	peri		×			×			×						×	
47. Strelitziaceae	peri		×			×	×	×	×	×				×	×	
48. Lowiaceae	×								×							
49. Zingiberaceae	peri		×					×	×				×	×		
50. Cannaceae	peri		×					×	×			×	×			
51. Marantaceae	peri		×					×		×				×		
Iridales																
52. Haemodoraceae	×		×			×			×		×					
53. Philydraceae	×			×				×	×				×			
54. Iridaceae	×		×			×	×	×	×				×	×		
55. Burmanniaceae	×	×			×				×							
Orchidales																
56. Corsiaceae	×				×				×							
57. Orchidaceae		×							×							

Distribution					
Europe	Asia	North America	South America	Africa	Australia and Pacific
×	×	×			
×	×	×	×	×	×
×	×	×	×	×	×
	×	×	×	×	×
					×
			×	×	×
	×	×			×
×	×	×	×	×	×
	×		×	×	×
	×	×	×	×	×
×	×	×	×	×	×
	R	R	×	×	
		×	×	R	
	×	×	×	×	×
	×	×	×	×	×
		×	×	R	
		R	×	R	
R	×	×	×	×	×
	×			×	×
	×	×	×	×	
	×				
	×	×	×	×	×
	×	×	×	×	
	×	×	×	×	
		×	×	×	×
	×				×
×	×	×	×	×	×
	×	×	×	×	×
	×		×		×
×	×	×	×	×	×

TABLE 3

Summary of common character variation in Dicot and Monocot families in Tables 1 and 2, in percent

	Habitat									Habit					Life style		
	moisture						Temperature										
	only wet	mesic & wet	mesic combo	only mesic	mesic & dry	only dry	only temperate	temperate & hot	only hot	only trees	trees, shrubs & herbs	trees & shrubs	shrubs & herbs	only herbs	only autotrophic	parasitic	saprophitic
dicots	16	13	71	52	10	10	16	55	28	11	22	53	34	11	94	4	1
monocots	40	19	51	26	12	5	11	63	26	0	7	9	28	67	93	0	7

	Xylem perforations				Leaves										Leaf sheath		
	only absent	only scalariform	scalriform & simple	only simple	raphids present	only alternate	alternate & opposite	only opposite	only simple	simple & compound	only compound	only entire	entire & not entire	only not entire	only open	open & closed	only closed
dicots	4	16	33	51	8	48	36	13	77	16	5	40	38	21			
monocots	14	45	53	2	49	82	12	4	96	4	0	79	18	0	46	19	4

	Stipules				Inflorescence										Flower symmetry		
	only absent	absent & present	only present	intravaginal scales	raceme	corymb	spike	panicle	thyrse	umbel	head	solitary flower	fascicle	cyme	only actinomorphic	actinomorphic & zygomorphic	only zygomorphic
dicots	59	19	21	0?	52	4	26	31	6	11	17	48	12	51	82	11	7
monocots	86	5	9	19	32	4	50	37	5	19	33	42	7	42	44	19	16

	Sex				Sepals										
	hermaphroditic	only dioecious	dioecious & monoecious	polygamous	only distinct	distinct & connate	only connate	only imbricate	imbricate & valvate	only valvate or open	absent	pleiomerous	diplomerous	haplomerous	oligomerous
dicots	85	6	14	23	23	34	37	19	7	10	10	6	26	90	28
monocots	79	4	26	19	30	42	14	19	18	42	28	0	4	82	21

	Sepals							Petals								
	2	3	4	5	6	8	more than 8	absent	pleiomerous	diplomerous	haplomerous	oligomerous	2	3	4	5	more than 5
dicots	12	30	57	74	30	15	10	42	7	23	72	15	4	16	43	65	31
monocots	19	77	11	7	2	4	0	42	0	0	70	14	14	70	5	4	0

	Petals						Stamens								
	only distinct	distinct & connate	only connate	only imbricate	imbricate & valvate or open	only valvate or open	pleiomerous	diplomerous	haplomerous	oligomerous	only distinct	distinct & connate	only conate	episepalous	epipetalous
dicots	39	23	15	18	6	6	45	56	71	29	59	32	8	7	26
monocots	21	39	14	18	26	23	32	67	53	42	51	38	4	47	

	Anthers						
	adnate	only basifixed	basifixed & dorsifixed	only dorsifixed	only distinct	distinct & connate	only connate
dicots	12	27	18	32	92	6	1
monocots	14	35	26	11	98	2	0

	Pollen apertures											Pollen cells		
	inaperturate	1(-3)-sulcate	ulcerate	colpate	colporate	colporoidate	rug(or)ate	rup(or)ate	poly-(2-4)porate	trichotomosulcate	spiraperturate	only 2	2 & 3	only 3
dicots	8	1	1	33	56	24	11	10	21	0	0	41	19	10
monocots	42	56	25	0	0	0	0	0	16	5	7	37	18	28

	Pollination				Nectary disk			Nectary		Unicarpellate pistils			
	only wind	wind & animal	only animal	water	only absent	absent & present	only present	on perianth	septal in ovary	pleiomerous	diplomerous	haplomerous	oligomerous
dicots	14	17	69	0	19	17	32	4	0?	7	8	11	16
monocots	21	21	53	7	96	4	0	21	37	9	14	12	21

	Carpels in compound pistils				Ovary				Placentation					
	pleiomerous	diplomerous	haplomerous	oligomerous	only superior	semi-inferior	superior & inferior	only inferior	only axile	axile & parietal	only parietal	basal	apical	free-central
dicots	9	17	52	75	66	18	11	11	26	12	7	27	24	3
monocots	9	12	74	33	65	7	14	26	19	19	9	39	23	0

	Ovules										Styles in compound pistils			
	1, 2 (3)	few-several (~4-10)	many (in combo)	only many	only bitegmic	bitegmic & unitegmic	only unitegmic	only crassinucellar	crassinucellar & tenuinucellar	only tenuinucellar	pleiomerous	diplomerous	haplomerous	oligomerous
dicots	77	36	38	16	54	7	26	50	6	28	5	8	25	79
monocots	68	33	51	23	84	5	0	70	9	9	4	4	26	89

	Stigmas in compound pistils						
	pleiomerous	diplomerous	haplomerous	oligomerous	decurrent ventrally	decurrent ventrally & apical	apical
dicots	8	15	49	76	25	8	79
monocots	9	19	68	47	39	39	61

	Fruit												Dehiscence of capsules & follicles			
	follicle	capsule	capsule & berry	berry	capsule & drupe	berry & drupe	drupe	schizocarp	nut	nutlet	samara	achene	only ventricidal	ventricidal (combo)	septicidal	loculicidal
dicots	8	49	20	35	13	13	30	11	9	16	11	7	7	11	18	28
monocots	7	54	19	35	0	5	7	4	2	19	2	11	0	2	4	44

	Seeds				Endosperm					Ratio of embryo length to endosperm length				
	1, 2 (3)	few-several (~4-10)	many (in combo)	only many	only abundant	abundant (in combo)	moderate	scant	only absent	only less than ½	½	less than ½ & more than ½	more than ½ (combo)	only more than ½
dicots	76	35	34	14	39	57	14	29	18	20	5	7	47	34
monocots	70	32	49	26	54	58	2	9	21	33	21	14	32	16

	Embryo			Cotyledons							Ratio of embryo length to width			
	only straight	straight & curved or contorted	only curved or contorted	shorter than radicle	equal to radicle	shorter & longer than radicle	longer than radicle	as wide as radicle	as wide as radicle & wider than radicle	wider than radicle	1-2	2.3-3.0	3.3-6.0	more than 6
dicots	54	17	16	40	29	13	53	32	12	53				
monocots	79	11	9								28	26	33	28

	Ratio of embryo width to length	
	1-3	more than 3
dicots		
monocots	11	4

	Distribution																
	Europe	Asia	North America	South America	Africa	Australia & Oceania	Asia & North America	N. America & S. America	South America & Africa	Africa & Australia	all continents	only Europe	only Asia	only North America	only South America	only Africa	only Australia & Oceania
dicots	35	71	65	63	60	49	55	55	45	40	23	0.3	7	3	4	6	5
monocots	46	84	74	75	77	75	61	65	63	65	33	0	2	0	2	0	2

REFERENCES

Angiosperm Phylogeny Group (APG, 1998) 1998. An Ordinal classification for the Families of Flowering Plants. *Annals of the Missouri Botanical Garden*, 85: 531-553.

Angiosperm Phylogeny Group (APG, 2003) An Update of the Angiosperm Phylogeny Group Classification for the Orders and Families of Flowering Plants: APG II. *Botanical Journal of the Linnean Society*, 141: 399-436.

Arber, A. 1925. *Monocotyledons: A Morphological Study.* 258 pages. Cambridge, England: Cambridge University Press.

Axelrod, D.L.1960. *The Evolution of Flowering Plants.* **In** Tax, K., editor, *Evolution after Darwin, volume I, The Evolution of Life*, pages 227-307. Chicago: University of Chicago Press.

Bailey, I.W. 1957. The Potentialities and Limitations of Wood Anatomy in the Study of the Phylogeny and Classification of Angiosperms. *Journal of the Arnold Arboretum,* 38:243-254.

Baillon, H.E.1866-1895. Histoire des plantes. Volumes 1-13. Paris.Bedell, H.G., and J.L. Reveal 1982. Amended Outlines and Indices for Six Recently Published Systems of Angiosperm Classification. *Phytologia,* 51:65-156.

Benson, L.D.1979. *Plant Classification.* 2nd edition, 901 pages. Lexington, Mass: D.C. Heath and Company.

Bentham, G., and J.D. Hooker 1862-1883. *Genera Plantarum.* 3 volumes. London.

Bessey, C.E. 1915. Phylogenetic Taxonomy of Flowering Plants. *Annals of Missouri Botanical Garden,* 2:109-164.

Botanical Review 1935-present. Bronx, New York: New York Botanical Garden.

Brummitt, R.K. 1992. *Vascular Plant Families and Genera.* 804 pages. Kew, England: Royal Botanic Gardens.

Burger, W.C.1981. Heresy Revived: The Monocot Theory of Angiosperm Origin. *Evolutionary Theory*, 5:189-225.

Cain, S.A. 1944. *Foundations of Plant Geography.* 556 pages. New York and London: Harper & Brothers.

Cave, M.S., editor 1958-1965. *Index to Plant Chromosome Numbers for 1956-1964.* 2 volumes. Chapel Hill, North Carolina: University of North Carolina Press.

Cheadle, V.I. 1943. The Origin and Certain Trends of Specialization in the Monocotyledoneae. *American Journal of Botany,* 30:11-17.

1953. Independent Origin of Vessels in the Monocotyledons and Dicotyledons. *Phytomorphology*, 3:22-44.

Constance, L. 1955. The Systematics of Angiosperms. **In:** *A Century of Progress in the Natural Sciences,* 1853-1953, pages 405-483. San Francisco: California Academy of Sciences.

— 1964. Systematic Botany-An Unending Synthesis. *Taxon,* 13:257-273. Contributions from the United States National Herbarium

Contributions from the United States National Herbarium, 1890-present. Vols. 1-46. Washington, D.C.: United States Department of Agriculture and later National Museum of Natural History, Smithsonian Institution.

Corner, E.J.H. 1976. *The Seeds of Dicotyledons.* 2 volumes. Cambridge, England.

Cronquist, A.1980. *An Integrated System of Classification of Flowering Plants.* 1262

pages. New York: Columbia University Press.

— 1988. *The Evolution and Classification of Flowering Plants.* Second edition. 555 pages. New York: New York Botanical Garden.

Cronquist, A., A.H. Holmgren, J.L. Reveal, and P.K. Holmgren 1972-1977. *Intermountain Flora.* 6 volumes. Published for The New York Botanical Garden by Hafner Publishing Co., Inc. and by Columbia University Press, New York.

Curtis, W. 1787-1983. *The Botanical Magazine*, 184 volumes. London.

Dahlgren, G. 1989. The Last Dahlgrenogram; System of Classification of the Dicotyledons. **In:** K.Tan, editor, *Davis and Hedge Festschrift*, pages 249-260. Edinburgh: Edinburgh University Press.

Dahlgren, R.M.T. 1975. A System of Classification of the Angiosperms to be Used to Demonstrate the Distribution of Characters. *Botaniska Notiser*, 128:119-147.

— 1980. A Revised System of Classification of the Angiosperms. *Botanical Journal of the Linnean Society,* 80:91-124.

— 1983. General Aspects of Angiosperm Evolution and Macrosystematics. *Nordic Journal of Botany,* 3:119-149.

Dahlgren, R.M.T. and H.T. Clifford 1981. *The Monocotyledons: A Comparative Study.* 378 pages. London and New York: Academic Press.

Dahlgren, R.M.T., H.T. Clifford, and P.F. Yeo 1985. *The Families of the Monocotyledons: Structure, Evolution, and Taxonomy.* 520 pages. Berlin, Heidelberg, New York, and Tokyo: Springer-Verlag.

Dahlgren, R.M.T. and F.N. Rassmussen 1983. Monocotyledon Evolution: Characters and Phylogenetic Estimation. **In:** M.K. Hecht, B. Wallace, and G.T. Prance, editors, *Evolutionary Biology,* 16:255-395.

Daumann, E. 1970. Das Blütennektarium der Monocotyledonen unter besonderer Berücksichigung seiner systematischen und phylogenetischen Bedeutung. Feddes Repertorium Specierum Novarum Regni Vegetabilis, 80:463-590.

Davidse, G., editor 1975. The Bases of Angiosperm Phylogeny. *Annals of the Missouri Botanical Garden*, 62:515-834.

Davis, G.L. 1966. *Systematic Embryology of the Angiosperms.* 528 pages. New York: John Wiley & Sons, Inc.

Davis, P.H. and V.H. Heywood 1963. *Principles of Angiosperm Taxonomy.* 556 pages. Princeton, New Jersey and New York: D.Van Nostrand Company, Inc.

Deyl, M. 1956. The Evolution of the Plants and the Taxonomy of the Monocotyledons. *Sborník Národního Musea v Praze,* 11B(6):1-143.

Dressler, R.L. 1982. *Phylogeny and Classification of the Orchid Family.* 314 pages. Portland, Oregon: Dioscorides Press.

Dyer, R.A. 1975-1976. *The Genera of Southern African Flowering Plants.* 2 volumes. Pretoria: Department of Agricultural Technical Services.

Eames, A. 1961. *Morphology of the Angiosperms.* 518 pages. New York: McGraw-Hill Publishing Company, Inc.

Ehrendorfer, F., and R.M.T. Dahlgren, editors 1983. New Evidence of Relationships and Modern Systems of Classification of the Angiosperms. *Nordic Journal of Botany*, 3:3-155.

Eldredge, N. and J. Cracraft 1980. *Phylogenetic Patterns and the Evolutionary Process.* 349 pages. NewYork: Columbia University Press.

Emberger, L. 1960. Les Vegetaux vasculaires. **In:** M. Chadefaud and L. Emberger, *Traite de Botanique Systematique.* 1539 pages. Paris: L'Academie de Medecine.

Engler, A. 1881-present. *Botanische Jahrbücher für Systematik, Pflazengeschichte und Pflanzengeographie.* Leipzig.

— 1900-1953. *Das Pflanzenreich.* 107 volumes. Leipzig and Berlin.

— 1926. Angiospermae: Kurze Erläuterung der Blüten und Fortpflanzungsverhältnisse. **In:** A. Engler and K. Prantl, *Die natürlichen Pflanzenfamilien.* 2nd edition, volume 14a. Leipzig.

Engler, A., and E. Gilg 1924. *Syllabus der Pflanzenfamilien.* 9th and 10th editions, 420 pages. Berlin.

Engler, A., and K. Prantl 1887-1915. *Die natürlichen Pflanzenfamilien.* 1st edition, parts 2-4. Leipzig.

— 1924-1980. *Die natürlichen Pflanzenfamilien.* 2nd edition, volumes 14d-21, 28b.Leipzig.

Erdtman, G. 1996. *Pollen Morphology and Plant Taxonomy: Angiosperms.* 553 pages. New York, London: Hafner Publishing Company.

Esau, K. 1977. *Anatomy of Seed Plants.* 2nd edition, 550 pages. New York: John Wiley and Sons.

Everett, T.H. 1980-1982. *The New York Botanical Garden Illustrated Encyclopedia of Horticulture.* 10 volumes. New York, London: Garland Publishing, Inc.

Exell, A.W., H. Wild, and G.V. Pope, editors 1960-19xx *Flora Zambesiaca.* Kew, England: Royal Botanic Gardens.

Faegri, K., and L. van der Pijl 1978. *The Prinicples of Pollination Ecology.* 3rd edition, 244 pages. Oxford and New York: Pergamon Press.

Fawcett, W., and A.B. Rendle 1910-1936. *Flora of Jamaica.* 7 volumes. London: British Museum.

Fedorov, A.A., editor 1969. *Chromosome Numbers of Flowering Plants.* 926 pages. St. Petersburg, Russia: Academy of Sciences of the USSR.

Flora Neotropica 1968-present. [Seventy-five monographs published by the New York Botanical Garden for the Organization for Flora Neotropica.]

Flora of Australia 1981-present. [18 volumes published of 59 envisioned.] Canberra: Australian Publishing Service.

Flora of Australia Volume 1: Introduction 2nd edition 1999. Australian Biological Resources Study/CSIRO Australia.

Flora of North America Editorial Committee, editors 1993-present *Flora of North America North of Mexico,* [four of 30 volumes thus far.] Oxford, England, New York: Oxford University Press.

Flore du Congo Belge et du Ruanda-Urundi. Spermatophytes. 1948-19xx Bruxelles.

Frodin, D.G. 2001. *Guide to Standard Floras of the World.* 2nd edition, 1100 pages. Cambridge, England: Cambridge University Press

Gibbs, R.D. 1974. *Chemotaxonomy of Flowering Plants.* 4 volumes. Montreal and London: McGill-Queen's University Press.

Gleason, H.A., and A. Cronquist 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada.* 2nd edition, 910 pages. Bronx, New York: New York Botanical Garden.

Goldberg, A. 1986. Classification, Evolution, and Phylogeny of the Families of Dicotyledons. *Smithsonian Contributions to Botany,* 58: 1-314.

— 1989. Classification, Evolution, and Phylogeny of the Families of Monocotyledons. *Smithsonian Contributions to Botany,* 71: 1-74.

Goldblatt, P., editor 1981, 1984. *Index to Plant Chromosome Numbers for 1975-1981.* 2 volumes.St. Louis: Missouri Botanical Garden.

Good, R. 1974a. *Features of Evolution in the Flowering Plants*. 405 pages. New York: Longmans, Green and Company.

— 1974b. *The Geography of the Flowering Plants*. 4th edition, 557 pages. London: Longman.

Gray, A. 1970. *Gray's Manual of Botany*. 8th edition by M.L. Fernald. 1632 pages. New York: Van Nostrand Reinhold Company.

Gregory, M. 1994 . Bibliography of Systematic Wood Anatomy of Dicotyledons. *IAWA Journal,* supplement 11: 265 pages.

Gundersen, A. 1950. *Families of Dicotyledons*. 237 pages. Waltham, Massachusetts: Chronica Botanica Company.

Halliday, G., and M. Beadle 1983. *Consolidated Index to "Flora Europaea"*. 210 pages. Cambridge, London, New York: Cambridge University Press.

Hallier, H. 1912. L'Origine et le système phylétique des Angiosperms. *Archives Neerlandaise des Sciences Exactes et Naturelles,* series 3B, 1:146-234.

Hanson, B., and K. Rahn 1969. Determination of Angiosperm Families by Means of a Punched-Card System. *Dansk Botanisk Arkiv,* 26:7-44.

— 1972. Additions and Corrections 1 [to the above]. *Saertryk af Botanisk Tidsskrift*. 67:152-153.

Harborne, J.B., and H. Baxter, editors 1993. *Phytochemical Dictionary*. 791 pages. London; Washington, D.C.: Taylor and Francis.

Harborne, J.B., and B.L. Turner 1984. *Plant Chemosystematics*. 562 pages. London and New York: Academic Press.

Hawkes, J.G., R.N. Lester, and A.D. Skelding, editors 1979. *The Biology and Taxonomy of the Solanaceae*. 738 pages. London and New York: Academic Press.

Hegnauer, R. 1962-1994. *Chemotaxonomie der Pflanzen*. 11 volumes. Basel, Boston, Berlin: Birkhäuser Verlag.

Heywood, V.H., editor 1971. *The Biology and Chemistry of the Umbelliferae*. 438 pages. London: Academic Press.

Heywood, V.H., J.B. Harborne, and B.L. Tucker, editors 1977. *The Biology and Chemistry of the Compositae*. 2 volumes, 1189 pages. London and New York: Academic Press.

Heywood, V.H., D.M. Moore, I.B.K. Richardson, and W.T. Stearn, editors 1978. *Flowering Plants of the World*. 335 pages. New York: Mayflower Books.

Hickman, J.C., editor 1993. *The Jepson Manual Higher Plants of California*. 1400 pages. Berkeley, Los Angeles, London: University of California Press.

Holmgren, N.H., P.K. Holmgren, R.A. Jess, K.M. McCauly, L. Vogel 1998. *Illustrated Companion to Gleason and Cronquist's Manual*. 937 pages. Bronx, New York: New York Botanical Garden.

Hooker, J.D. 1875-1897. *Flora of British India*. 7 volumes. London.

Hooker, W.J., and J.D. Hooker 1837-1990. *Hooker's Icones Plantarum*. 40 volumes. London.

Huber, H. 1969. Die Samenmerkmale und Verwandtschaftsverhältnisse der Liliifloren. *Mitteilungen der Botanischen Staatssammlung München*, 8:219-538.

Humbert, H., editor 1936-present. *Flore de Madagascar et des Camores*. [by family, about 20 volumes thus far]. Paris: Muséum National D'Histoire Naturelle.

Hutchinson, J. 1964, 1967. *The Genera of Flowering Plants*. 2 volumes. Oxford, England: Clarendon Press.

— 1969. *Evolution and Phylogeny of Flowering Plants.* 717 pages. London and New York: Academic Press.

— 1973. *The Families of Flowering Plants.* 3rd edition, 968 pages. Oxford, England: Clarendon Press.

Hutchinson, J., and J.M. Dalziel 1954-1972. *Flora of West Tropical Africa.* 2nd edition by R.W.J. Keay and F.N. Hepper. 3 volumes. London: Crown Agents for Oversea Governments and Administrations.

Iconographia Cormophytorum Sinicorum 1972-1976. 5 volumes. China [in Chinese].

Index Kewensis, an Enumeration of the Genera and Species of Flowering Plants from the Time of Linnaeus, compiled at the expense of the late C.R. Darwin under the direction of J.D. Hooker by B.D. Jackson, 2 volumes, 1895. 20 supplement volumes to 1995 published at the Herbarium of the Royal Botanic Gardens, Kew, and Oxford, England.

Jackson, B.D. 1928. *A Glossary of Botanic Terms.* 4th edition, 481 pages. London and NewYork: Duckworth.

Jacobs, S.W.L., and J. Everett, editors 1998. *Grasses; Systematics and Evolution. 406 pages.* Collingwood, VictoriaAustralia: CSIRO Publishing.

Johnson, A.M. 1931. *Taxonomy of the Flowering Plants.* 864 pages. New York and London: Century Company.

Källersjö, M., J.S. Farris, M.W. Chase, B. Bremer, M.F. Fay, C.J. Humphries, G. Petersen, O. Seberg, and K. Bremer 1998. Simultaneous Parsimony Jackknife Analysis of 2538 rbc L DNA sequences Reveals Support for Major Clades of Green Plants, Land Plants, Seed Plants and Flowering Plants. *Plant Systematics and Evolution,* 213:259-287.

Kevin, P.G., and H.G. Baker 1983. Insects as Flower Visitors and Pollinators. Annual *Review of Entomology,* 28:407-453.

Kiger, R.W., and D.M. Porter 2001. *Categorical Glossary for the Flora of North America Project.* 165 pages. Hunt Institute for Botanical Documentation. Carnegie Mellon University, Pittsburgh.

Kimura, Y. 1956. Systeme et phylogenie des Monocotyledons. *Notulae Systematicae,* 15:137-159.

Kubitski, K., editor 1977. Flowering Plants, Evolution and Classification of Higher Categories. **In:** *Plant Systematics and Evolution,* supplementum 1. Vienna and New York.

— 1998. *Flowering Plants; Monocotyledons. Volume III. Alismatanae and Commelinanae* (except Gramineae). Berlin.

— 1998. *Flowering Plants; Monocotyledons. Volume IV. Lilianae (except Orchidaceae).* Berlin.

Kubitzki, K., J.G. Rohwer, and V. Bittrich, editors 1993. *The Families and Genera of Vascular Plants. II. Flowering Plants.Dicotyledons.* Berlin.

Lawrence, G.H.M. 1951. *Taxonomy of Vascular Plants.* 823 pages. New York: Macmillan Company.

Le Maout, E., and J. Decaisne 1873. *A General System of Botany.* 1066 pages. London, Boston, New York: Longmans, Green, and Company.

Lemee, A. 1929-1951. *Dictionaire descriptif et synonymique des genres de plantes phanerogames.* 9 volumes. Brest, France: Imprimerie Commerciale et Administrative.

Lindley, J. 1853. *The Vegetable Kingdom.* 3rd edition, 908 pages. London.

Mabberley, D.J. 1997. *The Plant-Book.* 2nd edition, 858 pages. Cambridge, England: Cambridge University Press.

Macbride, J.F. 1930-19xx *Flora of Peru.* 13 volumes. Chicago: Field Museum of Natural History.

Maheshwari, P. 1950. *An Introduction to the Embryology of the Angiosperms*. 453 pages. NewYork: McGraw-Hill Book Company, Inc.

Martin, A.C. 1946. Comparative Internal Morphology of Seeds. *American Midland Naturalist,* 36:513-660.

Martius, C.F.P. 1840-1906. *Flora Brasiliensis.* 15 volumes (in 40 parts). Munich, Vienna, and Leipzig.

Meeuse, A.D.J. 1970. The Descent of the Flowering Plants. *Acta Botanica Neerlandica,* 19:61-72, 133-140.

Melchior, E., editor 1964. *Engler's Syllabus der Pflanzenfamilien.* 12th edition, 2 volumes. Berlin: Gebrüder Borntraeger.

Metcalfe, C.R., editor, volume 8 edited by D.F. Cutler and M. Gregory 1960-19xx. *Anatomy of the Monocotyledons.* [eight volumes thus far, including Gramineae, Palmae, Commelinales-Zingiberales, Juncales, Cyperaceae, Dioscoreales, Helobiae, and Iridaceae.] Oxford, England: Clarendon Press.

Metcalfe, C.R., and L. Chalk 1950. *Anatomy of the Dicotyledons.* 1st edition, 2 volumes. Oxford, England: Clarendon Press.

— 1979. *Anatomy of the Dicotyledons*. 2nd edition, 3 volumes. Oxford, England: Clarendon Press.

Missouri Botanical Garden 1993. *Annals of the Missouri Botanical Garden,* 80(3):523-580. [Several papers on the molecular approach to taxonomy by many authors.]

Muller, J. 1981. Fossil Pollen Records of Extant Angiosperms. *The Botanical Review*, 47:1-142.

Ohwi, J. 1984. *Flora of Japan*, edited by Meyer, F.G., and E.H. Walker. 1067 pages. Washington, D.C.: Smithsonian Institution.

Ornduff, R., and R.J. Moore, editors 1967-1977. *Index to Plant Chromosome Numbers for 1965-1974.* 5 volumes. Utrecht: Bohn, Scheltema & Holkema.

Polhill, R.M., and P.H. Raven, editors 1981. *Advances in Legume Systematics*. 2 volumes. Kew, England: Royal Botanical Gardens.

Proctor, M., P. Yeo, and A. Lack 1996. *The Natural History of Pollination.* 479 pages. Portland, Oregon: TimberPress.

Pulle, A.A. 1952. *Compendium van de Terminologie, Nomenclatuur en Systematiek der Zaadplanten.* 3rd edition, 376 pages. Utrecht: N.V.A. Oosthock's Unitgevers-Maatschappij.

Radford, A.E., W.C. Dickison, J.R. Massey, and C.R. Bell 1974. *Vascular Plant Systematics.* 891 pages. New York, San Francisco, London: Harper and Row.

Raven, P.H., and D.I. Axelrod 1974. Angiosperm Biogeography and Past Continental Movements. *Annals of Missouri Botanical Garden*, 61:539-673.

Real, L., editor 1983. *Pollination Biology.* 338 pages. Orlando, Florida: Academic Press.

Richards, P.W. 1996. *Tropical Rain Forest.* 2nd edition, 575 pages. Cambridge, England: Cambridge University Press.

Rouleau, E. 1981. *Guide to Generic Names Appearing in the Index Kewensis and its Fifteen Supplements, Pars IV: Conspectus Systematis.* 17 pages. Cowansville, Quebec, Canada: Les Editions Jules Chatelain Inc.

Royal Botanical Gardens, Kew 1974-present. *Kew Record of Taxonomic Literature Relating to Vascular Plants (for 1971-present)*. London.

Rudall, P.J., P.J. Cribb, D.F. Cutler, C.J. Humphries, editors 1995. *Monocotyledons: Systematics and Evolution.* 2 volumes. Kew, England: Royal Botanic Gardens.

Small, J.K. 1933. *Manual of the Southeastern Flora.* 1554 pages. Chapel Hill: University of North Carolina Press.

Smith, A.C. 1971. An Appraisal of the Orders and Families of Primitive Extant Angiosperms. *Journal of the Indian Botanical Society*, 50:215-226.

Smith, L.B., and R.J. Downs 1974-1979. Bromeliaceae. *Flora Neotropica,* 14(1-3): 2142 pages.

Smithsonian Contributions to Botany, 1969-present: Number 1-91. Washington, D.C.: Smithsonian Institution.

Sneath, P.H., and R.R. Sokal 1973. *Numerical Taxonomy: The Principles and Practice of Numerical Classification.* 359 pages. San Francisco: W.H. Freeman and Company.

Soó, C.R. de 1961. Present Aspects of Evolutionary History of Telomophyta. *Annales Universitatis Scientiarum Budapestinensis,* Sectio Biologica, 4:167-178.

Sporne, K.R. 1975. *The Morphology of Angiosperms: The Structure and Evolution of Flowering Plants.* 207 pages. New York: St. Martin's Press.

Stafleu, F.A., and R.S. Cowan 1976-1988. *Taxonomic Literature.* 2nd edition, 7 volumes. Utrecht and The Hague: Bohn, Scheltema & Holkema.

— 1992-1998. *Taxonomic Literature.* Supplements to volume 1, 5 volumes. Königstein, Germany: Koeltz Scientific Books.

Stapf, O. 1929-1931. *Index Londinensis to Illustrations of Flowering Plants, Ferns and Fern Allies.* 6 volumes [additional 2-volume supplement by W.C. Worsdell issued in 1941]. Oxford, England: Clarendon Press.

Stebbins, G.L. 1974. *Flowering Plants, Evolution above the Species Level.* 399 pages. Cambridge, Massachusetts: Belknap Press of Harvard University Press.

Steenis, C.G.G.J. van, editor 1950-present. *Flora Malesiana.* 15 volumes. Jakarta, Leiden, Gronigen: Rijksherbarium/Hortus Botanicus.

Stewart, W.N., and G.W. Rothwell 1933. *Paleobotany and the Evolution of Plants.* 2nd edition, 405 pages. Cambridge, England, New York: Cambridge University Press.

Stuessy, T.F. 1990. *Plant Taxonomy: The Systematic Evaluation of Comparative Data.* 514 pages. New York: Columbia University Press.

Swift, L.H. 1974. *Botanical Classifications: A Comparison of Eight Systems of Angiosperm Classification.* 374 pages. Hamden, Connecticut: Archon Books.

Takhtajan, A. 1969. *Flowering Plants: Origin and Dispersal.* 310 pages. Washington, D.C.: Smithsonian Institution Press.

— 1980. Outline of the Classification of Flowering Plants. *The Botanical Review,* 46:225-359.

— 1983. The Systematic Arrangement of Dicotyledonous Families. **In:** C.R. Metcalfe and L. Chalk, *Anatomy of Dicotyledons*, 2nd edition, volume 2, pages 180-201. Oxford, England: Clarendon Press.

— 1986. *Floristic Regions of the World.* 522 pages. Berkeley and Los Angeles: University of California Press.

— 1997. *Diversity and Classification of Flowering Plants.* 643 pages. New York: Columbia University Press.

Thanikaimoni, G. 1972-1994. *Index Bibliographique sur la morphologie des pollens d'Angiospermes.* In: Travaux de la Section Scientifique et Technique de l'Institut Français de Pondichéry, India, volumes 12(1,2), 13, 18, 22, 27, 36. Pondichéry, India: Institut Français de Pondichéry.

Thorne, R.F. 1976. A Phylogenetic Classification of the Angiosperms. In: M.K. Hecht, W.C. Steere, and B. Wallace, *Evolutionary Biology*, volume 9, pages 35-106.

— 2000a. Classification and Geography of the Flowering Plants: Dicotyledons of the Class Angiospermae (Subclasses Magnoliidae, Ranunculidae, Caryophyllidae, Dilleniidae, Rosidae, Asteridae, and Lamiidae). *The Botanical Review,* 66:441-647.

— 2000b. The Classification and Geography of the Monocotyledon Subclasses Alismatidae, Liliidae, and Commelinidae. In: B. Nordenstam, G. El-Ghazaly, M. Kassas and T.C. Laurent, editors. *Plant Systematics for the 21st Century*, pages 75-124.

Turrill, W.B., C.E. Hubbard, E. Milne-Redhead, and R.M. Polhill, editors 1952-19xx. *Flora of Tropical East Africa.* [130 families published thus far].Rotterdam, Brookfield: A.A. Balkema.

Tutin, T.G., V.H. Heywood, N.A. Burges, D.M. Moore, D.H. Valentine, S.M. Walters, D.A. Webb, editors 1964-1980. *Flora Europaea.* 5 volumes. Cambridge, London, New York: Cambridge University Press.

Uhl, N.W., and J. Dransfield 1987. *Genera Palmarum.* 610 pages. Lawrence, Kansas: Allen Press.

Vester, H. 1940. Die Areale und Arealtypen der *Angiospermen Familien.* 194 pages. Leipzig: Akademische Verlagsgesellschaft.

Wagner, P. 1977. Vessel Types of the Monocotyledons: A Survey. *Botaniska Notiser,* 130:383-402.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer 1990. *Manual of the Flowering Plants of Hawai'i.* 1853 pages. Honolulu: University of Hawaii Press and Bishop Museum Press.

Wettstein, R. 1935. *Handbuch der systematischen Botanik.* 4th edition, 1152 pages. Leipzig, Vienna: Franz Deuticke.

Wiens, J.J., editor 2000. *Phylogenetic Analysis of Morphological Data.* 220 pages. Washington and London: Smithsonian Institution Press.

Willis, J.C. 1973. *A Dictionary of the Flowering Plants and Ferns.* 8th edition by H.K. Airy Shaw, 1245 pages. Cambridge, England: Cambridge University Press.

Wilson, K.L., and D.A. Morrison, editors 2000. *Monocots; Systematics and Evolution.* 738 pages. Collingwood, Victoria, Australia: CSIRO Publishing.

Wood, C.E., Jr. 1983. Index to Papers 1-100 Published as Parts of the Generic Flora of the Southeastern United States. *Journal of the Arnold Arboretum,* 64:547-563. [Additional families and genera are considered in volumes 65-71, 1984-1990. And *Harvard Papers in Botany* volume 1-, 1996-.]

Woodson, R.E., Jr., and R.W. Schery, and collaborators 1943-1980. Flora of Panama. *Annals of the Missouri Botanical Garden,* volumes 30-67.

Young, D.A., and D.S. Seigler, editors 1981. *Phytochemistry and Angiosperm Phylogeny.* 295 pages. New York: Praeger.

Young, D.J., and L. Watson 1970. The Classification of Dicotyledons: A Study of the Upper Levels of the Hierarchy. *Australian Journal of Botany,* 18:387-433.

Zomlefer, W.B. 1994. *Guide to Flowering Plant Families.* 430 pages. Chapel Hill and London: University of North Carolina Press.

APPENDIX

Characters that occur in few Dicot Families (mostly 0.3-5%)

Trochodendrales

1 Cercidiphyllaceae: Trees with long and short shoots; "sepals" may be bracteoles.
2 Tetracentraceae: Trees with long and short shoots; buds enclosed by stipule adnate to petiole.
3 Eupteliaceae: Buds perulate; connective produced apically.
4 Trochodendraceae: Buds perulate; leaves subverticillate; stamens adnate to ovary; seeds minute, fusiform; a droplet of fluid is secreted from the dorsal protuberance of each carpel.

Hamamelidales

5 Plantanaceae: Petiole caps bud; ovules orthotropous; connective flattened apically; inflorescences globular; fruit with long hairs at base; stipules large and broad, united around the twig; bark often scaling off.
6 Myrothamnaceae: Aromatic resinous shrubs; leaves flabellate-cuneate.
7 Buxaceae: Rarely subshrubs; styles often distant; fruit sometimes explosively dehiscent.
8 Hamamelidaceae: Anthers dehisce by flaps; indument often stellate; petals often liguliform; fruit usually woody; fruit sometimes explosively dehiscent.
9 Daphniphyllaceae: "Sepals" may be bracteoles; sometimes with very poisonous alkaloids; flowers minute.
10 Didymelaceae: "Sepals" may be bracteoles; inflorescence a compound spike; drupes large.

Salicales

11 Salicaceae: Buds perulate; inflorescences catkins; seeds enveloped in fine hairs.

Balanopales

12 Balanopaceae: Terminal bud perulate; female flower subtended by numerous imbricate bracteoles; each style 2-partite nearly to the base.

Fagales

13 Leitneriaceae: Wood very lightweight; secretory canals in stem; leaves with resinous contents; stamens inserted on a bract; inflorescences catkins.
14 Rhoipteleaceae: Aromatic plants; anthers didymous; flowers minute.
15 Myricaceae: Aromatic plants; leaves resinous glandular; stamens inserted on a bract; fruit often covered with waxy worts.
16 Betulaceae: Male inflorescence a catkin; female inflorescence a catkin, erect cluster or short spike; stamens inserted on a bract; buds perulate; hairs at apex of anther in *Carpinus* and *Ostrya*.
17 Ticodendraceae: Cortex exfoliating; hairs at apex of anther; male flowers in catkins; well developed resinous secretory system in the bark.
18 Juglandaceae: Aromatic resinous plants; male inflorescence usually a catkin; female a catkin or flower subsolitary, or in a cluster or short spike; anthers inserted on a flattened receptacle; filaments short; sieve tubes sometimes with lateral sieve areas, recalling those of gymnosperms.
19 Fagaceae: Fruit at least partly enclosed by consolidated bracteoles, frequently an acorn; male inflorescence catkin-like spikes or heads; female flowers solitary or in dichasia or spikes; buds perulate; terminal buds several in *Quercus*

Casuarinales

20 Casuarinaceae: Leaves reduced to a 4-16-toothed sheath, very scale-like; branchlets longitudinally grooved, jointed; samaras enclosed by woody bractioles.

Piperales

21 Saururaceae: Involucre often white; vessels in 1-2 concentric rings; tissue with oil cells, spicy.
22 Piperaceae: Aromatic, with etherial oil cells; vascular bundles ± scattered as in monocots; stem nodes often swollen; embryo sac with up to 100 antipodals; plants sometimes scandent.
23 Lactoridaceae: Shrubs with swollen nodes; leaves glandular punctate; anthers extrorse; connective apically produced.
24 Chloranthaceae: Tissues aromatic; the 50-250 stamens may represent an inflorescence; pollen sometimes polycolpoidate.

Magnoliales

25 Magnoliaceae: Stamens, pistils, and sometimes perianth spirally arranged; seeds sarcotestal; sometimes nectar on petals; fruit sometimes a fleshy syncarp; stipules large, enclosing the bud.
26 Winteraceae: Leaves aromatic, stamens spirally arranged; fruit sometimes a fleshy syncarp.
27 Annonaceae: Stamens and pistils spirally arranged, or the latter whorled; connective often broad and truncate; fruitlets often stipitate; leaves usually distichous; fruit sometimes a fleshy syncarp; endosperm ruminate.
28 Eupomatiaceae: Perianth (bracts?) calyptrate; stamens spirally arranged.
29 Degeneriaceae: Stamens laminar; stigma decurrent along ventral suture of ovary; tree aromatic; fruit large; endosperm ruminate; seeds sarcotestal; cotyledons 3(4).
30 Austrobaileyaceae: Tepals spirally arranged; fruitlets large; endosperm ruminate; stamens laminar; flowers fetid; gradual transition from tepals to stamens; sieve tube companion cells sparse or absent.
31 Himantandraceae: Sepals calyptrate; pistils spirally arranged; indument of peltate scales; fruit a fleshy syncarp; petals similar to stamens.
32 Schisandraceae: Tepals, stamens, and pistils spirally arranged; gradual transition from sepals to petals.
33 Illiciaceae: Tepals spirally arranged; crushed leaves aromatic; flowers fetid.
34 Canellaceae: Plants aromatic; leaves glandular-punctate; petals rarely spirally arranged; endosperm sometimes ruminate.
35 Myristicaceae: Leaves glandular-punctate, sepals colored; seed large, often with a laciniate colored aril; endosperm usually ruminate.
36 Trimeniaceae: Leaves sometimes glandular-punctate; stigma sessile.
37 Amborellaceae: Tepals spirally arranged.
38 Monimiaceae: Leaves pellucid punctate; disk adnate to concave receptacle; perianth sometimes spirally arranged; filament sometimes with a pair of basal appendages and anther opening by flaps; seeds rarely sarcotestal or arillate; pistils rarely connate, or adnate to receptacle; staminodes sometimes present.
39 Calycanthaceae: Plants aromatic; perianth spirally arranged; flower parts perigynous.
40 Idiospermaceae: Plants aromatic; anthers laminar; tepals spirally arranged; floral parts perigynous; cotyledons 3, 4.

Laurales

41 Gomortegaceae: Tepals spirally arranged; anthers dehisce by flaps; filaments with a gland on each side.
42 Lauraceae: Plants aromatic; anthers dehisce by flaps; filaments often with a gland on either side at base.
43 Hernandiaceae: Anthers dehisce by flaps; filaments sometimes with a gland or 2 at base.

Aristolochiales

44 Aristolochiaceae: Aromatic plants; flowers often fetid; inflorescence sometimes cauliflorous.

Nymphaeales

45 Cabombaceae: Sepals petaloid; stamens cyclically arranged; parenchyma laticiferous; embryo only slightly differentiated.
46 Nelumbonaceae: Leaves peltate; plumule foliaceous; petals and stamens spirally arranged; pistils separately embedded in an obconic receptacle but not adnate to it.
47 Nymphaeaceae: Vascular bundles scattered and closed, resembling those of monocots; petals sometimes nectariferous; parenchyma laticiferous; pollen monocotyledonoid; stamens spirally arranged; petals sometimes grading into stamens.

Ranunculales

48 Ranunculaceae: Vessels frequently in several cycles or scattered; pistils often spirally arranged; sepals sometimes petaloid; petals often with a nectary; rarely nectar secreted by carpels.
49 Ceratophyllaceae: Submerged rootless herbs; flowers minute; leaves dichotomously divided into linear serrulate segments; stamens spirally arranged; anthers subsessile, apically produced; "sepals" may be bracteoles; fruit a spiny nutlet; embryo with a well developed plumule.
50 Coriariaceae: Buds sometimes perulate; major leaf veins extending from base to apex of blade; petals accrescent and fleshy; style stigmatic all around.
51 Circaeasteraceae: Leaf venation open and dichotomous; leaves in a rosette at apex of stem; fruit with uncinate prickles; plant a small annual.
52 Nandinaceae: Leaf decompound; sepals spirally arranged; 6 honey scales present; pollen fossaperturate; cotyledons hardly differentiated.
53 Paeoniaceae: Leaves often decompound; sometimes vascular bundles present in pith; stamens spirally arranged; seed with aril or sarcotesta.
54 Berberidaceae: Vascular bundles sometimes scattered in pith; nectaries on petals; anthers with valvate flaps.
55 Podophyllaceae: Honey scales absent; anthers dehisce longitudinally by slits; vascular bundles scattered in pith.
56 Sargentodoxaceae: Pistils spirally arranged; petals squamiform, glandular.
57 Menispermaceae: Flowers usually trimerous; anthers often 4-lobed; seed often hippocrepiform; sepals sometimes spirally arranged.
58 Lardizabalaceae: Leaves usually digitately compound, pinnate in *Decaisnea*; stigma sessile.

Gunnerales

59 Gunneraceae: Stem sometimes polystelic; flowers in dense clusters; embryo sac of *Peperomia* type; sometimes symbiotic with *Nostoc*; leaves radical; flowers minute.

Geraniales

60 Connaraceae: Flowers sometimes heteromorphic; pulvini present; seed with aril or sarcotesta; sometimes secretory cavities in the parenchyma.
61 Geraniaceae: One sepal sometimes spurred; androecium obdiplostemonous; some genera with epicalyx; fruit often beaked; petals rarely contorted.
62 Vivianiaceae: Petals sometimes contorted; fruit not beaked; leaves sometimes whorled.
63 Limnanthaceae: Style gynobasic; petals sometimes contorted; terminal flowers sometimes 3.
64 Oxalidaceae: Flowers dimorphic; petals contorted in bud; seeds sometimes arillate; androecium weakly obdiplostemonous.
65 Tropaeolaceae: Prostrate or twiners; sepals colored, dorsal one spurred; petals inserted on calyx; mustard-oil present.
66 Balsaminaceae: Sepals often colored, posterior one spurred; anthers form a cap over the stigma; fruit usually dehisces elastically; lateral petals may be connate.
67 Linaceae: Sometimes climbing; flower sometimes heteromorphic; petals contorted in bud, sometimes with a ligular attachment; androecium weakly obdiplostemonous.
68 Erythroxylaceae: Petals mostly with a ligular bifid appendage or callosity; stipules intrapetiolar; flowers usually heteromorphic, androecium obdiplostemonous; petals sometimes contorted.
69 Zygophyllaceae: Filament often with a ventral ligular appendage; flower parts rarely

subperigynous; androecium obdiplostemonous; wood sometimes resinous; plants sometimes in salt habitats.

70 Balanitaceae: Plant spiny; leaves 2-foliolate; style very short; bark bitter.

71 Malpighaceae: Hairs often 2-armed, appressed and medifixed (malpighiaceous); sepals with 2(1) large dorsal glands; flowers sometimes dimorphic; glands often on petiole or lower surface of leaf.

72 Stackhousiaceae: Petals and stamens perigynous; disk lines the calyx-tube; dehisced fruit leaves a columella; leaves rarely much reduced.

Rutales

73 Meliaceae: Petals sometimes adnate to staminal tube; seeds often winged; wood scented; secretory cavities in a few genera; leaves rarely glandular punctate; sometimes bitter.

74 Simaroubaceae: Usually very bitter; stamens often with a basal ligular scale; few with secretory tissue, some with canals; leaves rarely much reduced; often ovaries free and styles connate; androecium mostly obdiplostemonous.

75 Rutaceae: Aromatic oil or resin cavities nearly always present; filaments sometimes with a bifid scale; sometimes ovaries free and styles connate; epicarp of fruit sometimes separates from the endocarp; bark sometimes bitter; androecium usually obdiplostemonous; flowers rarely epiphyllous.

76 Pittosporaceae: Resin abundant in bark of *Pittosporum*; leaves sometimes whorled; seeds sometimes embedded in viscous exudate; funicle sometimes long; plants sometimes climbers.

77 Cneoraceae: Pistil sometimes with septal glands; leaves with secretory cells (oil or resin); oil cells in bark; embryo arcuate, peripheral.

78 Burseraceae: Resin or oil canals present; rachis often winged; androecium obdiplostemonous; leaves usually not punctate; floral parts rarely perigynous.

79 Anacardiaceae: Resin canals often present; rachis sometimes winged; floral parts rarely perigynous; funicle often long; sometimes all but 1 stamen staminodal.

Sapindales

80 Akaniaceae: Stamens in 2 series, one of 5 the other of 3; scattered secretory cells in leaf and cortex; seeds not arillate; endosperm smells of bitter almond.

81 Sapindaceae: Petals often with a basal ligulate scale; stamens usually internal to disk; disk sometimes unilateral; tissues usually with resin or latex-like secretions; seeds often arillate; tendrils sometimes present.

82 Melianthaceae: Sepals unequal, one sometimes spurred or saccate; stamens internal to disk; disk unilateral; seeds sometimes arillate.

83 Hippocastanaceae: Leaves palmately compound; secretory cells in vegetative organs; seeds not arillate; embryo conferruminate.

84 Staphyleaceae: Sepals often petaloid; capsule apically dehiscent; filaments on or external to disk.

85 Aceraceae: Fruit a samaroid schizocarp; sap sometimes milky; style sometimes stigmatic all around.

86 Sabiaceae: Leaves and flowers sometimes with obscure reddish glandular dots; sometimes the integument does not cover the nucellus; anthers sometimes didymous.

Fabales

87 Caesalpiniaceae: Leaves usually paripinnate; adaxial petal internal; tendril rarely present, from twig; fruit a legume, rarely other type; funicle long; seeds sometimes arillate.

88 Fabaceae: Leaves usually imparipinnate, sometimes ending in a tendril; adaxial petal enlarged and external; fruit a legume, rarely other type; stamens mostly diadelphous; funicle short; plant very rarely laticiferous.

89 Mimosaceae: Flowers small, the stamens long-exserted, usually monadelphous; fruit a legume, rarely other type; funicle often long; anther often with a deciduous apical gland; seed with an areole on each side, sometimes arillate; leaves mostly bipinnate, very rarely ending in a tendril, the rachis rarely winged.

Polygalales

90 Polygalaceae: Two inner sepals usually colored; seed arillate, often hairy; stamens

not always adnate to corolla; pollen polycolporate; interxylary phloem sometimes present.

91 Krameriaceae: Sepals petaloid, the 2 inner petals much smaller than the others; achene bristly; anthers poricidal.

92 Trigoniaceae: Seeds usually enveloped by long hairs; one petal spurred, a gland often present opposite it; 1-3 glands usually adjoining the split staminal tube.

93 Vochysiaceae: Only 1 stamen fertile; one sepal gibbous or spurred; seeds often winged, sometimes pilose; some are large resinous trees; intra- and interxylary phloem sometimes present.

Papaverales

94 Papaveraceae: Sap often colored; petals often crumpled in bud, often 2-merous, 3-merous in some genera; fruit often a proicidal capsule, rarely a silique, rarely torulose, rarely with a replum; seeds often arillate; vascular bundles in some *Papaver* in concentric zones and tending to be scattered, recalling Ranunculaceae; sepals caducous.

95 Fumariaceae: Sap watery; petals 2-merous, the outer 1 or 2 often saccate or spurred; sepals caducous; fruit sometimes elongate and torulose, sometimes transversely septate and breaking into 1-seeded indehiscent segments like some legumes; seeds usually arillate; plant sometimes scandent.

96 Tovariaceae: Plants with a strong odor, producing glucosinolates; stigmas sessile; seeds minute, shiny.

97 Capparaceae: Ovary usually stipitate; fruit sometimes torulose or a silique, sometimes with a secondary septum, rarely transversely locellate; seeds often reniform; glucosinolates produced.

98 Brassicaceae: Stamens usually tetradynamous; sepals biseriate; style short; ovary rarely stipitate; fruit a silique, rarely divided transversely and dehiscent in joints; ovary usually with a secondary septum; glucosinolates produced.

99 Pentadiplandraceae (?): Petals cupular and connivent basally; connective produced into an apical knob; ovary stipitate, seeds reniform; glucosinolates produced.

100 Resedaceae: Petals often laciniate; stigmas sessile; short androgynophore present; seeds reniform; stipules gland-like; carpels rarely free; glucosinolates produced.

101 Moringaceae: Habit *Acacia*-like; flower honey-scented, the parts perigynous; disc lines the hypanthium; sepals petaloid; ovary stipitate; style elongate; fruit rarely torulose; plant secretes a gum resembling tragacanth when wounded; glucosinolates produced.

102 Bretschneideraceae: Flower parts perigynous, the hypanthium lined with glandular tissue; style elongate, curved; seeds red; glucosinolates produced.

Batales

103 Bataceae: Male calyx bilabiate; fruits united in a fleshy mass; flowers minute; stigma sessile; one of the ovary septa is secondary; produce glucosinolates; plants of coastal regions; funicle elongate.

Cistales

104 Cistaceae: Outer 2 sepals usually smaller than the inner 3 or absent; petals usually crumpled in bud, sometimes convolute, caducous; plants glandular.

105 Cochlospermaceae: Sap yellow-red; outer 2 sepals smaller than the inner 3; seeds usually reniform, often pilose; funicle rather long; leaves palmately lobed; plants produce triterpinoids and/or sapogenins (not in Violales).

106 Bixaceae: Seeds with a red fleshy testa; funicle rather long; 1-2 glands at base of outer sepals; leaves palmatinerved; plants produce triterpinoids and/or sapogenins (not in Violales); mucous secreting canals present.

Caryophyllales

107 Cactaceae: Spiny succulent plants; leaves usually rudimentary; perianth and stamens spirally arranged; funicle often long; fruit rarely longitudinally dehiscent or circumscissile; flower rarely unisexual; anomalous thickening of stem in at least 2 genera; betalains produced.

108 Aizoaceae: Plants often succulent; petals sometimes transitional to stamens; fruit rarely circumscissile; funicle often long; anomalous secondary thickening of stem occurs; betalains produced.

109 Portulacaceae: Plants often succulent; stipules sometimes scarious; fruit sometimes circumscissile; anthers often pink; anther wall development conforms to the Monocot type; funicle sometimes long; intraxylary phloem in some genera; betalains produced.

110 Basellaceae: Twiners, often fleshy; sepals often colored; flowers rarely unisexual; no anomalous secondary thickening of stem; larger vascular bundles bicollateral; betalains produced.

111 Didiereaceae: Plants spiny; sepals petaloid; anthers didymous; stigma often expanded and 3-4-lobed; seed arillate; betalains produced.

112 Gyrostemonaceae: Leaves succulent; seed arillate; no anomalous secondary thickening of stem; no betalains produced.

113 Phytolaccaceae: Sepals green or colored; seeds ± reniform; anomalous secondary thickening of stem in some species; betalains produced.

114 Barbeuiaceae: Capsule woody; seeds reniform, arillate; stem with anomalous secondary thickening.

115 Achatocarpaceae: Plant thorny; seed exarillate; no anomalous thickening of stem.

116 Petiveriaceae: Fruit sometimes a spiny nutlet; stigma sometimes sessile; stems with anomalous secondary thickening.

117 Agdestidaceae: Calyx accrescent; nutlet winged; stem with anomalous secondary thickening; seed exarillate.

118 Nyctaginaceae: Bracts calyx-like, sometimes colored; calyx often petaloid; stigma rarely sessile; plant sometimes thorny; stems with anomalous secondary thickening; interxylary phloem in some genera; betalains produced; fruits enclosed in base of calyx; cotyledons often unequal.

119 Stegnospermaceae: Seed with large red aril; no anomalous secondary stem thickening.

120 Caryophyllaceae: Stem nodes often swollen; stipules, when present, often scarious; capsule sometimes dehiscent by apical teeth, rarely circumscissile; sepals rarely spirally arranged; androecium mostly obdiplostemonous; some genera with anomalous secondary stem thickening; petals sometimes with a ligular process.

121 Molluginaceae: Stipules scarious or absent; fruit sometimes circumscissile; seeds sometimes arillate; stem and roots with anomalous secondary thickening.

122 Illecebraceae: Stipules scarious; bracts often scarious; stamens mostly perigynous, anthers didymous; flowers rarely unisexual; fruit sometimes a utricle.

123 Amaranthaceae: Sepals scarious; bracts and bracteoles often scarious; stamens often alternating with a staminal membrane; inflorescence sometimes glomerules; fruit sometimes circumscissile; stem and roots with anomalous secondary thickening; betalains produced.

124 Chenopodiaceae: Flowers minute; calyx sometimes membranous; anthers incurved in bud; leaves sometimes fleshy or reduced to scales; fruit rarely circumscissile; stem and roots with anomalous secondary thickening; interxylary phloem present; betalains produced; sometimes style stigmatic all around.

Polygonales

125 Polygonaceae: Sepals often colored, sometimes in 2 series, often accrescent and membranous; stem often jointed and with swollen nodes; a stipular sheath (ocrea) usually present; wall development of the anther of the Monocot type; anomalous structure as medulary vascular bundles or intraxylar or interfascicular phloem in a few species; funicle sometimes long.

Primulales

126 Plumbaginaceae: Flower sometimes heteromorphic; stamens opposite corolla lobes; funicle long; plants of saline habitats.

127 Primulaceae: Leaves often glandular punctate; stamens opposite the corolla lobes, rarely alternating with staminodes (scales); flowers often dimorphic; fruit often dehiscent by apical teeth, rarely circumscissile; seeds angular; stem sometimes with anomalous structure (concentric rings of vascular bundles).

128 Tamaricaceae: Leaves often scale-like; petals sometimes with 2 ligular processes; androecium mostly obdiplostemonous; seeds usually with long hairs, sometimes winged; commonly steppe, desert and shore plants.

129 Frankeniaceae: Stems sometimes jointed; petals with a ventral ligular process; anthers

didymous; funicle sometimes long; plants mainly of saline habitats.

130 Myrsinaceae: Plants with resin canals, streaks or dots in most tissues, including the flowers; stamens opposite the corolla lobes; ovules often embedded in the placenta; embryo often transversely placed in the seed; one genus is a mangrove, and its anthers are transversely septate into loceli.

131 Theophrastaceae: Stamens opposite the corolla lobes; resin absent; staminodes sometimes glandular or petaloid; fruit rarely almost dry; placenta immersed in mucilage.

Plantaginales

132 Plantaginaceae: Petals scarious; stigma decurrent all around the style or punctiform; fruit often circumscissile; stamens rarely inserted on the receptacle in male flowers; pollen sometimes slightly colpoid; seeds sometimes peltately attached to the placenta; endosperm translucent; medulary vascular bundles rarely present.

Proteales

133 Proteaceae: Bracts often colored; cotyledons rarely 3-8; integuments develop very slowly and do not enclose the nucellus until after fertilization.

Santalales

134 Olacaceae: Stamens inserted on the corolla or hypogynous; sometimes ventral surface of corolla or stamens hairy; sepals sometimes accrescent.

135 Aptandraceae: Stamens in a column around the pistil; sepals accrescent; ovules ategmic; embryo minute, barely differentiated.

136 Octoknemataceae: Style short, its 3-5 lobes bifid; seed longitudinally 8(6-10)-ribbed.

137 Opiliaceae: All or most are root parasites; calyx minute, the lobes obsolete; stamens sometimes hypogynous; ovules of some ategmic.

138 Medusandraceae: Staminodes much longer than the petals; anthers dehisce by valves; buds perulate; secretory canals throughout.

139 Cardiopteridaceae (?): Laticiferous climbers; leaves sometimes lobed; one style accrescent, the other short; ovules naked (?); embryo minute.

140 Santalaceae: Sometimes parasitic on roots or stems; sepals sometimes petaloid; leaves sometimes reduced to scales; some with ategmic ovules.

141 Loranthaceae: Hemiparasites of branches and roots, very rarely chlorophylless; leaves sometimes reduced to scales; secretory canals and intra- or extraxylary phloem sometimes present; cotyledons sometimes 3-6 or 0.

142 Misodendraceae: Hemiparasites on branches of *Nothofagus*; leaves sometimes scale-like; anthers unilocular; fruit with 3 enlarged, feathery setae; seed without a testa.

143 Grubbiaceae (?): Ericoid shrubs, not parasitic; flowers minute.

Thymelaeales

144 Geisolomataceae: Sepals petaloid; styles free basally, connate apically; intraxylary phloem absent.

145 Gonystyaceae (?): Phloem fibers abundant; intraxylary phloem absent; mucilage usually present; parastyles sometimes present.

146 Thymelaeaceae: Plants with tough fibrous bast; many poisonous; calyx often petaloid; mucilage sometimes present; seeds often arillate; flowers often sweetly scented; intraxylary phloem usually present; stamens often inserted at two levels on the perianth.

Euphorbiales

147 Euphorbiaceae: Fruit usually dehisces into cocci open ventrally, and often leaves a columella; sometimes laticiferous; extrafloral nectaries common; inflorescence sometimes a cyathium.

148 Simmondsiaceae (?): Stem with concentric rings of xylem and phloem separated by circles of parenchyma.

149 Callitrichaceae (?): Flowers minute; vascular system a weak axile bundle.

150 Aextoxicaceae: Stamens alternating with large reniform disk-glands; lower surface of leaf lepidote; endosperm ruminate.

151 Pandaceae: Inflorescence sometimes cauliflorous; fruit sometimes a massive drupe with stony endocarp.

Urticales

152 Eucommiaceae (?): Filaments very short, inserted on a very narrow pedicel; anthers linear, apically produced; laticiferous cells present.

153 Barbeyaceae: Stigma plumose; anthers subsessile, slightly apiculate; sepals accrescent in female flower.

154 Urticaceae: Cystoliths often abundant; stems often fibrous; hairs sometimes stinging; flowers minute; filaments inflexed in bud; laticiferous canals rarely present.

155 Theligonaceae: Succulent herbs; cystoliths present; calyx completely closed in bud; anthers linear; seed hippocrepiform.

156 Cannabaceae: Fibrous herbs, laticiferous or resin canals present; cystoliths present; filaments and anthers erect in bud; styles filiform.

157 Moraceae: Flowers minute; filaments inflexed or erect in bud; laticiferous; cystoliths often present; fruit often multiple.

158 Ulmaceae: Leaves often asymmetrical, disticous; cystoliths in a few species; stamens erect in bud; plant not laticiferous.

Malvales

159 Sterculiaceae: Petals contorted, sometimes adnate to staminal tube; bast fibers tough; hairs often stellate; plants with mucilaginous receptacles; stamens of male flowers in a column; epicalyx sometimes present.

160 Elaeocarpaceae: Petals often fimbriate, not contorted; fruit sometimes densely echinate; flowers rarely unisexual; mucilage cells present, but no canals.

161 Tiliaceae: Petals contorted; hairs often stellate; bast fibers tough; mucilage receptacles present; epicalyx sometimes present; stamens sometimes in bundles.

162 Sphaerosepalaceae: Extremely tenaceous and fibrous bark; plants rich in mucilage; style rarely gynobasic; anthers didymous.

163 Malvaceae: Staminal tube closely surrounds the pistil; petals sometimes contorted, usually asymmetrical; anthers unilocular; bast fibers tough; epicalyx often present; tissues with mucilage cells; hairs usually stellate.

164 Bombacaceae: Petals convolute, asymmetric; bast fibers tough; epicalyx sometimes present; hairs stellate or lepidote; mucilage cells and cavities present.

Violales

165 Flacourtiaceae: Perianth sometimes not clearly differentiated into sepals and petals; petals rarely spirally arranged, sometimes transitional to stamens; styles rarely repeatedly branched; inflorescence rarely catkin-like, rarely epiphyllous or cauliflorous; sometimes fruit densely spiny or prickly.

166 Lacistemataceae: Anther didymous; flowers minute.

167 Passifloraceae: Corona of thread-like filaments present; tendrils often present; seeds pitted and arillate; petiole often with stalked glands; sepals often petaloid; stamens sometimes on the gynophore.

168 Malesherbiaceae: Corona at throat of calyx-tube; stamens inserted on the gynophore; seeds pitted; styles inserted below apex of ovary; Andean plants.

169 Turneraceae: Stigmas fringed; often a pair of glands at base of blade; petals inserted on calyx-tube; flowers usually dimorphic; seeds pitted, sculptured, and arillate; corona sometimes present.

170 Achariaceae: The 3 stigmas sometimes bifid; seeds pitted; plant sometimes scandent; corolla sometimes adnate to calyx.

171 Caricaceae: Sap milky; anther connective often apically produced; seeds pitted or smooth, arillate; stigmas often fringed.

172 Violaceae: One petal often gibbous or spurred; anther connective apically produced; filaments very short; sometimes 2 anthers with glandular spurs; seeds often arillate.

173 Stachyuraceae (?): Inflorescence long and narrow; berry dryish, seeds arillate; filaments subulate.

174 Scyphostegiaceae (?): Stigmas sessile, forming a large fleshy disk with a small central ostiole; anthers with a common globose apical connective; fruit dehisces apically; endemic to Borneo.

175 Peridiscaceae: Two large pits at base of blade on dorsal surface; anthers monothecous; disk large, cupular, lobed, surrounding base of ovary.

176 Hoplestigmataceae (?): Sepals completely connate before anthesis; styles curved near middle; stigmas reniform.

177 Loasaceae: Plants mostly scabrous, the hairs often hooked, sometimes stinging; frequently twiners; sometimes 5 petaloid staminodes present, inserted on the calyx.

178 Cucurbitaceae: Anthers often sinuate; climbing or prostrate plants, with tendrils, often scabrous, the hairs rarely hooked; each stigma is usually bilobed; sometimes with extrafloral nectaries; sometimes vascular bundles bicollateral, frequently in 2 rings and with some sieve tubes in the cortex; stamens rarely free of corolla.

Rhamnales

179 Vitaceae: Plants often with tendrils and swollen nodes; inflorescences leaf-opposed; flowers minute; stamens opposite the petals; seeds with hard testa; endosperm sometimes ruminate.

180 Leeaceae: Tendrils absent; stamens opposite the petals; endosperm ruminate.

181 Rhamnaceae: Petals small, often surrounding the anthers; stamens opposite the petals; disk sometimes lining the calyx-tube; plant sometimes thorny, tendrils rare; endosperm sometimes ruminate; flowers small, the parts sometimes perigynous.

182 Erythropalaceae: Stamens opposite the petals, filaments short; disk large, partly enclosing the ovary; tendril sometimes present.

183 Aquifoliaceae: Stigma usually sessile; sepals minute; stamens alternipetalous; fruit with 4(3-22) pyrenes; disk absent.

184 Icacinaceae: Frequently long hairs on ventral surface of petals; stamens alternipetalous; inflorescences axillary or leaf-opposed; style usually short; interxylary phloem in 2 genera.

Celastrales

185 Ctenolophonaceae: Petals thick, linear-oblong, spoon-shaped basally; seed arillate; disk cupular, external to the stamens.

186 Ixonanthaceae: Disk conspicuous, annular or cupular, internal to the stamens; seed sometimes arillate.

187 Irvingiaceae: Stipules large; style short; disk conspicuous, surrounding base of ovary.

188 Dichapetalaceae: Petals mostly bilobed; leaves often with a few flat glands near base below; ovules carunculate.

189 Celastraceae: Seeds often with a colored aril; style usually short; disk cupular or flat, surrounding or beneath ovary; some genera with secretory sacs or laticiferous canals.

190 Goupiaceae: Petals acuminate; filaments very short; connective produced apically.

191 Siphonodontaceae: Styles short, adnate to the ventral wall of the ovary; drupe with 10 or 20 pyrenes; filament short, inserted external to the disk.

Dilleniales

192 Dilleniaceae: Sepals sometimes spirally arranged; petals often crumpled in bud; sometimes stipules wing-like and adnate to petiole; seeds mostly arillate.

193 Actinidiaceae: Anthers inflexed in bud, dehiscent longitudinally or by pores.

194 Saurauiaceae: Major lateral veins marked and parallel; anthers dehisce by apical pores or short slits.

Rosales

195 Rosaceae: Pistils sometimes spirally arranged; epicalyx sometimes present; an hypanthium often present, frequently lined by glandular tissue; plants sometimes thorny; some harbor N-fixing organisms; sometimes glands on petiole or base of blade.

196 Chrysobalanaceae: Style gynobasic; hypanthium often deep and narrow; a pair of glands often present on the petiole or base of blade, sometimes several on the bracts; interior of fruit often densely hairy; leaves often coriaceous.

197 Elaeagnaceae: Sometimes thorny; sometimes producing gum when injured; tannins abundant; calyx often colored; indument lepidote; root nodules with N-fixing organisms.

198 Neuradaceae: Often woolly, hairs not stellate; epicalyx sometimes present; petals inserted on the calyx; pollen sometimes unique, 3-armed, demicolporate at both poles; fruit sometimes spiny.

199 Corynocarpaceae (?): Petals shortly adnate to sepals; stamens opposite petals; staminodes petaloid; no resin canals present; large disk gland on the staminodes; 1 carpel aborts.

200 Crossosomataceae (?): Disk adnate to hypanthium; seeds with a multifid aril; filament inserted between dorsal and ventral halves of anther.

Myrtales

201 Myrtaceae: Tissues contain secretory cavities with oily substances; intraxylary phloem universal; leaves glandular punctate.

202 Lecythidaceae: Stamens monadelphous or diadelphous, often forming a hood over the pistil; fruit often an operculate woody capsule; style short; no secretory cavities; intraxylar phloem absent, but vascular bundles in cortex; sometimes large glands on margins of leaves.

203 Barringtoniaceae: Vascular bundles in cortex; fruit indehiscent; style long; pollen sometimes syncolpate.

204 Asteranthaceae: One or more whorls of stamens are staminodal and corona-like; style elongate; vascular bundles present in cortex; pollen not syncolpate.

205 Dialypetalanthaceae: Oil glands in all parts; seeds minute, fusiform; flowers sweet-scented.

206 Sonneratiaceae: Hypanthium present; anthers reniform; flowers sometimes unisexual; intraxylary phloem present; some are mangroves.

207 Punicaceae: Sepals often red; petals crumpled in bud; intraxylary phloem present; plant not glandular; hypanthium extends above the ovary; funicle long; outer testa fleshy.

208 Rhizophoraceae: Often mangroves; intraxylary phloem present; leaves sometimes glandular punctate; seed often viviparous; anthers sometimes 4-∞ locular; petals often laciniate, or markedly hairy on ventral surface; sometimes calyx-tube extends above ovary.

209 Lythraceae: Pistil and stamens usually trimorphic; petals crumpled in bud; calyx-tube often long; appendages often present between calyx lobes; dehiscence of capsule sometimes circumscissile; pollen sometimes also with 3 or 6 pseudocolpi; intraxylary phloem present.

210 Crypteroniaceae: Stamens inserted at apex of calyx-tube, alternate with its lobes; anthers didymous; intraxylary phloem present.

211 Oliniaceae: Petals alternate with 5 colored scales; pollen sometimes also with 3 pseudocolpi; intraxylary phloem present.

212 Penaeaceae: Ericoid habit; bracts often colored; pollen also with 3-5 pseudocolpi; embryo sac 16-nucleate; calyx colored; stamens inserted near (at) apex of calyx-tube; intraxylary phloem present.

213 Melastomataceae: Calyx often colored; leaves mostly with 3-9 longitudinal arcuate veins; anthers frequently curved, often inflexed in bud, usually dehiscent by pore(s), the connective often appendaged at or near the base of the anther; petals inserted at apex of calyx-tube; oil glands only in *Microlicia*; calyx rarely calyptrate; intraxylary phloem universal.

214 Onagraceae: Calyx-tube often produced beyond the ovary and often colored; petals sometimes convolute; intraxylary phloem present; rarely a few multiperforate xylem plates present.

215 Haloragaceae: Flowers minute; embryo sac of *Polygonum* type.

216 Hippuridaceae: Vascular bundles concentric or in an axile strand; stamen epigynous; leaves linear, verticellate; flowers minute.

217 Trapaceae: Floating herbs; petiole inflated; fruit turbinate, with 2-4 spines.

218 Combretaceae: Calyx-tube extends above ovary; flowers sometimes unisexual; pollen sometimes also with 3 pseudocolpi; intraxylary phloem common.

Theales

219 Theaceae: Petals sometimes spirally arranged; flowers often large.

220 Bonnetiaceae: Sepals unequal; petals convolute; placentas thick; plants sometimes resinous; dehisced capsule leaves a columella.

221 Pentaphylacaceae: Buds perulate; anthers didymous, dehiscing by apical lidded pores; filaments thick, broad; dehisced capsule leaves a columella.

222 Pellicieraceae: Buttressed mangrove tree; sepals white, later rose like the petals; anthers very long, linear; fruit large, long-acuminate.

223 Medusaginaceae: Styles on shoulders of ovary; flowers fetid; seeds winged; dehisced capsule leaves a columella; petals also contorted; cortical vascular bundles in stem.

224 Eucryphiaceae: Calyx calyptriform; dehisced capsule leaves a columella; seeds winged.

225 Paracryphiaceae: Pistil costate-cylindrical, the apex truncate; leaves subverticillate; seeds winged; inflorescence a compound spike; dehisced capsule leaves a columella.

226 Symplocaceae: Stamens sometimes in fascicles alternate with corolla lobes; leaves often sweet; calyx lobes persistent.

227 Tetrameristaceae: Leaves asymmetric; leaves and perianth glandular-punctate; filament flattened basally; connective of anther basally produced and glandular.

228 Clusiaceae: Sap resinous; staminodes often in female flower; seeds often arillate; embryo sometimes conferuminate.

229 Quiinaceae: Anthers didymous; seeds often densely hairy; sepals sometimes unequal in size; sometimes mucilaginous in pith and resin in fruit, petals and injured tissue.

230 Hypericaceae: Leaves usually gland-dotted; plant with secretory cavities, sometimes resinous (*Vismia*); very rarely lower leaves alternate (*Psorospermum*); seeds minute, not arillate.

231 Elatinaceae: Plant resinous; stipules scarious; petals persistent; dehisced capsule sometimes leaves a columella; seeds minute, sometimes sculptured.

232 Dipterocarpaceae: Plant usually resinous and mucilaginous; often 2-5 calyx lobes accrescent and wing-like; petals markedly convolute, often hairy; anther connective usually apically produced; cortical vascular bundles in young stem.

233 Humiriaceae: Plants sometimes resinous; endocarp woody and sometimes with numerous resin-filled cavities; connective of anther markedly produced apically.

234 Ancistrocladaceae (?): Twigs with coiled hooks; filaments basally broad; calyx-lobes accrescent and wing-like in fruit; endosperm ruminate.

235 Marcgraviaceae: Bracts modified into colored, variously-shaped nectaries; filaments broadened toward base.

236 Caryocaraceae: Filaments colored, often warty, bent in bud; sepals sometimes open in bud; endocarp woody, muricate.

237 Ochnaceae: Ovary sometimes deeply lobed; sepals sometimes colored; cortical bundles nearly always present in stem; style sometimes gynobasic; receptacle often swollen and red in fruit; contrasting in color with the fruitlets.

238 Strasburgeriaceae: Sepals unequal in size, and spirally arranged; filaments broadening toward base; large mucilage cells and passages in tissues; cortical vascular bundles present; cotyledons thick, subelliptic, the radicle short, endosperm fleshy.

239 Diegodendraceae: Stipules very long, coiled around the bud; style gynobasic; leaves pellucid-punctate, smelling of camphor when crushed.

240 Scytopetalaceae: Fruit sometimes woody; seeds sometimes long-haired; endosperm often ruminate.

241 Sarcolaenaceae: Base of flower usually enclosed in an involucre of united parts.

Ericales

242 Ericaceae: Anthers sometimes with basal tails and produced as tubes apically; anthers dehisce by pores, very rarely by longitudinal slits; androecium obdiplostemonous; pollen usually in tetrads.

243 Tremandraceae: Anthers sometimes beaked, opening by a pore; leaves rarely much reduced, often glandular, sometimes stellate tomentose.

244 Epacridaceae: Anthers dehisce longitudinally; pollen in tetrads or single; fruit 10-1 pyrenes; stamens sometimes hypogynous.

245 Clethraceae: Anthers not appendaged, dehisce by pores; androecium obdiplostemonous; seeds often winged; indument often stellate.

246 Empetraceae: Anthers dehisce longitudinally; pollen usually in tetrads; fruit 2-9 pyrenes; disjunct between northern N. Amer. and southern S. Amer; plants ericoid; stamens long-exserted; apex of style expanded and divided.

247 Pyrolaceae: Androecium obdiplostemonous; anthers dehisce by pores; pollen single or in tetrads; ovary imperfectly unilocular; seeds minute; embryo minute, undifferentiated.

248 Monotropaceae: Chlorophylless, with hardly any vessels; leaves reduced to scales; anthers rarely spurred, dehisce by chinks or slits; pollen grains single; seeds minute; embryo minute.

249 Diapensiaceae: Petals sometimes nearly free, sometimes hypogynous; corolla lobes sometimes fringed; anthers dehisce transversely or by longitudinal slits; pollen grains single; seeds minute.

250 Cyrillaceae: Buds perulate; anthers dehisce longitudinally or by apical pores; funicle rather long; no seed coat in mature seed.

251 Lennoaceae: Plants chlorophylless, colored; leaves reduced to scales; fruit circumscissle; embryo globose, undifferentiated; plants of deserts and coastal dunes.

Ebenales

252 Ebenaceae: Anthers apiculate; stamens sometimes hypogynous; endosperm very hard.

253 Sapotaceae: Laticiferous canals in pith, cortex and leaves; hairs commonly 2-shanked and appressed; one series of stamens often staminodal and petaloid; sepals sometimes spirally arranged.

Styracales

254 Styracaceae: Indument mostly stellate or lepidote; often with resiniferous intercellular canals in the bark and wood.

255 Lissocarpaceae: Connective produced apically; petal lobes contorted in bud; corona of 8 teeth present; stamens in 1 series, but diplostemonous.

256 Alangiaceae: Laticifers present; anthers long, linear.

Rafflesiales

257 Hydnoraceae: Plant chlorophylless, colored, malodorous, leaves absent; seeds minute, embryo undifferentiated; vascular bundles in one or more irregular rings; flowers very rarely unisexual.

258 Rafflesiaceae: Chlorophylless colored or white parasites of roots and stems of woody plants, sometimes malodorous; leaves reduced to scales; seeds minute, embryo undifferentiated.

259 Balanophoraceae: Chlorophylless parasites of tree roots, sometimes malodorous; leaves reduced to scales or absent; anthers 1-multilocellate; embryo undifferentiated; plants of upland moist forest.

Apiales

260 Araliaceae: Secretory canals with oil, resin or gum in the tissues; indument often stellate; embryo often minute and undifferentiated; endosperm sometimes ruminate.

261 Apiaceae: Secretory canals containing oil, resin or mucilage; stem internodes usually become hollow; leaves basally sheathing; stigmas apical; embryo usually minute; plants rarely climbers.

Saxifragales

262 Crassulaceae: Plants usually succulent; intrastaminal nectariferous scales usually present; seeds minute; pistils connate basally in *Penthorum* and *Diamorpha*.

263 Saxifragaceae: Capsule often apically dehiscent; seeds minute.

264 Parnassiaceae: Petals marcescent, sometimes fimbriate; five multifid staminodes with nectar secreting base.

265 Eremosynaceae: Annual herb; leaves radical and cauline, entire to pinnately lobed; capsule subdidymous.

266 Francoaceae: Perennial; two petals sometimes smaller than the others or absent; capsule elongate, apically dehiscent; leaves subbasal, lyrate or rounded cordate.

267 Davidsoniaceae: Leaves very large, the rachis partly alate; indument irritant; stipules large; flower with 8 or 10 nectariferous scales alternate with the stamens; drupe with two pyrenes.

268 Hydrangeaceae: Capsule sometimes apically dehiscent; sometimes outer flowers sterile and calyx lobes large and petaloid; seeds minute.

269 Philadelphaceae: Indument mostly stellate; filaments sometimes flattened and toothed toward the apex; seeds minute.

270 Pterostemonaceae: Androecium obdiplostemonous; capsule apically dehiscent; flower parts perigynous; filaments flattened, toothed near apex.
271 Iteaceae: Inflorescence long and narrow; styles united only at their apex.
272 Baueraceae: Capsule didymous, compressed, truncate, apically and loculicidally dehiscent; anthers didymous; flower parts perigynous.
273 Bruniaceae: Shrubs often ericoid, the leaves small, usually imbricate; seeds minute.
274 Vahliaceae: Annuals or biennials, with a taproot; flowers paired; capsule dehisces apically between the styles; seeds minute.
275 Donatiaceae: Cushion herbs; leaves closely imbricate; androecium obdiplostemonous; capsule turbinate, dehiscence circumscissile.
276 Tetracarpaeaceae: Petals clawed, caducous, but filaments and sepals persistent; follicles fusiform.
277 Escalloniaceae: Leaves mostly with gland-tipped teeth.
278 Grossulariaceae: Plants often spiny; sepals often petaloid; petals inserted on calyx-tube, often smaller than the calyx lobes.
279 Brunelliaceae: Disk adnate to ovary and calyx; fruit separating into exocarp and endocarp, often with irritant hairs.
280 Cunoniaceae: Stipules often large; stamens long-exserted; seeds sometimes hairy or winged.
281 Greyiaceae: Disk cupular, external to the stamens, coronoid, with 10 staminodes; androecium obdiplostemonous; anthers didymous; leaves with resinous glands; petiole adnate to the twig for a distance.
282 Cephalotaceae: Some ascidia present (tubular leaves for catching insects); apical connective of anther glandular; disk papillose; sepals valvate, white and green; stamens perigynous.

Begoniales

283 Begoniaceae: Leaves mostly asymmetric; sepals petaloid; stigmas often bifid and twisted; sometimes the capsule dehisces between the styles; stem sometimes jointed, with swollen nodes; rarely subshrubs; rarely climbers; seeds minute, sculptured.
284 Datisaceae: Capsule dehisces apically between the styles; seeds minute, sculptured.

Droserales

285 Dioncophyllaceae: Midrib of leaf often excurrent, with 2 hooks; leaf vernation sometimes circinate; leaves sometimes with mucilaginous glands; capsule dehisces before the seeds are ripe; seeds large, discoid, winged; stigmas sometimes plumose.
286 Droseraceae: Leaves with sticky tentacles or bristles, used to capture insects; rarely subshrubs (*Drosophyllum*); leaves usually circinate, rarely whorled; successive vascular bundles without regular arrangement.
287 Byblidaceae: Leaves circinate in vernation, with stalked viscous glands; anthers with a swollen rounded base; seeds rough, warty; embryo minute, globular and undifferentiated.
288 Podostemonaceae (?): Plants mostly submerged in running water, often thalloid in appearance, some laticiferous; sepals sometimes petaloid; ovary sometimes stipitate; seeds minute.
289 Hydrostachyaceae (?): Submerged freshwater herbs; leaves basal, sometimes pinnatisect; inflorescence a dense scapose spike; anthers didymous; seeds minute; pollen in tetrads; vascular bundles in an isolated ring.

Sarraceniales

290 Sarraceniaceae: Plants with ascidia (tubular leaves for catching insects); sepals often colored; seeds small.

Nepenthales

291 Nepenthaceae: Plants with ascidia (tubular leaves for catching insects); often climbers of wet tropical jungle; seeds minute; pollen in tetrads; sepals nectariferous on inner surface; medulary and cortical vascular bundles in some species.

Polemoniales

292 Polemoniaceae: Individual stamens sometimes inserted at different levels on the corolla; corolla lobes contorted in bud; fruit rarely indehiscent.
293 Hydrophyllaceae: Stamens sometimes differing in length and individually inserted

at different levels on the corolla, the filaments often flanked by a pair of scale-like appendages; corolla lobes rarely contorted; hairs often rough.

294 Boraginaceae: Ovary usually 4-lobed and the style gynobasic; plants often scabrid; inflorescence usually scorpioid; coronal scales sometimes present; corolla lobes sometimes contorted.

295 Fouquieriaceae: Petioles become spines; sepals unequal and markedly imbricate; seeds compressed, winged all around or long-hairy; base of ovary glandular.

Gentianales

296 Loganiaceae: Very rarely 1 calyx lobe enlarged and petaloid; fruit dehiscence rarely circumscissile; attachment of seed to placenta sometimes peltate; leaves bitter; plants sometimes epiphytes; intra- or interxylary phloem present.

297 Rubiaceae: Stipules often interpetiolar and only 2 for a pair of leaves ; corolla lobes sometimes contorted; sometimes 1 calyx lobe enlarged and petaloid; corolla very rarely bilabiate or nearly partite to the base; filaments very rarely strongly unequal in length; fruit dehiscence rarely circumscissile; endosperm rarely ruminate; cystoliths sometimes present even in flowers.

298 Columelliaceae: Anthers subsessile, twisted, the connective broad; ovary imperfectly bilocular; plants bitter in all parts; wood very hard; seeds and embryo minute.

299 Gentianaceae: Corolla rarely with coronal scales, sometimes 2 nectaries on each corolla segment, rarely spurred; sepals sometimes with basal nectar glands; seeds minute; intraxylary phloem present; pollen rarely in polyads; plants very rarely vines.

300 Menyanthaceae: Inner surface of corolla lobes often fimbriate; corolla lobes induplicate-valvate; intraxylary phloem absent.

301 Convolvulaceae: Filaments inserted toward base of corolla, the filaments often unequal in length; sepals often markedly imbricate, sometimes unequal; laticiferous canals usually present; petals usually plicate-contorted, rarely imbricate; intraxylary phloem present; ovary rarely deeply bilobed.

302 Cuscutaceae: Chlorophylless yellow or orange twiners; leaves absent; coronal scales present; dehiscence of fruit sometimes circumscissile.

303 Apocynaceae: Laticiferous canals and intraxylary phloem present; seeds often with apical and basal tufts of hair; corolla sometimes with coronal appendages, sometimes contorted in bud; ovaries often two; anthers usually sagittate, connivent around the stigma; sepals often glandular basally inside; endosperm sometimes ruminate.

304 Plocospermaceae: Style twice shortly bilobed apically; seeds with apical tuft of hair; ovary unilocular, the placentas 2, each with 1 subapical and 1 subbasal ovule.

305 Asclepiadaceae: Laticiferous canals and intraxylary phloem present; corolla lobes contorted, a corona rarely absent; anthers connivent or connate above the stigma; pollen usually in pollinia; ovaries 2, united by the stigma; seeds usually compressed and mostly with an apical coma.

Oleales

306 Oleaceae: Stamens usually 2, the anther loculi back to back; trichomes often peltate; petals rarely convolute; fruit rarely circumscissile.

307 Salvadoraceae: Anther loculi back to back; interxylary phloem in 2 of the genera; plants often of saline habitats.

Cornales

308 Davidiaceae: Inflorescence with 2 large white leafy bracts; buds perulate; epicarp hard, endocarp stony, sulcate.

309 Nyssaceae: Flowers small, greenish; calyx minute; style elongate; glandular disk pulvinate; stone of fruit sulcate.

310 Garryaceae: Inflorescence catkin-like; connective apically produced; testa thick, fleshy; funicle rather long.

311 Cornaceae: Inflorescence sometimes subtended by a whorl of petaloid bracts; calyx teeth minute or obsolete.

Dipsacales

312 Caprifoliaceae: Corolla sometimes gibbous or spurred; seeds often with a bony testa; stamens rarely didynamous.

313 Adoxaceae: Anthers unithecal, apparently due to splitting of the anthers; fruit with 1-5 pyrenes; flowers with a musky smell.

314 Valerianaceae: Dried specimens usually malodorous; corolla often gibbous or spurred, rarely bilabiate; calyx minute, sometimes merely a ring, but sometimes plumose in fruit.

315 Dipsacaceae: Leaves pinnately dissected; inflorescence usually involucrate; sepals sometimes pappus-like; calyx sometimes bristly; flowers rarely in verticillasters; stamens sometimes didynamous; sometimes increased number of antipodals in the embryo sac; plants rarely subshrubs.

Scrophulariales

316 Solanaceae: Anthers often connivent, sometimes poricidal; stamens rarely differing in length, rarely didynamous; seeds usually minute, often sculptured; dehiscence of fruit rarely circumscissile; intraxylary phloem present.

317 Nolanaceae: Corolla plicate in bud; stamens sometimes unequal in length; intraxylary phloem present; endocarp sometimes stony; plants mostly along seashore.

318 Scrophulariaceae: Corolla often bilabiate, sometimes spurred, gibbous or saccate, the lobes imbricate; stamens usually didynamous; intraxylary phloem absent; sometimes root parasites with chlorophyll; seeds often minute and sculptured; hairs often uniseriate.

319 Orobanchaceae: Chlorophylless, parasitic on roots; leaves reduced to scales; corolla bilabiate or nearly regular; stamens didynamous; anthers often connivent in pairs; seeds minute, sculptured.

320 Buddlejaceae (?): Stigma enlarged; corolla lobes imbricate; seeds often winged or produced at each end; indument, when present, glandular, stellate or lepidote; intraxylary phloem absent.

321 Globulariaceae: Corolla bilabiate, the lobes imbricate in bud; stamens didynamous; inflorescence usually involucrate and chaffy.

322 Lentibulariaceae: Leaves sometimes reduced to scales, sometimes with insectivorous bladders; corolla spurred, gibbous or personate, the lobes imbricate; anther loculi divaricate; dehiscence of fruit sometimes circumscissile; seeds sculptured.

323 Acanthaceae: Bracts often colored and conspicuous; cystoliths commonly present; stamens usually didynamous; anther loculi confluent or separate; corolla bilabiate, rarely unilabiate; funicle usually indurate (jaculator) in fruit; intraxylary or interxylary phloem sometimes present.

324 Bignoniaceae: Seeds often flattened and winged; stamens usually didynamous; corolla lobes imbricate in bud, rarely valvate; calyx rarely truncate or bilabiate; sometimes part of the leaf converted to a branched tendril; interxylary phloem sometimes present; anthers usually connivent in pairs, the sacs divergent 180°.

325 Gesneriaceae: Corolla often bilabiate, often ventricose, rarely spurred, the lobes imbricate in bud; stamens usually didynamous; anthers often connivent or connate in pairs or in a group of four; many epiphytes; seeds minute, scultpured; fruit rarely circumscissile.

326 Pedaliaceae: Fruit often horned, hooked, or winged; anthers often connivent, the sacs sometimes divaricate; corolla sometimes ventricose or spurred, the lobes imbricate in bud; calyx sometimes spathaceous or bilabiate; stamens often didynamous.

Lamiales

327 Myoporaceae: Leaves often gland-dotted; secretory cavities in leaf and stem; stamens usually didynamous; anther sacs divergent basally; corolla lobes imbricate in bud; intraxylary phloem in *Oftia*.

328 Verbenaceae: Stamens sometimes didynamous; anther sacs often divaricate; style terminal; corolla lobes imbricate in bud; intraxylary phloem in *Avicennia*.

329 Phrymaceae: Calyx and corolla bilabiate; leaves gland-dotted; style terminal; anther sacs not divergent; stamens didynamous; corolla lobes imbricate in bud; ovary uniovulate.

330 Lamiaceae: Plants usually aromatic; leaves usually glandular-punctate; corolla often bilabiate; style usually gynobasic; calyx

sometimes bilabiate; stamens often didynamous; anther sacs usually divaricate; plants rarely climbers; flowers frequently in verticillasters; stems square.

Campanulales

331 Campanulaceae: Laticiferous canals present; sometimes intraxylary phloem present; medulary vascular bundles in some genera; corolla very rarely spurred; plants rarely climbers; glandular hairs absent; capsule dehiscent by pores or by lateral slits, or apically loculicidal, or circumscissile.

332 Goodeniaceae: Laticiferous canals absent; style indusiate apically; corolla bilabiate, rarely unilabiate; anthers sometimes connivent or connate around the style; medulary vascular bundles in 3 genera.

333 Brunoniaceae: Style apically indusiate; anthers connate around the style; leaves rosulate, basal; inflorescence scapose, bracteate; flowers subactinomorphic.

334 Calyceraceae: Style not indusiate; anthers connivent or connate around the style; inflorescence involucrate; stigma capitate; no secretory cavities; no phloem strands in cortex; no external glands.

335 Stylidiaceae: Filaments connate, and adnate to the style; style not indusiate; not laticiferous; anther sacs sometimes separate; corolla often with paracorolla; pollen spinulose.

Asterales

336 Asteraceae: Sepals absent or represented by a pappus or scales, bristles or hairs; heads involucrate; when zygomorphic the corolla is usually ligulate, rarely bilabiate; very rarely the female flower is apetalous; anthers sometimes tailed or produced apically; laticiferous vessels in 2 tribes; oil tubes often present; pollen usually spinulose; plants often with a taproot; rarely climbers; indusium absent; medulary and cortical vasculary bundles sometimes present; intraxylary phloem present in 3 genera; embryo sac often with increased number of nuclei; fruit a cypsela.

Characters that occur in few Monocot Families (mostly 2-7%)

Pandanales

1 Pandanaceae: Leaves spinulose; plants often with prop roots; inflorescence sometimes a spadix; flowers minute; pericarp often with woody fibers; stamens spirally arranged; bracts sometimes brightly colored; sometimes increase in antipodals in embryo sac.

Arecales

2 Arecaceae: Leaves large, usually pinnately or palmately divided; perianth rarely glumaceous, rarely spirally arranged, rarely to 10 parts; calyx sometimes open in bud; plants sometimes climbers; plants sometimes with prop roots.

Cyclanthales

3 Cyclanthaceae: Fruit a syncarp; seeds sometimes sarcostestal; staminodes 4; plants sometimes lianas, the sap watery or milky; sometimes male with 4-24 tiny perianth segments in 1-2 series; endosperm formation Helobial.

Arales

4 Araceae: Inflorescence rarely with few flowers; spathe sometimes colored; flowers small, often fetid; individual floral bracts absent; plants sometimes climbers, some with latex, rarely paradioecious; leaf venation often pinnate or palmate; seed sometimes sarcostestal; embryo usually axile in the endosperm; endosperm formation Cellular; *Acorus* lacks raphids.

5 Lemnaceae: Plants floating, small or minute, reduced to a mere thalus, often rootless, with 1 female and 1-2 male flowers; fruit a utricle, the seed sarcostestal; anthers with 2 separate sacs, transversely or apically dehiscent; endosperm formation Cellular.

Alismatales

6 Alismataceae: Leaf strongly nerved, both longitudinally and transversely; inflorescence scapose; latex present; stamens and pistils sometimes spirally arranged; anthers extrorse; nectaries on pistils and receptacle; embryo sac with 1 antipodal cell, rarely 2-3.

7 Butomaceae: Perianth petaloid; inflorescence scapose, involucrate; secretory canals absent; anthers introrse; seeds minute.

8 Hydrocharitaceae: Each of the styles often bilobed; petals sometimes with a basal gland; stamens sometimes spirally arranged; staminodes nectariferous; perianth rarely homochlamydeous; stigmas elongated; fruit sometimes dry; plants fresh water and marine.

Juncaginales

9 Scheuchzeriaceae: Numerous, long, uniseriate intravaginal hairs present; anthers extrorse; flowers bracteate; marsh plants.

10 Juncaginaceae: Flowers ebracteate; anthers extrorse; secondary multiplication of embryo sac antipodals; marsh plants.

11 Lilaeaceae: Inflorescence scapose, the flowers bracteate; style long, filiform; fruit compressed, longitudinally ribbed; aquatic or marsh plants.

Najadales

12 Aponogetonaceae: Leaves with numerous conspicuous transverse veins; inflorescence scapose; anthers extrorse; plants of fresh water.

13 Zosteraceae: Flowers bracteate; trachiary elements reduced; seed longitudinally ribbed;

pollen filamentous; marine plants; endosperm Nuclear.

14 Potamogetonaceae: Stamens adnate to claw of sepal; anthers extrorse; endosperm Helobial; plants of fresh to brackish water.

15 Zannichelli: Embryo coiled; tracheary elements reduced; endosperm Helobial; embryo sac antipodals multiply to 4-5; submerged plants of fresh to salt water.

16 Najadaceae: Stem filiform, much branched; leaves linear; flowers minute; tracheary elements reduced; submerged plants of fresh or brackish water; endosperm Nuclear.

17 Posidoniaceae: Anther sacs separated by connective which is markedly produced apically; fibrous leaf base persistent; anthers sessile, extrorse; leaves liguliform; tracheary elements reduced; plants marine, submerged; stigma sessile, fimbriate.

Triuridales

18 Triuridaceae: Plant reddish, purple, or cream; perianth corolline; flowers bracteate; anthers extrorse.

Typhales

19 Sparganiaceae: Inflorescences spherical heads; anthers extrorse; antipodals of embryo sac multiply postfertilization; plants of fresh water.

20 Typhaceae: Spadix dense, cylindrical; flowers minute; fruits with a tuft of long hair; seed striate; leaves liguliform; pistil stipitate; emergent plants of fresh water.

Juncales

21 Juncaceae: Flowers small; perianth usually glumaceous, in 2 whorls; leaf often with a ligule at apex of sheath; pollen shed in tetrads; diffuse centromere in chromosomes of *Luzula*.

22 Thurniaceae: Leaves basal, linear-acuminate, leathery; inflorescence a dense globular head, subtended by several leafy bracts; seeds pointed at both ends; flowers small; pollen shed in tetrads.

23 Restionaceae: Leaves reduced, mostly to a sheath; glumes 6-3, in 2(1) series, or rarely absent from the female flower; sheath very rarely with a ligule; anther 1(2)-locular; pollen often graminoid.

24 Centrolepidiaceae: Small tufted herbs; inflorescence scapose, subtended by relatiavely large bracts; flowers minute; anthers 1-2-locular; fruit rarely indehiscent; stomates somewhat similar to those of Poaceae; antipodals of embryo sac increased; flower subtended by 1-3 bracteoles.

25 Flagellariaceae: Leaves grass-like; perianth dry or somewhat corolline; plant sometimes a somewhat woody climber; embryotega present on seed; pollen ± graminoid; rarely 1 stamen aborts.

Cyperales

26 Cyperaceae: Stem usually solid, often trigonous, very rarely articulated; leaves usually basal or subbasal, cauline ones usually 3-ranked; flowers subtended by a glume; lodicules absent; inflorescence usually subtended by 1 or more bracts; leaves linear, grass-like, the sheath closed, ligule rarely present; guard cells dumbbell-shaped; pollen apertures sometimes elongated; embryo axile in the endosperm or basal; diffuse centromere in chormosomes of some species.

Poales

27 Poaceae: Stem terete, jointed, internodes hollow, the nodes solid, swollen; leaves distichous, the sheath open, a ligule ususally present, guard cells dumbbell-shaped; flowers in spikelets, distichous, enclosed in glumes; sometimes the lemma, more rarely the glumes, awned; often 2-3 minute hyaline scales (lodicules) internal to the lemma; fruit a caryopsis; embryo basal to lateral and lying against the endosperm; secondary multiplication of the antipodal cells of the embryo sac is characteristic, and as many as 300 cells may be produced.

Liliales

28 Trilliaceae: Leaves usually broad, with a midrib and 1 pair of longitudinal veins, the transverse veins evident; sepals green, purplish or white; filaments usually short

and the anthers elongated, the connective usually produced apically.

29 Liliaceae: Individual flowers usually bracteate; plants rarely woody, rarely climbing; anthers rarely extrorse; pollen sometimes zonisulculate; embryo axile in endosperm, which is never floury.

30 Smilacaceae: Plants usually climbing; petiole sometimes tendriliferous; leaves usually fairly broad and petiolate, with a midrib and 1-2 pairs of longitudinal arcuate veins and conspicuous cross-veins; staminodes present in female flowers, pistillode absent from male.

31 Agavaceae: Usually large plants with fleshy or coriaceous leaves; inflorescence often large and scapose; filaments usually long-exserted; seeds usually compressed; embryo within the endosperm; endosperm fleshy or hard, starchless.

32 Xanthorrhoeaceae: Plants usually large, sometimes resinous; leaves firm, often pungent, usually linear, sometimes liguliform; perianth mostly glumaceous, rarely large and colored, the inner whorl sometimes petaloid; pollen sometimes zonisulculate; endosperm horny, with protein, oil and hemicellulose.

33 Philesiaceae: Leaves usually ovate or oblong, with a conspicuous midrib and sometimes 1, 2 or 4 pairs of longitudinal arcuate veins, the reticulation between them mostly evident; flowers often large; anthers elongated, large; plants sometimes climbers; endosperm hard, with protein and oil.

34 Stemonaceae: Flowers small to moderate in size; perianth segments 2-seriate when 4, in 1 whorl when 5; connective apically produced; seed longitudinally grooved or ribbed, with a basal aril and sometimes a very long funicle; plants sometimes climbers.

35 Dioscoreaceae: Leaf blade usually broad, the main veins longitudinal and the cross-veins quite evident; flowers small, inconspicuous, sometimes vascular bundles in concentric zones; seeds often winged; plants climbers; endosperm horny, with protein, oil and hemicellulose.

36 Taccaceae: Leaves basal, large, broad, entire or deeply lobed, with a midrib and fairly numerous lateral veins extending from it, the petiole often long; inflorescence scapose, often subtended by a combination of linear and broad bracts; perianth dark, brownish; anthers inflexed, the connective shortly apically produced; style arms usually bilobed, reflexed; seeds longitudinally ridged; embryo minute, included in the endosperm, basal or lateral; endosperm somewhat cartilaginous, with protein, lipid, but no starch.

37 Pontederiaceae: Freshwater herbs; leaf blade broad or narrow, the primary veins longitudinal; perianth petaloid, marcescent; flower often trimorphic, seeds longitudinally ribbed; embryo axile in the endosperm; endosperm floury, starchy with an outer layer of protein; sometimes only 1 stamen functional; pollen elongated.

38 Amaryllidaceae: Herbs usually with a tunicated bulb, very rarely a rhizome; leaves often linear or lorate, basal, the veins inconspicuous; inflorescence usually a scapose, cymose umbel, often enclosed in bud by 1 or more membranous bracts; flowers usually showy, corolline, a corona sometimes present; style slender; endosperm with cellulose or starch, protein, and oil, enclosing the embryo.

39 Velloziaceae: Leaves sometimes spinulose, linear-acuminate, with a midrib, the sheath persistent; perianth petaloid, sometimes with a small corona behind the anthers; endosperm hard, with hemicellulose, protein, oil, and starch; pollen sometimes in tetrads; rarely functionally dioecious.

Bromeliales

40 Bromeliaceae: Hairs characteristically shield-like scales with a uniseriate stalk; leaves liguliform, without a midrib and without conspicuous lateral veins, often with spiny teeth; bracts often brightly colored; perianth heterochlamydeous, but sometimes the sepals are colored; petals usually considerably larger than the sepals, sometimes with a pair of basal appendages; stamens often long-exserted, the anthers linear; stigmas sometimes spirally twisted around each other; seeds sometimes appendaged or winged; embryo lateral to endosperm or rarely embedded in it; endosperm mealy, starchy.

Commelinales

41 Commelinaceae: Stems usually articulated, the nodes swollen; leaves usually arranged along the stem, often elongated,with a prominent midrib, more rarely the blade ovate to suborbicular; inflorescence sometimes with a protecting bract; perianth heterochlamydeous, but sometimes the sepals are colored; petals ephemeral and deliquescent; stamens sometimes bearded with brightly colored hairs; sometimes 2-4 stamens converted to attractive staminodes; seeds often sculptured, sometimes arillate, rarely winged; embryo marginal, its position indicated by an embryotega; endosperm mealy, starchy.

42 Xyridaceae: Leaves linear, or sometimes terete or flattened; flowers subtended by imbricate, leathery, usually rigid bracts; flowers ephemeral; sepals all similar or 2 bractose, the third membranous; petals colored; 3 of the stamens staminodal, with a feathery apex, or lacking; style sometimes with 2-3 subbasal glandular appendages; seeds small, usually longitudinally striate; embryo small, lying against the endosperm, the latter mealy, starchy and sometimes also oily; pollen usually elongated.

43 Mayacaceae: Herbs of fresh water and marshes; stems filiform; leaves usually linear, arranged along the stem, apically minutely bidentate, not sheathing; sepals green; petals corolline, clawed; anthers 4-locular, dehiscing by an apical pore or short slit; seeds small, subglobose, reticulately sculptured, the embryo lying against the endosperm, under an embryotega; endosperm mealy, starchy and proteinaceous; pedicels subtended by a membranous bract.

44 Rapateaceae: Leaves basal, distichous, equitant; inflorescence often subtended by 1-2 large bracts, the individual flowers subtended by several sometimes colored bracteoles; sepals hyaline, rigid; petals corolline; anthers linear, dehiscent by pores or an apical cleft; pollen sometimes zonisulculate; style filiform; seeds sometimes longitudinally striate; embryo small, lying agains the endosperm, the latter mealy, starchy; uniseriate mucus-producing hairs present.

45 Eriocaulaceae: Inflorescence a scapose head, subtended by an involucre which is sometimes white; flowers minute; perianth scarious, often white; style often appendaged, 2-3-lobed, the lobes often apically bifid; fruit a thin-walled capsule; embryo lies against the endosperm, the latter mealy or floury, starchy.

Zingiberales

46 Musaceae: Large rhizomatous herbs, the leaves convolute in bud, with a midrib and numerous parallel veins extending from it toward the margin; flowers covered by large colored bracts; perianth segments petaloid, 5 connate, 1 free; stamens 5(6), the filaments free from the perianth; anthers linear; seeds with an embryotega; embryo at the margin of perisperm, the latter mealy, starchy.

47 Strelitziaceae: Leaves distichous, large, the blade with a midrib and numerous lateral parallel veins, the petiole long; inflorescence in the axil of cymbiform bracts, the latter sometimes colored; flowers large, the perianth segments often differing in size, shape and sometimes color, free or 5 connate and 1 free; stamens epigynous or adnate to base of perianth, 5(6), the 6th often a petalaoid staminode; anthers linear; seeds globose, sometimes arillate, with an embryotega; embryo marginal or within the perisperm, the latter mealy and starchy.

48 Lowiaceae: Leaves with a midrib and numerous parallel veins extending apically from it, the transverse veins conspicuous, the petiole long; inflorescence scapose, the bracts colored but not very large; flowers malodorous; stamens epigynous, unilateral; stigmas laciniate; seeds globose, arillate; albumen starchy.

49 Zingiberaceae: Plants often aromatic; leaf blade with midrib and numerous fine parallel veins extending obliquely upward from it; ligule present between petiole and sheath; bracts often colored; sepals calycine; one petal sometimes pouched; stamen filament sometimes petaloid; pollen forate or spiraperturate in Costoideae; style commonly lying between the anther sacs; seeds often arillate.

50 Cannaceae: Leaf blade with a strong midrib and numerous lateral veins extending from it;

sepals herbaceous; anther unilocular, adnate to one side of the petaloid filament; staminodes 3(1, 4), petaloid; style petaloid; fruit often warty; seeds globular; albumen very hard, starchy.

51 Marantaceae: Leaf with a pulvinus at apex of petiole; blade with a distinct midrib and numerous parallel lateral veins; bracts sometimes colored; anther unilocular, adnate to one side of the petaloid filament; staminodes 2-4, petaloid; seeds sometimes arillate; albumen mealy, starchy.

Iridales

52 Haemodoraceae: Stem and roots often with red sap; leaves equitant; inflorescence and perianth often woolly; endosperm mostly starch, some protein, oil and hemicellulose.

53 Philydraceae: Plants often floccose; leaves equitant; inflorescence sometimes woolly; flowers covered by a bract in bud; perianth corolline, marcescent; pollen rarely 3- or zonisulculate ?; seeds minute, sculptured, tailed at both ends; endosperm starchy, sometime also with oil and protein.

54 Iridaceae: Leaves often equitant; spathes very rarely colored; perianth petaloid, marcescent, rarely with a spur or sac at the base; styles sometimes petaloid; anthers extrorse; embryo enclosed in the endosperm, the latter with hemicellulose, protein and oil, rarely also starch; nectaries sometimes at base of filaments.

55 Burmanniaceae: Leaves sometimes equitant, commonly colorless, yellowish or reddish and sometimes reduced to scales; inflorescence sometimes with colored bracts; perianth corolline; anther connective often broadened and apically produced, and the anther sacs separate; stigmas usually enlarged, often capitate, sometimes each bifid; capsule sometimes winged, dehiscence various; seeds minute but larger than those of most orchids; embryo arrested in 4-10-celled stage.

Orchidales

56 Corsiaceae: Chlorophylless saprophytes; leaves reduced to scales; perianth segments corolline, the median one of the outer series enlarged and enclosing 5 linear tepals; the stamens are close to the style; anthers extrorse; seeds minute, with a long funicle, the testa obscurely longitudinally grooved; embryo tiny, undifferentiated.

57 Orchidaceae: Stamens adnate to style, the latter sometimes adnate to a petal; pollinia usually present; flowers usually resupinate; perianth usually petaloid, sometimes the outer whorl sepaloid, the segments often differ in size, shape and color; frequently a nectariferous spur is present; leaves often fleshy; plant often epiphytic, often obligately mycorrhizal, rarely saprophytic and the leaves reduced to scales; capsule mostly dehiscing by 3 or 6 longitudinal slits; seeds minute, the embryo immature when the seeds are shed; endosperm absent in mature seed.

TABLE 4

Summary of characters and states that occur in a few families, in percent or an estimate

	Dicot families	Monocot families
Plants succulent	2	2
Plants scandent or twining	3+	16
Chlorophylless	2	7
Hemiparasites (with chlorophyll)	1	0
Ascidia present	1	0
Otherwise insectivorous	1	0
Mangroves	1	2
Epiphytes	1+	2+
Plants spicy scent	3	5
Betalains present	3	0
Glucosinolates present	3	0
Plants aromatic	1+	5
Plants resinous	8	2
Plants with mucilage	4	2
Plants with oil	2	some
Buds perulate	4	0
Nodes swollen	2	4
Stem jointed	1	4
Tendrils present	3	2
Plants thorny	2	2
Sap laticiferous	7	5
Strong fibers in stem	2	4
Plants prickly	some	7
Ericoid habit	1+	?
Plants of saline habitats	2	4
Submerged freshwater herbs	1	some
Plants of fresh water	some	14
Plants marine or of salt water	few	7
Plants of brackish water	few	4
Marsh plants	some	10
Plants thalloid	0.3	2
Stem trigonous	0	2
Stem hollow	1	2
Prop roots present	0.3	5
Chromosomes with diffuse centromere	0	4
Plant with red sap	few	2
Plant floating	0.3	2
Plant malodorous	1	few
Seashore plants	0.3+	some
Twigs with coiled hooks	0.3	0
Leaves gland-dotted	5	0
Glands on base of blade or on petiole	2	0
Glands elsewhere on leaf	1	0
Leaves oblique	1	?
Rachis of leaf alate	1	0
Petiole caps bud	1	0
Petiole sheathing	1	many

	Dicot families	Monocot families
Leaves with 3-9 longitudinal arcuate veins	1	many
Leaf venation circinate	1	0
Leaves verticillate	1+	2
Cystoliths present	2	?
Leaves distichous	many	5
Leaves liguliform	some	9
Leaves equitant	?	9
Leaves linear	some	9
Leaf venation convolute	some	5
Leaves large	many	14
Leaves strongly nerved both longitudinally and transversally	few	12
Leaves with numerous conspicuous transverse veins	many	4
Leaves grasslike	few	5
Leaf sheath open	some	2+
Leaf sheath closed	0?	2+
Stomates like Poaceae	0	2
Guard cells dumbbell-shaped	0	4
Ligule between petiole and sheath	0	9
Midrib of leaf excurrent with 2 hooks	0.3	0
Leaf spinulose	0.3+	9
Petiole becomes a spine	0.3	0
Leaf venation pinnate	many	2
Leaf venation palmate	many	2
Leaf with midrib, and numerous parallel veins extending toward the margin	many	4
Leaf with midrib, and numerous parallel veins extending obliquely upward from it	many	2
Leaf with midrib, and numerous parallel veins extending apically from it; transverse veins conspicuous	many	2
Leaves bitter	1	?
Leaves sweet	0.3	?
Petiole inflated	0.3	0?
Stipules interpetiolar and only 2 for each pair of leaves	0.3	0
Stipules cap the bud	0.3	0
Leaf with midrib and a pair of longitudinal veins	few	2
Leaf with pulvinus at apex of petiole	few	2
Leaf with tendril(s)	1	2

	Dicot families	Monocot families
Leaf coriaceous	many	2+
Cauline leaves 3-ranked	some	2
Petiole long	many	7
Leaf apically bidentate	0	2
Hairs stellate	3	rare
Hairs scabrous	1	rare
Hairs uniseriate	0.3+	many
Hairs malpighiaceous	few	rare
Indumenta irritant	some	?
Hairs peltate (lepidote)	2	2
Hairs glandular	0.3+	?
Plant wooly	0.3+	4
Uniseriate intravaginal hairs present	0?	2
Uniseriate mucus producing hairs	0?	2
Vascular bundles scattered	1	~90
Vascular bundles in cortex	2	0
Intraxylary phloem	8	0
Interxylary phloem	3	0
Vascular bundles in pith	2	0
Vascular bundles in concentric zones	few	2?
Bicollateral vascular bundles	1	0
Interfascicular phloem	0.3	0
Vascular bundle in a single axile strand	0.3	few
Xylem plates multiporate	0.3	0
Taproot present	many	0
N-fixing bacteria in nodules of roots	2	0
Bluegreen algae in tissues	0.3	0
Stem filiform	some	2
Plant rhizomatous	many	2+
Plant with bulb	0.3	some
Bulb tunicate	0	2
Inflorescence a spadix	0?	5
Inflorescence a spherical head	few	4
Inflorescence with cymbiform bract	0	4
Bracts (bracteoles) present	many	9
Glumes present	0	5
Glumes awned	0	2
Involucre present	some	12
Bracts colored	2	21
Outer flowers of inflorescences sterile	1	0
Epicalyx present	2	0
Inflorescence in catkins	2	?
Inflorescence leaf-opposed	1	0
Inflorescence scorpioid	0.3	0
Inflorescence a scape	many	many
Base of flower enclosed in an involucre of united parts	0.3	0?
Flowers foetid	2	4
Flowers bi- or tri- morphic	3	2
Flowers large	many	10
Flowers small	many	21

	Dicot families	Monocot families
Flowers unisexual (unspecified)	1	?
Flowers resupinate	few	2
Flower (mostly perianth) bilaterally summetrical	many	4
Calyx bilabiate	1	0
Sepals unequal in size	2	?
Sepals (calyx) accrescent	2	?
Calyx absent or represented by a pappus	1	?
Calyx tube extends above ovary	1	0
Hypanthium lined with glandular tissue	1	0
Sepals caducous	1	?
One calyx lobe enlarged and colored	1	0
Sepals colored	5	many
Sepals spirally arranged	5	2
Sepals spurred	1	0
Glands internal to sepals at their base	1	0
Calyx bristly	1	0
Calyx calyptriform	1	0
Calyx spathaceous	few	0
Appendages between calyx lobes	few	0
Sepals thick and fleshy	0.3	0
Sepals nectariferous on inner surface	0.3	0
Petals spirally arranged	3	2
Corolla bilabiate	3	few
Corolla lobes contorted in bud	2	0
Corolla plicate in bud	1	0
Petals laciniate	1	few
Corolla (petals) adnate to calyx tube	1	0
Petals (corolla) gibbous or spurred	3	5
Petals (corolla) nectariferous	1	2
Petals contorted in bud	4	0
Petals crumpled in bud	1	0
Corona present	3	4
Petals caducous	1	?
Scale or ligular attachment on petals	2	2
Petals with long hairs on ventral surface	1	0
Petals bilobed	1	0
Perianth bilaterally symmetrical	many	4
Perianth marcescent	?	5
Petals hairy	many	?
Lodicules present	0	2
Perianth glumaceous	some	7
Perianth ephemeral and deliquescent	some	5
Perianth spirally arranged	8	2
Petals marcescent	1	few
Petals small, each often surrounding a stamen	0.3	0

	Dicot families	Monocot families
Petals fringed or laciniate	2	few
Petals smaller than the calyx lobes	1	few
2 petals smaller than the others or absent	0.3	0
Perianth segments petaloid, 5 connate, 1 free	0	4
Corolla ligulate	0.3	0
Petals acuminate	0.3	?
Petals thick, linear-oblong, spoon-shaped basally	0.3	0
Stamens in 2 cycles, obdiplostemonous	5	0
Stamens in 1 series opposite petals or corolla lobes	2	?
Stamens in a column	1	0
Stamens in fascicles	1	0
Stamens spirally arranged	2	5
Stamens inserted on a bract	1	0
Stamens didynamous	4	0
Stamens tetradynamous	0.3	0
Stamens monadelphous or diadelphous	1	0?
Stamens with a basal appendage on each side	1	0
Stamens strongly unequal in length	1	few
Stamens inserted at different levels on corolla	1	0
Stamens 8,10, alternating with as many nectary scales	0.3	0
Staminodes petaloid	2	5
Staminodes present	many	9
Stamens adnate to style	0.3	2
Stamens close to style	few	2
Stamens bearded with brightly colored hairs	few	2
Filaments long-exserted	many	4
Filaments with a scale	1	0
Filaments colored	1	some
Filaments subulate	1	?
Filaments flattened and apically toothed	1	0
Filaments flattened basally	1	?
Filaments petaloid	few	4
Failaments inserted between dorsal and ventral lobes of anther	0.3	0
Interstaminal scale present	0.3	0
Anthers dehiscent by flaps	2	0
Anthers poricidal	3	4
Anthers connate in pairs	1	0
Anthers didymous	4	5
Anthers connivent or connate around the style	2	some
Anthers twisted	1	0
Anthers unilocular	1	7

	Dicot families	Monocot families
Anthers inflexed in bud	1	2
Anthers pink	1	0
Anther sacs divided into more than 4 compartments	1	0
Anthers extrorse	some	19
Anther sacs divaricate	1	0
Connective of anther apically glandular	1	0
Connective apically produced	5	9
Anthers curved	0.3	?
Connective appendage at base of anther	0.3	0
Anther with a swollen rounded base	0.3	0
Two anthers with glandular spurs	0.3	0
Anthers with a common globular apical connective	0.3	0
Connective basally produced and glandular	0.3	0
Anthers reniform	0.3	0
Anthers 4-locular	0.3	2
Anthers very long	many	few
Anthers tailed	0.3	0
Anthers sagittate	0.3	0
Anthers with apical tubes and basal tails	0.3	0
Pollen in tetrads	2	5
Pollen in pollinia	0.3	2
Pollen in polyads	0.3	0
Pollen with 3 or 6 pseudocolpi	1	0
Pollen graminaceous	0	5
Pollen elongated	0	5
Pollen zonisulculate	0	7
Pollen syncolpate	0.3	0
Pollen unique, 3-armed demicolpate at both ends	0.3	0
Pollen porate or spirapenturate	0	2
Antipodals increased or other nuclei in embryo sac	1	10
Antipodals reduced	1	2
Base of ovary glandular	0.3	0
Pistil costate-cylindrical and apex truncate	0.3	0
Pistils spirally arranged	2	2
Ovary stipitate	3	0
Ovaries deeply lobed	1	?
Ovaries distinct but styles or stigma connate	1	0
Placenta thick	0.3+	some
2 placentas, each with 1 subapical and 1 subbasal ovule	0.3	0
Funicle long	5	4
Funicle absent or ovules peltately attached to placenta	1	?
Styles curved near middle	0.3	0
Style lying between the anther	0	2

	Dicot families	Monocot families
sacs		
Style petaloid	0	4
Style long, filiform	many	4
Each style arm bilobed	2	9
Style with 2-3 subbasal appendages	0	4
Style gynobasic	2	0
Styles inserted on shoulder of ovary	1	0
Style apically indusiate	1	0
Stigmas plumose	0.3	?
Stigmas enlarged or expanded	many	few
Stigmas fringed	1	2
Stigmas reniform	0.3	?
Stigmas sessile	0.3+	2
Stigmas twisted around each other	few	2
Stigmas bifid and twisted	few	2
Disk pulvinate	0.3	0
Disk papillose	0.3	0
Nectaries on pistils and receptacle	?	2
Nectaries septal in ovary	0.3	many
Nectaries on base of filament	few?	2
Hypanthium lined with glandular tissue	1+	0
Capsule apically dehiscent	4	?
Fruit dehiscence circumscissile	6	?
Fruit spiny or adapted for external animal distribution	3	few
Fruit interior often densely hairy	1	0
Fruit large, long-acuminate	0.3	0
Follicles fusiform	0.3	0
Capsule didymous or subdidymous	1	?
Fruit with more than one pyrene	1	0
Capsule dehisces before seeds are ripe	1	0
Fruit turbinate	1	0
Fruit a utricle	some	2
Fruit a syncarp	some	2
Fruit a silique	1	0
Fruit dehiscent by pores	1	0
Dehisced capsule leaves a columella	2	0
Fruit separating into endocarp and exocarp	1	0
Fruit woody	1	4
Fruit with tuft of hairs	some	2
Seeds longitudinally ribbed or striate	some	14
Seeds minute	7	12
Seeds sculptured	3	5
Seeds arillate	9	10
Seeds with sarcotesta	2	5
Seeds winged	2+	5
Seeds pitted	1	?
Seeds hairy	4	?
Seeds reniform	2	0
Seeds viviparous	0.3	0
Seeds globose	some	5
Seeds large	many	some
Testa hard	1+	?
Seeds tailed at both ends	some	4
Seeds rough, warty	0.3	?
Embryo conferuminate	1	?
Embryo arcuate, peripheral around perisperm	some	0
Embryo within endosperm	many	14
Embryo lateral to endosperm	some	19
Embryo coiled	some	2
Embro tiny, undifferentiated	some	4
Cotyledons more than 2	1	0
Endosperm absent in mature seed	many	2
Endosperm ruminate	3	?
Embryotega present	0	7
Endosperm formation Helobial	few	5
Endosperm formation Nuclear	many	4
Endosperm formation Cellular	many	4

Indices to the Family Numbers used

Dicot Families

323. Acanthaceae
85. Aceraceae
170. Achariaceae
115. Achatocarpaceae
193. Actinidiaceae
313. Adoxaceae
150. Aextoxicaceae
117. Agdestidaceae
108. Aizoaceae
80. Akaniaceae
256. Alangiaceae
123. Amaranthaceae
37. Amborellaceae
79. Anacardiaceae
234. Ancistrocladaceae
27. Annonaceae
261. Apiaceae
303. Apocynaceae
135. Aptandraceae
183. Aquifoliaceae
260. Araliaceae
44. Aristolochiaceae
305. Asclepiadaceae
336. Asteraceae
204. Asteranthaceae
30. Austrobaileyaceae
70. Balanitaceae
12. Balanopaceae
259. Balanophoraceae
66. Balsaminaceae
114. Barbeuiaceae
153. Barbeyaceae
203. Barringtoniaceae
110. Basellaceae
103. Bataceae
272. Baueraceae
283. Begoniaceae
54. Berberidaceae
16. Betulaceae
324. Bignoniaceae
106. Bixaceae
164. Bombacaceae
220. Bonnetiaceae
294. Boraginaceae
98. Brassicaceae
102. Bretschneideraceae
279. Brunelliaceae
273. Bruniaceae
333. Brunoniaceae
320. Buddlejaceae
78. Burseraceae
7. Buxaceae
287. Byblidaceae
45. Cabombaceae
107. Cactaceae
87. Caesalpiniaceae
149. Callitrichaceae
39. Calycanthaceae
334. Calyceraceae
331. Campanulaceae
34. Canellaceae
156. Cannabaceae
97. Capparaceae
312. Caprifoliaceae
139. Cardiopteridaceae
171. Caricaceae
236. Caryocaraceae
120. Caryophyllaceae
20. Casuarinaceae
189. Celastraceae
282. Cephalotaceae
49. Ceratophyllaceae
1. Cercidiphyllaceae
124. Chenopodiaceae
24. Chloranthaceae
196. Chrysobalanaceae
51. Circaeasteraceae
104. Cistaceae
245. Clethraceae
228. Clusiaceae
77. Cneoraceae
105. Cochlospermaceae
298. Columelliaceae
218. Combretaceae
60. Connaraceae
301. Convolvulaceae
50. Coriariaceae
311. Cornaceae
199. Corynocarpaceae
262. Crassulaceae
200. Crossosomataceae
210. Crypteroniaceae
185. Ctenolophonaceae
178. Cucurbitaceae
280. Cunoniaceae
302. Cuscutaceae
250. Cyrillaceae
9. Daphniphyllaceae
284. Datiscaceae
308. Davidiaceae
267. Davidsoniaceae
29. Degeneriaceae
205. Dialypetalanthaceae
249. Diapensiaceae
188. Dichapetalaceae
111. Didiereaceae
10. Didymelaceae
239. Diegodendraceae
192. Dilleniaceae
285. Dioncophyllaceae
315. Dipsacaceae
232. Dipterocarpaceae
275. Donatiaceae
286. Droseraceae
252. Ebenaceae
197. Elaeagnaceae
160. Elaeocarpaceae
231. Elatinaceae
246. Empetraceae
244. Epacridaceae
265. Eremosynaceae
242. Ericaceae
182. Erythropalaceae
68. Erythroxylaceae
277. Escalloniaceae
152. Eucommiaceae
224. Eucryphiaceae
147. Euphorbiaceae
28. Eupomatiaceae
3. Eupteleaceae
88. Fabaceae
19. Fagaceae
165. Flacourtiaceae
295. Fouquieriaceae
266. Francoaceae
129. Frankeniaceae
95. Fumariaceae
310. Garryaceae
144. Geissolomataceae
299. Gentianaceae
61. Geraniaceae
325. Gesneriaceae
321. Globulariaceae
41. Gomortegaceae

145. Gonystylaceae
332. Goodeniaceae
190. Goupiaceae
281. Greyiaceae
278. Grossulariaceae
143. Grubbiaceae
59. Gunneraceae
112. Gyrostemonaceae
215. Haloragaceae
8. Hamamelidaceae
43. Hernandiaceae
31. Himantandraceae
83. Hippocastanaceae
216. Hippuridaceae
176. Hoplestigmataceae
233. Humiriaceae
257. Hydnoraceae
268. Hydrangeaceae
293. Hydrophyllaceae
289. Hydrostachyaceae
230. Hypericaceae
184. Icacinaceae
40. Idiospermaceae
122. Illecebraceae
33. Illiciaceae
187. Irvingiaceae
271. Iteaceae
186. Ixonanthaceae
18. Juglandaceae
91. Krameriaceae
166. Lacistemataceae
23. Lactoridaceae
330. Lamiaceae
58. Lardizabalaceae
42. Lauraceae
202. Lecythidaceae
180. Leeaceae
13. Leitneriaceae
251. Lennoaceae
322. Lentibulariaceae
63. Limnanthaceae
67. Linaceae
255. Lissocarpaceae
177. Loasaceae
296. Loganiaceae
141. Loranthaceae
209. Lythraceae
25. Magnoliaceae
168. Malesherbiaceae
71. Malpighiaceae
163. Malvaceae
235. Marcgraviaceae
223. Medusagynaceae
138. Medusandraceae
213. Melastomataceae
73. Meliaceae
82. Melianthaceae
57. Menispermaceae
300. Menyanthaceae
89. Mimosaceae
142. Misodendraceae
121. Molluginaceae
38. Monimiaceae
248. Monotropaceae
157. Moraceae
101. Moringaceae
327. Myoporaceae
15. Myricaceae
35. Myristicaceae
6. Myrothamnaceae
130. Myrsinaceae
201. Myrtaceae
52. Nandinaceae
46. Nelumbonaceae
291. Nepenthaceae
198. Neuradaceae
317. Nolanaceae
118. Nyctaginaceae
47. Nymphaeaceae
309. Nyssaceae
237. Ochnaceae
136. Octoknemaceae
134. Olacaceae
306. Oleaceae
211. Oliniaceae
214. Onagraceae
137. Opiliaceae
319. Orobanchaceae
64. Oxalidaceae
53. Paeoniaceae
151. Pandaceae
94. Papaveraceae
225. Paracryphiaceae
264. Parnassiaceae
167. Passifloraceae
326. Pedaliaceae
222. Pellicieraceae
212. Penaeaceae
99. Pentadiplandraceae
221. Pentaphylacaceae
175. Peridiscaceae
116. Petiveriaceae
269. Philadelphaceae
329. Phrymaceae
113. Phytolaccaceae
22. Piperaceae
76. Pittosporaceae
132. Plantaginaceae
5. Platanaceae
304. Plocospermataceae
126. Plumbaginaceae
55. Podophyllaceae
288. Podostemaceae
292. Polemoniaceae
90. Polygalaceae
125. Polygonaceae
109. Portulacaceae
127. Primulaceae
133. Proteaceae
270. Pterostemonaceae
207. Punicaceae
247. Pyrolaceae
229. Quiinaceae
258. Rafflesiaceae
48. Ranunculaceae
100. Resedaceae
181. Rhamnaceae
208. Rhizophoraceae
14. Rhoipteleaceae
195. Rosaceae
297. Rubiaceae
75. Rutaceae
86. Sabiaceae
11. Salicaceae
307. Salvadoraceae
140. Santalaceae
81. Sapindaceae
253. Sapotaceae
241. Sarcolaenaceae
56. Sargentodoxaceae
290. Sarraceniaceae
194. Saurauiaceae
21. Saururaceae
263. Saxifragaceae
32. Schisandraceae
318. Scrophulariaceae
174. Scyphostegiaceae
240. Scytopetalaceae
74. Simaroubaceae
148. Simmondsiaceae
191. Siphonodontaceae
316. Solanaceae
206. Sonneratiaceae
162. Sphaerosepalaceae
173. Stachyuraceae
72. Stackhousiaceae
84. Staphyleaceae
119. Stegnospermataceae
159. Sterculiaceae
238. Strasburgeriaceae
335. Stylidiaceae
254. Styracaceae
226. Symplocaceae
128. Tamaricaceae
276. Tetracarpaeaceae
2. Tetracentraceae
227. Tetrameristaceae
219. Theaceae
155. Theligonaceae
131. Theophrastaceae
146. Thymelaeaceae

17. Ticodendraceae
161. Tiliaceae
96. Tovariaceae
217. Trapaceae
243. Tremandraceae
92. Trigoniaceae
36. Trimeniaceae
4. Trochodendraceae
65. Tropaeolaceae
169. Turneraceae
158. Ulmaceae
154. Urticaceae
274. Vahliaceae
314. Valerianaceae
328. Verbenaceae
172. Violaceae
179. Vitaceae
62. Vivianiaceae
93. Vochysiaceae
26. Winteraceae
69. Zygophyllaceae

Monocot Families

31. Agavaceae
6. Alismataceae
38. Amaryllidaceae
12. Aponogetonaceae
4. Araceae
2. Arecaceae
40. Bromeliaceae
55. Burmanniaceae
7. Butomaceae
50. Cannaceae
24. Centrolepidaceae
41. Commelinaceae
56. Corsiaceae
3. Cyclanthaceae
26. Cyperaceae
35. Dioscoreaceae
45. Eriocaulaceae
25. Flagellariaceae
52. Haemodoraceae
8. Hydrocharitaceae
54. Iridaceae
21. Juncaceae
10. Juncaginaceae
5. Lemnaceae
11. Lilaeaceae
29. Liliaceae
48. Lowiaceae
51. Marantaceae
43. Mayacaceae
46. Musaceae
16. Najadaceae
57. Orchidaceae
1. Pandanaceae
33. Philesiaceae
53. Philydraceae
27. Poaceae
37. Pontederiaceae
17. Posidoniaceae
14. Potamogetonaceae
44. Rapateaceae
23. Restionaceae
9. Scheuchzeriaceae
30. Smilacaceae
19. Sparganiaceae
34. Stemonaceae
47. Strelitziaceae
36. Taccaceae
22. Thurniaceae
28. Trilliaceae
18. Triuridaceae
20. Typhaceae
39. Velloziaceae
32. Xanthorrhoeaceae
42. Xyridaceae
15. Zannichelliaceae
49. Zingiberaceae
13. Zosteraceae