TAXONOMY

A classification for extant ferns

Alan R. Smith[1], Kathleen M. Pryer[2], Eric Schuettpelz[2], Petra Korall[2,3], Harald Schneider[4] & Paul G. Wolf[5]

[1] *University Herbarium, 1001 Valley Life Sciences Building #2465, University of California, Berkeley, California 94720-2465, U.S.A. arsmith@berkeley.edu (author for correspondence).*
[2] *Department of Biology, Duke University, Durham, North Carolina 27708-0338, U.S.A.*
[3] *Department of Phanerogamic Botany, Swedish Museum of Natural History, Box 50007, SE-104 05 Stockholm, Sweden.*
[4] *Albrecht-von-Haller-Institut für Pflanzenwissenschaften, Abteilung Systematische Botanik, Georg-August-Universität, Untere Karspüle 2, 37073 Göttingen, Germany.*
[5] *Department of Biology, Utah State University, Logan, Utah 84322-5305, U.S.A.*

We present a revised classification for extant ferns, with emphasis on ordinal and familial ranks, and a synopsis of included genera. Our classification reflects recently published phylogenetic hypotheses based on both morphological and molecular data. Within our new classification, we recognize four monophyletic classes, 11 monophyletic orders, and 37 families, 32 of which are strongly supported as monophyletic. One new family, Cibotiaceae Korall, is described. The phylogenetic affinities of a few genera in the order Polypodiales are unclear and their familial placements are therefore tentative. Alphabetical lists of accepted genera (including common synonyms), families, orders, and taxa of higher rank are provided.

KEYWORDS: classification, Cibotiaceae, ferns, monilophytes, monophyletic.

INTRODUCTION

Recent phylogenetic studies have revealed a basal dichotomy within vascular plants, separating the lycophytes (less than 1% of extant vascular plants) from the euphyllophytes (Fig. 1; Raubeson & Jansen, 1992; Kenrick & Crane, 1997; Pryer & al., 2001a, 2004a, b). Living euphyllophytes, in turn, comprise two major clades: the spermatophytes (seed plants), which are in excess of 260,000 species (Thorne, 2002; Scotland & Wortley, 2003), and the monilophytes (ferns, sensu Pryer & al., 2004b), with about 9,000 species, including horsetails, whisk ferns, and all eusporangiate and leptosporangiate ferns. Plants that are included in the lycophyte and fern clades are all spore-bearing or "seed-free", and because of this common feature their members have been lumped together historically under various terms, such as "pteridophytes" and "ferns and fern allies"—paraphyletic assemblages of plants. The focus of this reclassification is exclusively on ferns (Division Tracheophyta, Subdivision Euphyllophytina, Infradivision Moniliformopses, of Kenrick & Crane, 1997), characterized by lateral root origin in the endodermis, usually mesarch protoxylem in shoots, a pseudoendospore, plasmodial tapetum, and sperm cells with 30–1000 flagellae (Renzaglia & al., 2000; Schneider & al., 2002a).

Increasingly robust phylogenetic hypotheses for ferns (Hasebe & al., 1994, 1995; Manhart, 1994, 1995; Pryer & al., 1995, 2001a, 2004b; Kranz & Huss, 1996; Pahnke & al., 1996; Wolf, 1997; Wolf & al., 1998; Beckert & al., 1999; Vangerow & al., 1999; Sano & al., 2000a; Schneider & al., 2004c; Wikström & Pryer, 2005; Tsutsumi & Kato, 2006; Schuettpelz & al., in press), uti-

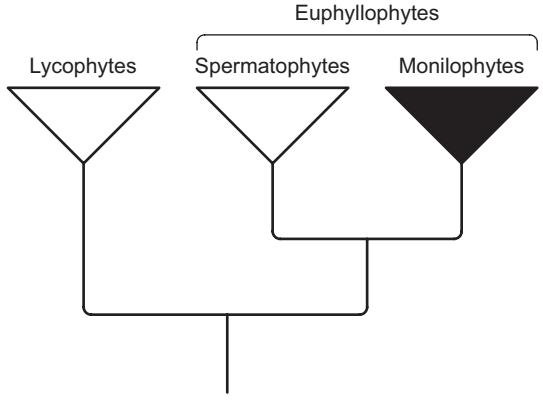

Fig. 1. Consensus phylogeny depicting relationships of major vascular plant lineages. Topology summarizes the results of previously published phylogenetic studies (e.g., Raubeson & Jansen, 1992; Kenrick & Crane, 1997; Renzaglia & al., 2000; Pryer & al., 2001a, see main text for others). Resolved nodes have received bootstrap support ≥ 70.

lizing data from morphology, seven chloroplast markers (*rbcL*, *atpA*, *atpB*, *accD*, *rps*4, 16S rDNA, ITS), one nuclear gene (18S rDNA), and three mitochondrial genes (*atp*1, *nad*2, *nad*5) prompt us to reevaluate the classification of these vascular plants. Multiple-gene phylogenetic analyses, e.g., studies by Wolf (1996), Wolf & al. (1998), Pryer & al. (2001a, 2004b), Schneider & al. (2004c), Wikström & Pryer (2005), and Schuettpelz & al. (in press), have given rise to growing conviction in both the composition and relationships of taxa at familial and ordinal ranks. Five recent morphological analyses of relationships, by Pryer & al. (1995, 2001a), Schneider (1996a), Stevenson & Loconte (1996), and Schneider & al. (in prep.) have increased support for the molecular-based consensus topology. For eusporangiate and basal leptosporangiate ferns, evidence is now sufficient to allow us to circumscribe confidently most clades and assign ranks. However, for some more derived leptosporangiate ferns, the phylogenetic evidence is still somewhat equivocal. Consequently, declaration of phylogenetic positions for some taxa and the assignment of ranks (which we consider subjective and secondary), in a classical "Linnaean-style" hierarchy, are tentative. In this paper, we present a revised view of the classification of extant ferns, taking into account all relevant evidence. We focus our classification at the ranks of class, order, and family, believing that the information at hand is most appropriate for resolution and understanding of relationships at these levels. Within most families, and especially at the generic level, there is still insufficient evidence to attempt many classificatory decisions.

In the classification proposed herein, we account for, and place in a revised taxonomic framework, all names at family and ordinal rank utilized in previous major classifications directed at ferns, particularly those that have been proposed in the last eighty years: Bower (1926), Christensen (1938), Ching (1940, 1978), Dickason (1946), Copeland (1947), Holttum (1947, 1949, 1973), Pichi Sermolli (1958, 1977), Mehra (1961), Wagner (1969), Nayar (1970), Tagawa & Iwatsuki (1972), Mickel (1974), Tryon & Tryon (1982), Kramer (in Kubitzki, 1990), Hennipman (1996), and Stevenson & Loconte (1996). We also consider various herbarium schemes in common use, such as the one by Crabbe & al. (1975). Many of these classifications, as well as others, have been reviewed and reproduced by Pichi Sermolli (1973), who also summarized detailed information on family names of ferns (1970, 1981, 1982, 1986). Smith (1995) provided a recent summary and discussion of these classifications.

Classifications serve many purposes, among them to provide a genealogical framework in which to identify plants, organize herbaria, retrieve information, and to conduct many kinds of studies (e.g., evolutionary, morphological, and physiological). Multi-use classifications serve us best if we name only those clades that are readily recognizable and characterized by morphological synapomorphic characters, at least at family and higher ranks. However, more traditional (morphology-based) and practical classifications are sometimes incompatible with the results and classifications implied by phylogenetic studies, especially when the principle of monophyly is used as a grouping criterion (recognizing clades, and not paraphyletic grades; APG II, 2003). When a traditionally recognized family nests within another, complex classificatory choices ensue: (1) recognition of paraphyletic families (Brummitt, 1996, 1997; Lidén & al., 1997; Moore, 1998; Diggs & Lipscomb, 2002; Grant, 2003); (2) dismemberment of a recognized family into smaller families (e.g., the disintegration of classical Scrophulariaceae; Olmstead & al., 2001); or (3) integration of the traditional family that causes the paraphyly into the "progenitor" family. The first choice, preferred by some, leads to recognition of unnatural (non-monophyletic) groups, which in our opinion often retards or obscures investigation into interesting biological, phytogeographic, and evolutionary questions. The second solution supposes that we have morphological synapomorphies for nodes that lead to all of the segregate families, and this is not often the case, although one hopes that eventually we shall find these synapomorphies. Until then, it may be nearly impossible to define some segregate families in such a way that they would be both keyable and circumscribable. The third solution is a "fast fix" to the problem, but expediency often demands that at least some of the intrafamilial subclades also be recognized taxonomically, either at a lower rank (e.g., subfamily), or with an unranked informal name (e.g., "grammitid ferns") until further decisions on rank can be made. This third option seems to us the most practicable and practical solution toward a "first-pass" revision of fern classification. As more data are gathered and future phylogenetic analyses provide better resolved and better supported topologies, one expects further insight into identifying synapomorphies for segregate taxa, enabling eventual movement toward the second option of recognizing segregate monophyletic families.

The nested linearity of a ranked Linnaean classification and the availability of a limited number of universally accepted ranks facilitate the organization and arrangement of taxa for cataloging purposes, such as the efficient arrangement of specimens in herbaria or the organization and retrieval of regional biodiversity from checklists, floras, and other taxonomic products. Ranked classifications often perform poorly, however, when called upon to present explicit statements of clade membership and relationship. Such classifications also can mislead one into making specious comparisons, e.g., attempting to describe the extent of biodiversity in terms of

numbers of taxa of a particular arbitrarily designated rank (comparing apples with oranges). Such problems notwithstanding, it is nevertheless highly likely that ranked Linnaean classifications will continue to co-exist with phylogenetic classifications for the foreseeable future.

In this paper we combine the principle of monophyly with a desire to maintain well-established names to update ordinal and familial ranks within ferns so that they are better reconciled with our current best estimates of phylogenetic relationships. However, we attempt to avoid recognizing monogeneric families within the more derived leptosporangiate ferns. To paraphrase Crisp & al. (1999), who addressed the matter of monotypic genera, the most compelling case for recognizing a monotypic family is when such a family is characterized by one or more autapomorphies and is the sister group to a clade of families, all of the members of which lack these apomorphies. The alternative would be to treat the whole clade (including the autapomorphic family) as a single family, which results in sinking some well-circumscribed families into synonymy. At this time, we prefer to utilize a minimum number of ranks to categorize only the most well supported splits in the phylogeny.

In some respects, our new classification differs in relatively minor ways in the circumscription of orders, families, and hierarchical structure from most other recent fern classifications (e.g., those of Tryon & Tryon, 1982; Kramer, in Kubitzki, 1990; and Stevenson & Loconte, 1996), but there are significant departures. Only one previous fern classification has employed cladistic methodology in a rigorous way; Stevenson & Loconte (1996) superimposed on their tree a hierarchical classification (albeit somewhat abbreviated), but the phylogeny that they generated was based exclusively on morphological data and differs radically from the most up-to-date phylogenetic hypothesis. Our classification, in contrast, is based on consensus of a variety of morphological and molecular studies.

Fern names above the rank of genus used in this classification (Appendices 1–4) have been obtained, for the most part, from the web site of James Reveal, University of Maryland (http://www.life.umd.edu/emeritus/reveal/PBIO/fam/hightaxaindex.html) and from Hoogland & Reveal (2005). Most names at family rank are also listed and discussed by Pichi Sermolli (1970, 1982) and summarized in reports by the *Subcommittee for Family Names of Pteridophyta* (Pichi Sermolli, 1981, 1986); this list was further emended and updated by Pichi Sermolli (1993). To the best of our knowledge (and unless otherwise indicated), the family names in Appendix 3 have all been published in accord with the *International Code of Botanical Nomenclature* (Greuter & al., 2000) and thus satisfy the relevant Articles in the *Code* with regard to publication and priority of family names (Art. 10.6, Art. 11.1–11.3; Art. 18; Art. 41.1) and names of ranks above family (Art. 16, 17). Although the principle of priority is not mandatory for names of taxa above the rank of family (Art. 11.9), authors are advised to follow this principle (Rec. 16B.1). Of the orders we recognize below, all have priority except Salviniales, which is later than the much less commonly applied name Pilulariales.

The rules of nomenclature applicable to supra-ordinal names are the same as those for ordinal names, discussed above. We have made no attempt to scrutinize the literature for names above the rank of order, but many of these names are included in lists available from the Reveal website (and so are included in Appendix 1) and in Hoogland & Reveal (2005); still others can be gleaned from Kenrick & Crane (1997, see, especially, their Table 7.2, pp. 231–233; however, many of these are not validly published) and from Pichi Sermolli (1959). Names at ordinal and subordinal ranks, also mostly from the Reveal website and from Hoogland & Reveal (2005), are given in Appendix 2, names at familial rank are given in Appendix 3. Citations for all names are given in Appendix 4. We also present an index to commonly accepted genera with family assignments proposed here (Appendix 5).

In the classification that follows, for each family, we give common names (often derived from the scientific names) for the clades (if there is one that has common usage), heterotypic synonyms, approximate numbers of genera and species, names of constituent genera, references to relevant phylogenetic literature, and discussion of unresolved problems, where appropriate. DNA sequence data are now available for all families recognized herein, and for most genera of ferns. A superscript number one ([1]) denotes those genera for which DNA sequence data are not available; nonetheless, taxonomic placement for most of these is relatively certain, based on morphological evidence. Lack of a superscript indicates that some molecular evidence (either published or unpublished) has been available to us for consideration and we are relatively confident in the placement of the genus. The classification presented below is based on the consensus relationships depicted in Fig. 2, which are derived from, and guided by, recent and ongoing phylogenetic studies (e.g., Hasebe & al., 1995; Pryer & al., 2004b; Schneider & al., 2004d; Korall & al., 2006; Schuettpelz & al., 2006, unpubl. data).

CLASSIFICATION OF EXTANT FERNS

In this reclassification, we treat all classes, orders, and families of extant ferns, which constitute a mono-

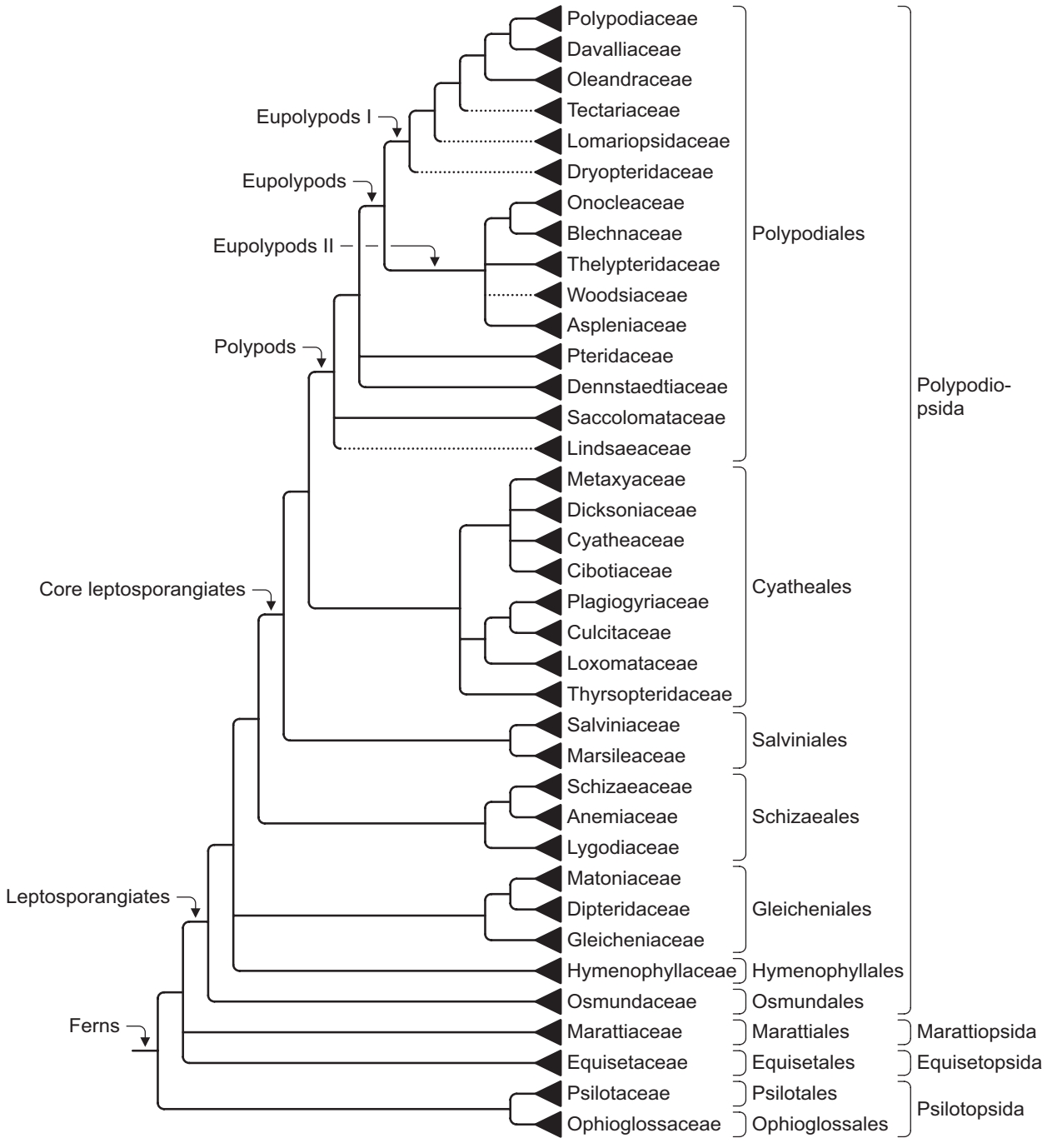

Fig. 2. Consensus phylogeny depicting fern relationships upon which our classification is based. Topology summarizes the results of previously published and ongoing phylogenetic studies (e.g., Hasebe & al., 1995; Pryer & al., 2004b; Schneider & al., 2004b; Korall & al., 2006; Schuettpelz & al., in press; Schuettpelz, unpubl.; see main text for others). Resolved nodes have received bootstrap support ≥ 70 except those drawn with dotted lines. Family, order, and class names that correspond to our classification are indicated to the right. Common names for some larger clades are indicated to the left.

phyletic group, sometimes referred to as Infradivision Moniliformopses (Kenrick & Crane, 1997), or monilophytes (Donoghue in Judd & al., 2002; Pryer & al., 2001a, 2004a, b). However, "Infradivision" is not a recognized rank in the *International Code of Botanical Nomenclature* (Greuter & al., 2000); moreover, the name "Moniliformopses" was never validly published, lacking a Latin diagnosis or description, or a reference to one.

Because validly published names at an appropriate rank are not available for ferns (as here defined), euphyllophytes (ferns + seed plants), or even vascular plants (euphyllophytes + lycophytes), and because all available names at higher ranks have been used in a sense we think would be confusing, we avoid placing ferns in any rank above class. Classification may be better served by adopting "floating", rankless names for clades above the rank of class.

Within ferns, we recognize four classes (Psilotopsida; Equisetopsida; Marattiopsida; Polypodiopsida), 11 orders, and 37 families.

I. CLASS PSILOTOPSIDA

A. ORDER OPHIOGLOSSALES.

1. Family Ophioglossaceae. — Ophioglossoids; incl. Botrychiaceae, Helminthostachyaceae. Four genera: *Botrychium* (grapeferns; moonworts), *Helminthostachys*, *Mankyua*[1], *Ophioglossum* (adder tongues). *Botrychium* (incl. *Botrychium* s.s., *Sceptridium*, *Botrypus*, and *Japanobotrychium*) and *Ophioglossum* (incl. *Cheiroglossa*, *Ophioderma*) are sometimes divided more finely (Kato, 1987; Hauk & al., 2003). Ca. 80 spp.; monophyletic (Hasebe & al., 1995; Hauk, 1995; Pryer & al., 2001a, 2004b; Hauk & al. 2003). *Mankyua*, from Cheju Island, Korea, has recently been described, but no molecular data are available (Sun & al., 2001). Species mostly terrestrial (a few epiphytic), temperate and boreal, but a few pantropical. Characters: vernation nodding (not circinate); rhizomes and petioles fleshy; root hairs lacking; aerophores absent (Davies, 1991); fertile leaves each with a single sporophore arising at the base of, or along, the trophophore stalk, or at the base of the trophophore blade (several sporophores per blade in *Cheiroglossa*); sporangia large, with walls two cells thick, lacking an annulus; spores globose-tetrahedral, trilete, many (> 1000) per sporangium; gametophytes subterranean, non-photosynthetic, mycorrhizal; $x = 45$ (46).

B. ORDER PSILOTALES.

2. Family Psilotaceae. — Whisk ferns; incl. Tmesipteridaceae. Two genera (*Psilotum*, *Tmesipteris*), ca. 12 total spp. (2 in *Psilotum*); monophyletic (Hasebe & al., 1995; Pryer & al., 2001a, 2004). Characters: roots absent; stems bearing reduced, unveined or single-veined euphylls; sporangia large, with walls two cells thick, lacking an annulus; two or three sporangia fused to form a synangium, seemingly borne on the adaxial side of a forked leaf; spores reniform, monolete, many (> 1000) per sporangium; gametophytes subterranean (*Psilotum*), non-photosynthetic, mycorrhizal; $x = 52$.

II. CLASS EQUISETOPSIDA [= SPHENOPSIDA].

C. ORDER EQUISETALES.

3. Family Equisetaceae. — Horsetails. A single genus (*Equisetum*), 15 spp. usually placed in two well-marked subgenera, subg. *Equisetum* and subg. *Hippochaete*; monophyletic (Pryer & al., 2001a, 2004b; Des Marais & al., 2003; Guillon, 2004). The spermatozoids of *Equisetum* share several important features with other ferns that support their inclusion in this clade (Renzaglia & al., 2000). Kato (1983) adduced additional morphological characters, including root characters, supporting a relationship between horsetails and ferns. Characters: stems whorled, lacunate; leaves whorled, connate; sporangia with helical secondary wall thickenings (Bateman, 1991), borne on peltate sporangiophores that collectively comprise strobili; sporangia large, lacking an annulus, many (> 1000) per sporangium; spores green, with circular aperture and four paddle-like, coiled elaters; gametophytes green, surficial; $x = 108$.

III. CLASS MARATTIOPSIDA

D. ORDER MARATTIALES. —

Including Christenseniales.

4. Family Marattiaceae. — Marattioids; incl. Angiopteridaceae, Christenseniaceae, Danaeaceae, Kaulfussiaceae. Four genera: *Angiopteris*, *Christensenia*, *Danaea*, *Marattia*; *Archangiopteris* has been recognized by some (e.g., Pichi Sermolli, 1977) but appears to nest within *Angiopteris* (Murdock, 2005); *Danaea* is sister to the other three genera (Pryer & al., 2001a, 2004b; Murdock, 2005) and represents a neotropical radiation (Christenhusz & al., unpubl.); *Angiopteris* and *Christensenia* are restricted to eastern and southeastern Asia, Australasia, and Polynesia, while *Marattia* is pantropical. Ca. 150 spp., but monographic revision is needed at the species level in several genera; monophyletic (Hill & Camus, 1986; Pryer & al., 2001a, 2004b; Murdock, 2005). We see no advantage or good reason for recognizing several of the constituent genera as monogeneric families, as done by Pichi Sermolli (1977). The name Danaeaceae has been found to predate Marattiaceae (Appendix 4); however, Marattiaceae is being proposed for conservation by Murdock & al. (subm.), and we maintain its usage in the usual broad sense.

Terrestrial (rarely epipetric) pantropical, fossils beginning in Carboniferous (Collinson, 1996). Characters: roots large, fleshy, with polyarch xylem; root hairs septate; roots, stems, and leaves with mucilage canals; rhizomes fleshy, short, upright or creeping, with a polycy-

clic dictyostele; vernation circinate; leaves large, fleshy, 1–3-pinnate (rarely simple in *Danaea*, or 3–5-foliate in *Christensenia*) with enlarged, fleshy, starchy stipules at the base and swollen pulvinae along petioles and rachises (and sometimes other axes); petiole and stem xylem polycyclic; stems and blades bearing scales; pneumathodes (lenticels) scattered all around petioles and/or rachises; sporangia free or in round or elongate synangia (fused sporangia), lacking an annulus, enclosing 1000–7000 spores; spores usually bilateral or ellipsoid, monolete; gametophytes green, surficial; $x = 40$ (39).

IV. CLASS POLYPODIOPSIDA [= FILICOPSIDA]

E. ORDER OSMUNDALES.

5. Family Osmundaceae. — Three genera: *Leptopteris*, *Osmunda*, *Todea*. Ca. 20 spp.; monophyletic (Hasebe & al., 1995; Yatabe & al., 1999; Pryer & al., 2001a, 2004b). Fossils from Permian; temperate and tropical. Characters: stem anatomy distinctive, an ectophloic siphonostele, with a ring of discrete xylem strands, these often conduplicate or twice conduplicate in cross-section; stipules at bases of petioles; leaves dimorphic or with fertile portions dissimilar to sterile; sporangia large, with 128–512 spores, opening by an apical slit, annulus lateral; spores green, subglobose, trilete; gametophytes large, green, cordate, surficial; $x = 22$.

F. ORDER HYMENOPHYLLALES.

6. Family Hymenophyllaceae. — Filmy ferns; incl. Trichomanaceae. Nine genera (Ebihara & al., 2006), two major clades (Pryer & al., 2001b), "trichomanoid" and "hymenophylloid", roughly corresponding to the classical genera *Trichomanes* s.l. and *Hymenophyllum* s.l. Ca. 600 spp.; monophyletic (Hasebe & al., 1995; Dubuisson, 1996, 1997; Pryer & al., 2001b, 2004b; Ebihara & al., 2002, in press; Dubuisson & al., 2003; Hennequin & al., 2003). Several segregate and monotypic genera are nested within *Hymenophyllum* s.l.: *Cardiomanes*, *Hymenoglossum*, *Rosenstockia*, and *Serpyllopsis* (Ebihara & al., 2002, in press; Hennequin & al., 2003). Several other classically defined hymenophylloid genera (subgenera) may not be monophyletic, e.g., *Mecodium* and *Sphaerocionium* (Hennequin & al., 2003; Ebihara & al., 2006). *Microtrichomanes* appears to be polyphyletic (Ebihara & al., 2004). *Trichomanes* s.l. comprises eight monophyletic groups that are regarded here as genera: *Abrodictyum* s.l., *Callistopteris*, *Cephalomanes*, *Crepidomanes*, *Didymoglossum*, *Polyphlebium*, *Trichomanes* s.s., and *Vandenboschia*; several of these have been subdivided into putatively monophyletic subgenera and sections (Ebihara & al., in press). Terrestrial and epiphytic; pantropical and south-temperate, but gametophytes survive in north-temperate regions as far north as Alaska. Characters: rhizomes slender, creeping, wiry, or sometimes erect and stouter, protostelic; vernation circinate; blades one cell thick between veins (a few exceptions); stomata lacking; cuticles lacking or highly reduced; scales usually lacking on blades, indument sometimes of hairs; sori marginal, indusia conical (campanulate), tubular, or clam-shaped (bivalvate), with receptacles (at least in trichomanoid genera) usually elongate, protruding from the involucres; sporangia maturing graduately in basipetal fashion, each with an uninterrupted, oblique annulus; spores green, globose, trilete; gametophytes filamentous or ribbon-like, often reproducing by fragmentation or production of gemmae; $x = 11, 12, 18, 28, 32, 33, 34, 36$, and perhaps others.

G. ORDER GLEICHENIALES. —

Including Dipteridales, Matoniales, Stromatopteridales. Monophyletic (Pryer & al., 2004b; Schuettpelz & al., 2006). Characters: root steles with 3–5 protoxylem poles (Schneider, 1996a); antheridia with 6–12 narrow, twisted or curved cells in walls.

7. Family Gleicheniaceae. — Gleichenioids, forking ferns; incl. Dicranopteridaceae, Stromatopteridaceae. Six genera (*Dicranopteris*, *Diplopterygium*, *Gleichenella*, *Gleichenia*, *Sticherus*, *Stromatopteris*), ca. 125 spp.; monophyletic (Hasebe & al., 1995; Pryer & al., 1995, 2001a, 2004b). Hennipman (1996) also suggested inclusion of the next two families in Gleicheniaceae; however, these are recognized here as distinct based on their significant morphological disparity. Fossil record beginning in Cretaceous (Jurassic and older fossils may belong to the Gleicheniales or represent ancestors of extant Gleicheniaceae); pantropical. Characters: rhizomes with a "vitalized" protostele, or rarely solenostele; leaves indeterminate, blades pseudodichotomously forked (except *Stromatopteris*); veins free; sori abaxial, not marginal, with 5–15 sporangia, each with a transverse-oblique annulus, exindusiate, round, with 128–800 spores; sporangia maturing simultaneously within sori; spores globose-tetrahedral or bilateral; gametophytes green, surficial, with club-shaped hairs; $x = 22, 34, 39, 43, 56$.

8. Family Dipteridaceae. — Including Cheiropleuriaceae. Two genera, *Cheiropleuria* and *Dipteris*, from India, southeast Asia, eastern and southern China, central and southern Japan, and Malesia, to Melanesia and western Polynesia (Samoa), ca. 11 spp.; monophyletic (Kato & al., 2001; Pryer & al. 2004b). Fossil record beginning in upper Triassic. Characters: stems long-creeping, solenostelic or protostelic, covered with bristles or articulate hairs; petioles with a single vascular bundle proximally and polystelic distally; blades (sterile ones, at least) cleft into two or often more subequal parts; veins highly reticulate, with included veinlets; sori exin-

dusiate, discrete, compital (served by many veins), scattered over the surface, or leaves dimorphic and the fertile ones covered with sporangia; sporangia maturing simultaneously or maturation mixed, with a 4-seriate stalk; annuli almost vertical or slightly oblique; spores ellipsoid and monolete, or tetrahedral and trilete, 64 or 128 per sporangium; gametophytes cordate-thalloid; $x = 33$. *Dipteris* differs from *Cheiropleuria* primarily in having bilateral, monolete spores (tetrahedral and trilete in *Cheiropleuria*) and monomorphic leaves with discrete sori (sporangia acrostichoid in *Cheiropleuria*).

9. Family Matoniaceae. — Matonioids. Two genera (*Matonia*, *Phanerosorus*), each with two spp.; monophyletic, sister to Dipteridaceae (Kato & Setoguchi, 1998; Pryer & al., 2004b; Schuettpelz & al., 2006). Malesia-Pacific Basin; fossil record beginning in mid-Mesozoic. Characters: stems solenostelic with at least two concentric vascular cylinders (polycyclic) and a central vascular bundle; blades flabellate (*Matonia*), unevenly dichotomously branched or with dichotomous pinnae; veins free or slightly anastomosing around sori; sori with peltate indusia; sporangia maturing simultaneously, with very short stalks and oblique annuli; spores globose-tetrahedral, trilete; gametophytes green, thalloid, with ruffled margins; antheridia large, many-celled; $x = 26$ (*Matonia*), 25 (*Phanerosorus*).

H. ORDER SCHIZAEALES. — Monophyletic (Hasebe & al., 1995; Pryer & al., 2001a, 2004b; Skog & al., 2002; Wikström & al., 2002). Fossil record beginning in the Jurassic (Collinson, 1996). Characters: fertile-sterile leaf blade differentiation; absence of well-defined sori; sporangia each with a transverse, subapical, continuous annulus.

10. Family Lygodiaceae. — Climbing ferns. A single genus (*Lygodium*), ca. 25 spp.; monophyletic (Skog & al., 2002; Wikström & al., 2002). Terrestrial, pantropical. Characters: rhizomes creeping, slender, protostelic, bearing hairs; leaves indeterminate, climbing, alternately pinnate; primary blade divisions (pinnae) pseudodichotomously forking with a dormant bud in the axils; veins free or anastomosing; sori on lobes of the ultimate segments; sporangia abaxial, solitary, one per sorus, each sporangium covered by an antrorse indusium-like subtending flange; spores 128–256 per sporangium, tetrahedral and trilete; gametophytes green, cordate, surficial; $x = 29, 30$.

11. Family Anemiaceae. — Including Mohriaceae. One genus (*Anemia*, incl. *Mohria*), ca. 100+ spp.; monophyletic (Skog & al., 2002; Wikström & al., 2002). Terrestrial; primarily New World, but a few spp. in Africa, India, and islands in Indian Ocean. Characters: rhizomes creeping to suberect, bearing hairs; leaves determinate, mostly hemidimorphic or dimorphic; veins free, dichotomous, occasionally casually anastomosing; sporangia usually on a basal pair (sometimes more than two pinnae, or all pinnae modified and fertile) of skeletonized, highly modified, often erect pinnae; spores 128–256 per sporangium, tetrahedral, with strongly parallel ridges (Tryon & Lugardon, 1991); gametophytes green, cordate, surficial; $x = 38$.

12. Family Schizaeaceae. — Two genera (*Actinostachys*, *Schizaea*), ca. 30 spp.; monophyletic (Skog & al., 2002; Wikström & al., 2002). The Cretaceous *Schizaeopsis* is the oldest fossil assigned to this lineage (Wikström & al., 2002). Terrestrial, pantropical. Characters: blades simple (linear) or fan-shaped, variously cleft and with dichotomous free veins; sporangia on marginal, elaminate, branched or unbranched projections at blade tips, not in discrete sori, exindusiate; spores bilateral, monolete, 128–256 per sporangium; gametophytes green and filamentous (*Schizaea*), or subterranean and non-green, tuberous (*Actinostachys*), and non-green; a puzzling array of base chromosome numbers: $x = 77, 94, 103$.

I. ORDER SALVINIALES. — Water ferns, heterosporous ferns; incl. "Hydropteridales", Marsileales, Pilulariales. Monophyletic (Hasebe & al., 1995; Pryer, 1999; Pryer & al., 2001a, 2004b). Characters: fertile-sterile leaf blade differentiation; veins anastomosing; aerenchyma tissue often present in roots, shoots, and petioles; annulus absent; plants heterosporous, spores with endosporous germination; monomegaspory; gametophytes reduced.

13. Family Marsileaceae. — Clover ferns, incl. Pilulariaceae. Three genera (*Marsilea*, *Pilularia*, *Regnellidium*), ca. 75 total spp.; monophyletic (Hasebe & al., 1995; Pryer, 1999; Nagalingum & al., unpubl.). Hennipman (1996) included both Salviniaceae and Azollaceae within Marsileaceae, but the spores of Marsileaceae differ markedly from those of Salviniaceae and Azollaceae (Schneider & Pryer, 2002). Rooted aquatics, in ponds, shallow water, or vernal pools, with floating or emergent leaf blades; subcosmopolitan. Characters: stems usually long-creeping, slender, often bearing hairs; leaflets 4, 2 or 0 per leaf; veins dichotomously branched but often fusing toward their tips; sori borne in stalked bean-shaped sporocarps (Nagalingum & al., in press), these arising from the rhizomes or from the base of the petioles, one to many per plant; heterosporous, microspores globose, trilete, megaspores globose, each with an acrolamella positioned over the exine aperture (Schneider & Pryer, 2002); perine gelatinous; $x = 10$ (*Pilularia*), 20 (*Marsilea*).

14. Family Salviniaceae. — Floating ferns, mosquito ferns; incl. Azollaceae. Two genera (*Salvinia*, *Azolla*), ca. 16 spp.; monophyletic (Pryer & al., 1995, 2004b; Reid & al., 2006). Some authors separate the genera into two families (Schneller in Kubitzki,

1990). Plants free-floating, subcosmopolitan; fossil record beginning in Cretaceous (Collinson, 1996). Characters: roots present (*Azolla*) or lacking (*Salvinia*); stems protostelic, dichotomously branched; leaves sessile, alternate, small (ca. 1–25 mm long), round to oblong, entire; veins free (*Azolla*) or anastomosing (*Salvinia*); spores of two kinds (plants heterosporous), large megaspores and small microspores, these globose, trilete; spore germination endosporic; $x = 9$ (*Salvinia*), the lowest base chromosome number known in ferns, 22 (*Azolla*).

J. ORDER CYATHEALES. — Tree ferns; incl. Dicksoniales, Hymenophyllopsidales, Loxomatales, Metaxyales, Plagiogyriales (Hasebe & al., 1995; Wolf & al., 1999; Pryer & al., 2004b). Existing molecular evidence indicates a close relationship among the included families. The order is without obvious defining morphological characters: some of the species have trunk-like stems but others have creeping rhizomes; some have only hairs on the stems and blades, others have scales; sori are abaxial or marginal, either indusiate or exindusiate; spores are globose or tetrahedral-globose, with a trilete scar; gametophytes green, cordate.

15. Family Thyrsopteridaceae. — One genus, *Thyrsopteris*, with a single species, *T. elegans*, endemic to the Juan Fernández Islands; clearly related to tree ferns, but of uncertain phylogenetic position within this group (Korall & al., 2006). Characters: rhizomes ascending to erect, solenostelic, bearing runners, clothed with stiff, pluricellular hairs; leaves large, 2–3.5 m long; blades 3–5-pinnate, partially dimorphic (sori often restricted to proximal segments); blade axes adaxially grooved; veins free; sori terminal on the veins, the outer and inner indusia fused to form asymmetric cup-like structures, each sorus with a columnar, clavate receptacle; sporangia with oblique annuli; spores globose-tetrahedral, with prominent angles; x = ca. 78.

16. Family Loxomataceae. — Two genera (*Loxoma*, *Loxsomopsis*), each with a single sp.; monophyletic (Pryer & al., 2001a, 2004b; Lehnert & al., 2001; Korall & al., 2006). South American Andes, southern Central America, and New Zealand. Characters: rhizomes long-creeping, solenostelic, bearing hairs with a circular, multicellular base; blades bipinnate or more divided; veins free, forked; indument of uniseriate (*Loxsomopsis*) to pluriseriate (*Loxoma*) bristles; sori marginal, terminal on veins, each with an urceolate indusium and elongate, often exserted receptacle; sporangia on thick, short stalks, with a slightly oblique annulus; spores tetrahedral, trilete; gametophytes with scalelike hairs (occurring also in some Cyatheaceae); $x = 46$ (*Loxsomopsis*), 50 (*Loxoma*).

17. Family Culcitaceae. — One genus, *Culcita*, with two species; monophyletic (Korall & al., 2006). Sister to Plagiogyriaceae, and not closely related to *Calochlaena*, with which *Culcita* has often been associated. This separation is supported by anatomical characters (White & Turner, 1988; Schneider, 1996a). Terrestrial; Azores, Madeira, Tenerife, southwestern Europe, and the Neotropics. Characters: rhizomes creeping or ascending, solenostelic, bearing articulate hairs; petioles in cross-section each with gutter-shaped vascular bundle; blades large, 4–5-pinnate-pinnatifid, sparingly hairy; veins free, often forked; sori to 3 mm wide, terminal on veins, paraphysate; outer indusia scarcely differentiated from the laminar tissue, inner noticeably modified; spores tetrahedral-globose, trilete; $x = 66$.

18. Family Plagiogyriaceae. — A single genus (*Plagiogyria*), with ca. 15 spp. (Zhang & Nooteboom, 1998); monophyletic (Korall & al., 2006). Characters: stems creeping to usually erect, lacking hairs or scales; leaves dimorphic; blades pectinate to 1-pinnate; veins simple to 1-forked, free, or in fertile blades somewhat anastomosing at their ends; young leaves densely covered with pluricellular, glandular, mucilage-secreting hairs; sori exindusiate; sporangia borne on distal parts of veins, seemingly acrostichoid; sporangial stalks 6-rowed; annuli slightly oblique, continuous; spores tetrahedral, trilete; gametophytes green, cordate; $x = 66$?

19. Family Cibotiaceae Korall, **stat. nov.** Based on a full and direct reference to the Latin description associated with subfam. Cibotioideae Nayar, Taxon 19: 234. 1970. – Type: *Cibotium* Kaulf., Jahrb. Pharm. 21: 53. 1820.

One genus (*Cibotium*), ca. 11 species; monophyletic, with some affinity to Dicksoniaceae, as circumscribed here (Korall & al., 2006). Terrestrial, amphipacific (eastern Asia, Malesia, Hawaii, southern Mexico and Central America). Characters: rhizomes massive, creeping to ascending or erect (to 6 m), solenostelic or dictyostelic, bearing soft yellowish hairs at apices and persistent petiolar bases; fronds monomorphic, mostly 2–4 m long; petioles hairy at bases, with three corrugated vascular bundles arranged in an omega-shape; blades large, bipinnate to bipinnate-pinnatifid or more divided; secondary and tertiary blade axes adaxially ridged; veins free, simple or forked to pinnate; stomata with 3 subsidiary cells; sori marginal at vein ends, indusia bivalvate, each with a strongly differentiated, non-green outer indusium and a similarly modified tongue-like inner indusium, paraphyses filiform; spores globose-tetrahedral, with prominent angles and a well-developed equatorial flange; antheridial walls 5-celled; $x = 68$.

The spores of Cibotiaceae are unlike those of all other families in Cyatheales (Gastony, 1982; Tryon & Lugardon, 1991), with a prominent equatorial flange, and with usually thick, bold, ± parallel, sometimes anastomosing ridges on the distal face; these ridges are the

result of a coarsely ridged exospore, which is overlain by a thin, sometimes granulate perispore. The spores of *Lophosoria* also have a prominent equatorial flange but lack distal ridges (Tryon & Tryon, 1982; Tryon & Lugardon, 1991). As far as is known, the chromosome base number of $x = 68$ for *Cibotium* is also unique in the tree fern clade. The Hawaiian species have been extensively studied by Palmer (1994).

20. Family Cyatheaceae. — Cyatheoids, scaly tree ferns; incl. Alsophilaceae, Hymenophyllopsidaceae. Ca. five genera: *Alsophila* (incl. *Nephelea*), *Cyathea* (incl. *Cnemidaria*, *Hemitelia*, *Trichipteris*), *Gymnosphaera*, *Hymenophyllopsis*, *Sphaeropteris* (incl. *Fourniera*); 600+ spp.; monophyletic, together with Dicksoniaceae, Metaxyaceae, and Cibotiaceae constituting the "core tree ferns" (Korall & al., 2006). Several studies have addressed relationships within Cyatheaceae (Conant & al., 1995, 1996; Hasebe & al., 1995; Stein & al., 1996; Lantz & al., 1999; Conant & Stein, 2001), and circumscriptions of genera have varied widely (e.g., Tryon, 1970; Holttum & Edwards, 1983). Several of these studies show convincingly that *Cnemidaria* nests within *Cyathea* (Conant & al., 1995; Conant & Stein, 2001; Korall & al., 2006). Hennipman (1996) included all other families here placed in Cyatheales (excepting Hymenophyllopsidaceae, unplaced in his "consensus" classification) in his Cyatheaceae. *Hymenophyllopsis* (ca. eight species) has thin leaves lacking stomates, and is confined to the sandstone tepuis of the Guayana Shield (eastern Venezuela, Guyana, northern Brazil). It has nearly always been regarded as an isolated genus in its own family (e.g., by Copeland, 1947; Tryon & Tryon, 1982). In the analysis by Wolf & al. (1999), a close relationship of *Hymenophyllopsis* to Cyatheaceae was suggested, based on a small taxonomic sampling. A larger sampling by Korall (in prep.) indicates that *Hymenophyllopsis*, as well as *Cnemidaria* and *Trichipteris*, all nest within *Cyathea*, and together form a well supported neotropical clade. The spores of *Hymenophyllopsis* are remarkably similar to some species of *Cyathea* (compare, e.g., Figs. 14.8–14.11 with 26.15–26.18 in Tryon & Tryon, 1982). Characters associating *Hymenophyllopsis* with Cyatheaceae include the presence of true scales on the rhizomes, petiole bases, and sometimes on the blades. Mostly arborescent, pantropical; fossils beginning in Jurassic or early Cretaceous. Characters: stems with polycyclic dictyosteles, apices (and usually petiole bases) covered with large scales, sometimes also with trichomidia (scurf = small scales) or hairs; leaves usually large (to 5 m); petioles with obvious, usually discontinuous pneumathodes in two lines; blades 1–3-pinnate (rarely simple); veins simple to forked, free, rarely anastomosing (mostly in some *Cyathea*); sori superficial (abaxial) or terminal on the veins and marginal or submarginal (*Hymenophyllopsis*), round, exindusiate, or indusia saucer-like, cup-like, or globose and completely surrounding sporangia, or bivalvate (*Hymenophyllopsis*); sporangia maturing gradately, with oblique annuli; receptacles raised; paraphyses usually present; spores tetrahedral, trilete, variously ornamented; gametophytes green, cordate; $x = 69$ (*Hymenophyllopsis* not yet counted).

21. Family Dicksoniaceae, nom. cons. — (Dicksonioids; incl. Lophosoriaceae). Three genera: *Calochlaena*, *Dicksonia*, *Lophosoria*). Ca. 30 spp.; monophyletic (Korall & al., 2006). Terrestrial; eastern Asia, Australasia, Neotropics, St. Helena. Characters: mostly arborescent or with erect or ascending rhizomes; rhizomes with polycyclic dictyosteles, or solenostelic (*Calochlaena*); stem apices and usually petiolar bases covered with uniseriate hairs; blades large, 2–3 pinnate; veins simple to forked, free; sori abaxial and exindusiate (*Lophosoria*) or marginal (*Calochlaena*, *Dicksonia*) and each with a bivalvate or cup-like indusium, the adaxial (outer) valve formed by the reflexed segment margin and often differently colored; sporangia with oblique annuli; receptacles raised; paraphyses often present, filiform; spores globose or tetrahedral, trilete; $x = 56$ (*Calochlaena*), 65 (*Dicksonia*, *Lophosoria*).

Lophosoria (3 spp.) is distinctive in having spores with a prominent subequatorial flange, with the proximal face coarsely tuberculate, the distal face perforate. It has often been recognized as comprising its own family, Lophosoriaceae (Pichi Sermolli, 1977; Tryon & Tryon, 1982; Kramer in Kubitzki, 1990).

22. Family Metaxyaceae. — A single genus (*Metaxya*), 2 spp.; monophyletic (Smith & al., 2001). Terrestrial, Neotropics. Characters: rhizomes short-creeping to ascending, dorsiventral, solenostelic, apices covered with pluricellular hairs; petioles each with an omega-shaped, corrugated vascular bundle; blades simply pinnate; veins free, simple or forked at the base, ± parallel; sori abaxial, round, scattered in several ill-defined rows, often with several sori on the same vein, with numerous filiform paraphyses, exindusiate; sporangia maturing simultaneously; sporangial stalks 4-rowed; annuli vertical or slightly oblique; spores 64 per sporangium, globose, trilete; $x = 95, 96$.

K. ORDER POLYPODIALES. — Including "Aspidiales", Aspleniales, Athyriales, Blechnales, "Davalliales", Dennstaedtiales, Dryopteridales, Lindsaeales, Lonchitidales, Monachosorales, Negripteridales, Parkeriales, Platyzomatales, Pteridales, Saccolomatales, Thelypteridales. Monophyletic (Hasebe & al., 1995; Pryer & al., 1995, 2001a, 2004b; Schneider & al., 2004c). Characters: indusia laterally or centrally attached (indusia lost in many lineages); sporangial stalks 1–3 cells thick, often long; sporangial maturation mixed; sporangia each with a vertical annulus interrupted by the stalk and stomium;

gametophytes green, usually cordate (sometimes ribbon-shaped in some epiphytes), surficial.

23. Family Lindsaeaceae. — Lindsaeoids; incl. Cystodiaceae, Lonchitidaceae. Ca. eight genera: *Cystodium*, *Lindsaea*, *Lonchitis*, *Odontosoria*, *Ormoloma*[1], *Sphenomeris*, *Tapeinidium*, *Xyropteris*[1]; in an unpublished thesis, Barcelona (2000) advocated the establishment of three additional genera allied to *Odontosoria* and *Sphenomeris*. Ca. 200 spp.; most likely monophyletic (Wolf & al., 1994; Pryer & al., 2004b; Korall & al., in press; Schuettpelz & al., in press). The inclusion of *Lonchitis* (traditionally associated with dennstaedtioid ferns) in Lindsaeaceae is puzzling on morphological grounds, but molecular evidence strongly suggests it belongs with the lindsaeoid ferns. Terrestrial, or infrequently epipetric or epiphytic, pantropical. Characters: roots with sclerenchymatous outer cortex combined with an innermost cortical layer six cells wide (Schneider, 1996a) (excepting *Lonchitis* and *Cystodium*); rhizomes short- to long-creeping, protostelic with internal phloem, or in a few taxa solenostelic, bearing generally narrow, basally attached, non-clathrate scales or uniseriate hairs; blades 1–3-pinnate or more divided, generally glabrous; veins usually free, forking, occasionally anastomosing, without included veinlets; sori marginal or submarginal, indusiate, indusia opening towards the margin (extrorse), sometimes also attached at the sides, or sori covered by the reflexed segment margin (*Lonchitis*); spores tetrahedral, trilete, infrequently bilateral, monolete; gametophytes green, cordate; x = 34, 38, 39, 44, 47, 48, 49, 50, 51, perhaps others.

The position of *Cystodium* is clearly among Polypodiales, and not Dicksoniaceae (in Cyatheales), where it has historically been placed, e.g., by Kramer in Kubitzki, 1990; Stevenson & Loconte, 1996 (Korall & al., in press). Croft (1986) discussed its differences from dicksonioids and recognized it at family rank. A relationship to other lindsaeoids is suggested by the molecular evidence, and this is reflected in our classification. However, expanded taxon sampling within early-diverging lineages of Polypodiales is necessary to confirm this or to determine whether recognition of a monotypic family Cystodiaceae is warranted (Korall & al., in press).

24. Family Saccolomataceae. — One genus, ca. 12 spp.; apparently monophyletic, but more sampling is needed to determine whether the Old World species are congeneric with those from the New World. The relationships of *Saccoloma* (incl. *Orthiopteris*) have been contentious. Kramer (in Kubitzki, 1990) treated *Saccoloma* as a subfamily within Dennstaedtiaceae. Terrestrial, pantropical. Characters: rhizomes short-creeping to erect and somewhat trunk-like (long-creeping in most Lindsaeaceae and Dennstaedtiaceae) and dictyostelic (usually solenostelic in Dennstaedtiaceae, protostelic with internal phloem in Lindsaeaceae); petioles each with an omega-shaped vascular strand (open end adaxial); blades pinnate to decompound, lacking articulate hairs (as found in Dennstaedtiaceae); veins free; sori terminal on the veins, indusia pouch- or cup-shaped; spores globose-tetrahedral, surface with distinctive ± parallel, branched ridges; x = ca. 63.

25. Family Dennstaedtiaceae. — Dennstaedtioids; incl. Hypolepidaceae, Monachosoraceae, Pteridiaceae. Ca. 11 genera: *Blotiella*, *Coptodipteris*, *Dennstaedtia* (incl. *Costaricia*[1]), *Histiopteris*, *Hypolepis*, *Leptolepia*, *Microlepia*, *Monachosorum*, *Oenotrichia* s.s.[1], *Paesia*, *Pteridium* (bracken). Ca. 170 spp.; monophyletic, if lindsaeoid ferns are excluded (Pryer & al., 2004b; Schuettpelz & al., in press). Monachosoraceae nests within Dennstaedtiaceae (Wolf & al., 1994; Wolf, 1995, 1997; Pryer & al., 2004b; Schuettpelz & al., 2006). Terrestrial, sometimes scandent; pantropical. Characters: rhizomes mostly long-creeping, often siphonostelic or polystelic, bearing jointed hairs; petioles often with epipetiolar buds, usually with a gutter-shaped vascular strand (open end adaxial); blades often large, 2–3-pinnate or more divided; indument of hairs; veins free, forked or pinnate, rarely anastomosing and then without included veinlets; sori marginal or submarginal, linear or discrete, indusia linear or cup-like at blade margins, or reflexed over sori; spores tetrahedral and trilete, or reniform and monolete; gametophytes green, cordate; x = 26, 29, 30, 31, 33, 34, 38, 46, 47, 48, and probably others.

26. Family Pteridaceae. — Pteroids or pteridoids; incl. Acrostichaceae, Actiniopteridaceae, Adiantaceae (adiantoids, maidenhairs), Anopteraceae, Antrophyaceae, Ceratopteridaceae, Cheilanthaceae (cheilanthoids), Cryptogrammaceae, Hemionitidaceae, Negripteridaceae, Parkeriaceae, Platyzomataceae, Sinopteridaceae, Taenitidaceae (taenitidoids), Vittariaceae (vittarioids, shoestring ferns). Ca. 50 genera, 950 spp. Constituent genera, some of them notoriously polyphyletic or paraphyletic and in need of redefinition (e.g., *Cheilanthes*), include *Acrostichum*, *Actiniopteris*, *Adiantopsis*, *Adiantum*, *Aleuritopteris*, *Ananthacorus*, *Anetium*, *Anogramma*, *Antrophyum*, *Argyrochosma*, *Aspidotis*, *Astrolepis*, *Austrogramme*, *Bommeria*, *Cassebeera*, *Ceratopteris*, *Cerosora*[1], *Cheilanthes*, *Cheiloplecton*, *Coniogramme*, *Cosentinia* (Nakazato & Gastony, 2001), *Cryptogramma*, *Doryopteris*, *Eriosorus*, *Haplopteris*, *Hecistopteris*, *Hemionitis*, *Holcochlaena*, *Jamesonia*, *Llavea*, *Mildella*, *Monogramma*, *Nephopteris*[1], *Neurocallis*, *Notholaena*, *Ochropteris*, *Onychium*, *Paraceterach*, *Parahemionitis*, *Pellaea* (Kirkpatrick, unpubl.), *Pentagramma*, *Pityrogramma*, *Platyloma*, *Platyzoma*, *Polytaenium*, *Pteris* (incl. *Afropteris*, *Anopteris*), *Pterozonium*, *Radiovittaria*, *Rheopteris*, *Scoliosorus*, *Syngramma*, *Taenitis*, *Trachypteris*, and *Vittaria.* The family thus

defined is monophyletic (Gastony & Rollo, 1995, 1998; Hasebe & al., 1995; Pryer & al., 1995; Gastony & Johnson, 2001; Schneider & al., 2004c; Zhang & al., 2005). Pteridaceae comprises five monophyletic groups, and if it were to be formally subdivided to reflect this, at either family or subfamily rank, the following taxa could be recognized: (1) Parkeriaceae, or Parkerioideae (*Acrostichum* and *Ceratopteris*), (2) Adiantaceae, or Adiantoideae (*Adiantum* and the ten vittarioid genera; Crane & al., 1995; Hasebe & al., 1995; Hennipman, 1996; Crane, 1997; Huiet & Smith, unpubl.); (3) Cryptogrammaceae (comprising *Coniogramme*, *Cryptogramma*, and *Llavea*; Zhang & al., 2005), no subfamily name available; (4) Sinopteridaceae, or Cheilanthoideae); and (5) Pteridaceae s.s., or Pteridoideae, containing *Pteris* (perhaps not monophyletic), its immediate allies, and the taenitioid ferns (*Taenitis* and allies; Sánchez-Baracaldo, 2004a, b).

Terrestrial, epipetric, or epiphytic, subcosmopolitan, but most numerous in tropics and arid regions. Characters: rhizomes long- to short-creeping, ascending, suberect, or erect, bearing scales (less often, only hairs); blades monomorphic, hemidimorphic, or dimorphic in a few genera, simple (mostly vittarioids), pinnate, or sometimes pedate, sometimes decompound; veins free and forking, or variously anastomosing and forming a reticulate pattern without included veinlets; sori marginal or intramarginal, lacking a true indusium, often protected by the reflexed segment margin, or sporangia along the veins; sporangia each with a vertical, interrupted annulus, receptacles not or only obscurely raised; spores globose or tetrahedral, trilete, variously ornamented; mostly $x = 29, 30$.

Platyzoma, sometimes recognized as an isolated family, is aberrant in chromosome base number ($x = 38$; Tindale & Roy, 2002) and in having dimorphic spores (so-called "incipient heterospory"; Tryon, 1964), but nests with other genera of Pteridaceae, subfam. Pteridoideae (Hasebe & al., 1995; Pryer & al., 1995).

Ceratopteris (3 spp., monophyletic) nests within Pteridaceae in all molecular analyses, and it appears to be sister to *Acrostichum* (Hasebe & al., 1995; Pryer & al., 1995). It has a number of strong autapomorphies that separate it from other Pteridaceae: coarsely ridged spores with parallel striations; spores 32 or fewer per sporangium; sporangia with ill-defined annuli; aquatic habitat; $x = 38$. Consequently, many taxonomists have placed it in its own family, Parkeriaceae (e.g., Copeland, 1947; Pichi Sermolli, 1977). Many of these autapomorphies (reduced spore number, loss of annulus) are probably a consequence of the shift to aquatic habitats.

The vittarioid genera include: *Ananthacorus*, *Anetium*, *Antrophyum*, *Haplopteris*, *Hecistopteris*, *Monogramma*, *Polytaenium*, *Radiovittaria*, *Rheopteris*, *Scoliosorus*, and *Vittaria*. The presence of *Rheopteris* in this clade is now clear (Huiet & Smith, unpubl.). Characters include linear, mostly simple blades, sori along veins or in linear grooves, clathrate stem scales; presence of "spicular" cells in blade epidermis (shared with a few genera of Pteridaceae, e.g., *Adiantum*). Spores in the vittarioid ferns are predominantly trilete, but reversals to the monolete condition have occurred in *Vittaria*.

27. Family Aspleniaceae. — Asplenioids, spleenworts. From one to ten genera (generic delimitation in doubt, in light of all recent molecular data, e.g., van den Heede & al., 2003; Schneider & al., 2004b, 2005; Perrie & Brownsey, 2005). Regardless of the classification adopted, a huge majority of the species are in *Asplenium*, even if that genus is construed in a fairly strict sense; the segregate genera *Camptosorus* and *Loxoscaphe* clearly nest within *Asplenium* s.l., or appear related to species heretofore generally placed in *Asplenium* (Murakami & al., 1999; Gastony & Johnson, 2001; Schneider & al., 2004b). So also are the generic segregates *Diellia* (endemic to Hawaii), *Pleurosorus*, *Phyllitis*, *Ceterach*, *Thamnopteris*, and several others little used in recent years (Murakami & al., 1999; Pinter & al., 2002; van den Heede & al., 2003; Schneider & al., 2004b). One expects that the oft-recognized, but still unsampled genera *Antigramma*[1], *Holodictyum*[1], *Schaffneria*[1], and *Sinephropteris*[1] also nest in *Asplenium*. *Hymenasplenium*, however, with a different chromosome base number than nearly all of the other segregates, as well as distinct root characters (Schneider, 1996b; Schneider & al., 2004b), appears to represent the sister clade to the rest of the species in the family, and this name could be adopted as a well-supported segregate genus. Ca. 700+ spp; monophyletic (Murakami & Schaal, 1994; Hasebe & al., 1995; Murakami & al., 1999; Gastony & Johnson, 2001; van den Heede & al., 2003; Schneider & al., 2004b, 2005; Perrie & Brownsey, 2005).

Terrestrial, epipetric, or epiphytic, subcosmopolitan, but most numerous in the tropics. Characters: rhizomes creeping, ascending, or suberect, bearing clathrate scales at apices and petiole bases (and sometimes other axes); petioles with back-to-back C-shaped vascular strands, these fusing distally into an X-shape; blades monomorphic, usually lacking acicular hairs on axes and/or lamina, often with microscopic clavate hairs; veins pinnate or forking, usually free, infrequently reticulate and then without included veinlets; sori elongate (linear) along the veins, not usually back-to-back on the same vein, usually with laterally attached, linear indusia; sporangial stalks long, 1-rowed; spores reniform, monolete, with a decidedly winged perine; $x = 36$ (mostly), but $x = 38, 39$ in *Hymenasplenium* (Murakami, 1995), 38 in *Boniniella*.

28. Family Thelypteridaceae. — Thelypteroids or thelypteridoids; incl. "Sphaerostephanaceae". Circa

5–30 genera, depending on taxonomic viewpoint: commonly accepted segregates are *Cyclosorus* (incl. *Ampelopteris*[1], *Amphineuron*[1], *Chingia*, *Christella*, *Cyclogramma*[1], *Cyclosorus* s.s., *Glaphyropteridopsis*, *Goniopteris*, *Meniscium*, *Menisorus*[1], *Mesophlebion*, *Pelazoneuron*, *Plesioneuron*, *Pneumatopteris*, *Pronephrium*, *Pseudocyclosorus*, *Sphaerostephanos*, *Stegnogramma*, *Steiropteris*, *Trigonospora*), *Macrothelypteris*, *Phegopteris*, *Pseudophegopteris*, and *Thelypteris* (incl. *Amauropelta*, *Coryphopteris*, *Metathelypteris*, *Oreopteris*, *Parathelypteris*, and *Thelypteris* s.s.) (see Holttum, 1971; Smith & Cranfill, 2002). Ca. 950 spp; monophyletic (Hasebe & al., 1995; Smith & Cranfill, 2002; Yatabe & al., 2002). Hennipman (1996) also included Blechnaceae and the athyrioid ferns in this family, a definition that would make Thelypteridaceae difficult or impossible to define morphologically.

Terrestrial, rarely epipetric, pantropical, a few temperate. Characters: rhizomes creeping, ascending, or erect, bearing scales at apices, these non-clathrate, usually bearing acicular hairs; petioles in cross-section with two elongate or crescent-shaped vascular bundles facing one another, these uniting distally into a gutter-shape; blades monomorphic or occasionally dimorphic, usually pinnate or pinnate-pinnatifid; veins pinnate, free to variously and usually very regularly anastomosing, with or without included veinlets; indument of acicular hyaline hairs on blades and rhizome scales; sori abaxial, round to oblong, rarely elongate along veins, with reniform indusia or exindusiate; sporangia with 3-rowed, short to long stalks; spores ellipsoid, monolete, perine winged to spinulose; $x = 27–36$. Indusia have been lost independently in many lineages within the family.

29. Family Woodsiaceae. — Athyrioids, lady ferns; incl. Athyriaceae, Cystopteridaceae. Circa 15 genera as defined here, ca. 700 spp., nearly 85% of them in the two main genera, *Athyrium* and *Diplazium* (incl. *Callipteris*, *Monomelangium*), which are both probably paraphyletic (Wang & al., 2003). Other widely recognized genera include *Acystopteris*, *Cheilanthopsis*, *Cornopteris*, *Cystopteris*, *Deparia* (incl. *Lunathyrium*, *Dryoathyrium*, *Athyriopsis*, and *Dictyodroma*; Sano & al., 2000b), *Diplaziopsis*, *Gymnocarpium* (incl. *Currania*), *Hemidictyum*, *Homalosorus*, *Protowoodsia*[1], *Pseudocystopteris*, *Rhachidosorus*, and *Woodsia* (incl. *Hymenocystis*[1]; see Shmakov, 2003). This family has been variously circumscribed, and its limits are still uncertain (Hasebe & al., 1995; Sano & al., 2000a, b). Wang & al. (2004) divided the Athyriaceae (excluding woodsioid ferns), by far the largest component in the family, into five subfamilies: Cystopteroideae, Athyrioideae, Deparioideae, Diplazioideae, and Rhachidosoroideae. As delimited here, the Woodsiaceae may be paraphyletic to the Aspleniaceae, Blechnaceae + Onocleaceae, and Thelypteridaceae, but support for this paraphyly—or alternatively for the monophyly of the family as here defined—is lacking in broad analyses (Hasebe & al., 1995; Sano & al., 2000a; Schneider & al., 2004c). Because of this uncertainty, combined with the morphological grounds for the recognition of the Woodsiaceae as here circumscribed, we believe it is premature to adopt the alternative of erecting (or resurrecting) numerous small families to house its constituent genera. Further sampling will likely shed additional light on this subject, and the recognition of several additional families may be warranted.

Mostly terrestrial, subcosmopolitan. Characters: rhizomes creeping, ascending, or erect; scales at apices, these usually non-clathrate, glabrous, glandular, or ciliate; petioles with two elongate or crescent-shaped vascular bundles facing one another, these uniting distally into a gutter-shape; blades monomorphic, rarely dimorphic; veins pinnate or forking, free, uncommonly anastomosing and then without included veinlets; sori abaxial, round, J-shaped, or linear with reniform to linear indusia, or exindusiate; spores reniform, monolete, perine winged, ridged or spiny; mostly $x = 40, 41$, also 31 (*Hemidictyum*), 33, 38, 39 (*Woodsia*), and 42 (*Cystopteris*).

30. Family Blechnaceae. — Blechnoids; incl. Stenochlaenaceae). Currently ca. nine genera recognized (*Blechnum* s.l., *Brainea*, *Doodia*, *Pteridoblechnum*, *Sadleria*, *Salpichlaena*, *Steenisioblechnum*, *Stenochlaena*, *Woodwardia*). Most of the existing recognized genera nest within *Blechnum* s.l., and their acceptance is dependent upon a revised recircumscription of *Blechnum* s.l., which is manifestly paraphyletic in its current usage (Nakahira, 2000; Cranfill, 2001). Ca. 200 spp.; monophyletic, sister to Onocleaceae (Hasebe & al., 1995; Cranfill, 2001; Cranfill & Kato, 2003). *Woodwardia* (incl. *Anchistea*, *Chieniopteris*, *Lorinseria*) appears to be an early-branching member of the Blechnaceae (Cranfill & Kato, 2003). Characters: rhizomes creeping, ascending, or erect, sometimes trunk-like, often bearing stolons, scaly at apex (and on blades), scales non-clathrate; petioles with numerous, round, vascular bundles arranged in a ring; leaves monomorphic or often dimorphic; veins pinnate or forking, free to variously anastomosing, areoles without included veinlets, on fertile leaves forming costular areoles bearing the sori; sori in chains or linear, often parallel and adjacent to midribs, indusiate, with linear indusia opening inwardly (toward midribs); sporangia with 3-rowed, short to long stalks; spores reniform, monolete, perine winged; gametophytes green, cordate; $x = 27, 28, 31–37$ (*Blechnum* and segregates, *Woodwardia*); 40 (*Salpichlaena*).

31. Family Onocleaceae. — Onocleoids. Four genera: *Matteuccia*, *Onoclea*, *Onocleopsis*, *Pentarhizidium*. 5 spp.; monophyletic, sister to Blechnaceae (Hasebe

& al., 1995; Gastony & Ungerer, 1997). Family circumscription follows Pichi Sermolli (1977) and Gastony and Ungerer (1997, their tribe Onocleeae of Dryopteridaceae). Terrestrial, largely in north-temperate regions; Characters: rhizomes long- to short-creeping to ascending, sometimes stoloniferous (*Matteuccia* and *Onocleopsis*); leaves strongly dimorphic; petioles with two vascular bundles uniting distally into a gutter-shape; blades pinnatifid or pinnate-pinnatifid; veins free or anastomosing, lacking included veinlets; spores reniform, brownish to green; sori enclosed (sometimes tightly) by reflexed laminar margins, also with membranous, often fugacious true indusia; $x = 37$ (*Onoclea*), 39, 40 (other genera).

32. Family Dryopteridaceae. — Dryopteroids or dryopteridoids; incl. "Aspidiaceae", Bolbitidaceae, Elaphoglossaceae, Hypodematiaceae, Peranemataceae. Circa 40–45 genera, 1700 spp., of which 70% are in four genera (*Ctenitis*, *Dryopteris*, *Elaphoglossum*, and *Polystichum*). Genera include *Acrophorus*, *Acrorumohra*, *Adenoderris*, *Arachniodes*, *Ataxipteris*[1], *Bolbitis* (incl. *Egenolfia*), *Coveniella*[1], *Ctenitis*, *Cyclodium*, *Cyrtogonellum*, *Cyrtomidictyum*, *Cyrtomium* (Lu & al., 2005), *Didymochlaena*, *Dryopolystichum*[1], *Dryopsis*, *Dryopteris* (incl. *Nothoperanema*; Geiger & Ranker, 2005), *Elaphoglossum* (incl. *Microstaphyla*[1], *Peltapteris*; Rouhan & al., 2004; Skog & al., 2004), *Hypodematium*, *Lastreopsis*, *Leucostegia*, *Lithostegia*[1], *Lomagramma*, *Maxonia*, *Megalastrum*, *Oenotrichia* p.p. (Tindale & Roy, 2002), *Olfersia*, *Peranema*, *Phanerophlebia*, *Polystichum* (incl. *Papuapteris*, *Plecosorus*; Little & Barrington, 2003), *Polybotrya*, *Polystichopsis*, *Revwattsia*[1] (Tindale & Roy, 2002), *Rumohra*, *Stenolepia*[1], *Stigmatopteris*, and *Teratophyllum*.

Terrestrial, epipetric, hemiepiphytic, or epiphytic, pantropical, also with many temperate representatives. Characters: rhizomes creeping, ascending or erect, sometimes scandent or climbing, with non-clathrate scales at apices; petioles with numerous round, vascular bundles arranged in a ring; blades monomorphic, less often dimorphic, sometimes scaly or glandular, uncommonly hairy; veins pinnate or forking, free to variously anastomosing, with or without included veinlets; sori usually round, indusia round-reniform or peltate (lost in several lineages), or sori exindusiate, acrostichoid in a few lineages; sporangia with 3-rowed, short to long stalks; spores reniform, monolete, perine winged; $x = 41$ (nearly all genera counted), rarely 40 (presumably derived).

Dryopteridaceae, as defined here, is almost certainly monophyletic, if *Didymochlaena*, *Hypodematium*, and *Leucostegia* are excluded (Hasebe & al., 1995; Tsutsumi & Kato, 2006). The inclusion of these three genera may render this family paraphyletic, but they are tentatively included here pending further studies to address their precise phylogenetic affinities. *Didymochlaena*, with a single species, has generally been associated with other members of the Dryopteridaceae (as here defined). The three closely related species of *Hypodematium*, on the other hand, have been variously treated: as composing a monogeneric family Hypodematiaceae; as allied to the athyrioid ferns (e.g., by Kramer in Kubitzki, 1990, presumably based on the presence of two vascular bundles in the petiole bases); or as close to *Dryopteris* (e.g., Tryon & Lugardon, 1991, using evidence from spore morphology). *Leucostegia* is nearly always placed in Davalliaceae (e.g., by Kramer, 1990), because of its similar indusia and sori terminal on the veins, but it differs from members of Davalliaceae in the terrestrial habit, the more strongly verrucate spores with rugulate perispore (Tryon & Lugardon, 1991), and $x = 41$ (vs. $x = 40$ in Davalliaceae). In a molecular phylogenetic analysis by Schneider & al. (2004c), *Didymochlaena* and *Hypodematium* were resolved as sister to one another, and together sister to the remainder of the Eupolypods I clade (Fig. 2), but support for these relationships was lacking. Tsutsumi & Kato (2006) found support for a sister relationship between *Hypodematium* and *Leucostegia*, and also support for these as sister to the remaining Eupolypods I, but *Didymochlaena* was unsampled in their analysis. Based on these results, we therefore believe it would be premature to segregate these genera from the Dryopteridaceae.

Within Dryopteridaceae, as defined here, nests *Elaphoglossum* (Hasebe & al., 1995; Sano & al., 2000a). Sometimes it is included in its own family Elaphoglossaceae, e.g., by Pichi Sermolli (1977), with 600–800 spp., many still undescribed. Elaphoglossaceae was regarded as comprising three genera by Pichi Sermolli (1977), but *Microstaphyla* and *Peltapteris* nest within *Elaphoglossum* (http://www.nybg.org/bsci/res/moran/elaphoglossum.html; Mickel & Atehortúa, 1980; Rouhan & al., 2004; Skog & al., 2004). Relationships of *Elaphoglossum* are often considered to be with *Lomariopsis* (Kramer in Kubitzki, 1990), but this is refuted by two unpublished topologies. Elaphoglossaceae, narrowly defined, is monophyletic (Skog & al., 2001, 2004), but to exclude it from Dryopteridaceae s.s., as delimited above, renders the latter paraphyletic. Characters of *Elaphoglossum* include simple blades (usually) and dimorphic leaves with acrostichoid sporangia.

Several authors have treated most of the genera within our concept of Dryopteridaceae, as well as Tectariaceae, Woodsiaceae, and Onocleaceae, as comprising a much larger family Dryopteridaceae s.l., with slightly varying circumscriptions (e.g., Tryon & Tryon, 1982; Kramer in Kubitzki, 1990; Wagner & Smith, 1993). With such a broad circumscription, and unless several other well-circumscribed families (e.g., Aspleniaceae, Blechnaceae, Polypodiaceae, Thelypteridaceae) are included,

Dryopteridaceae is certainly paraphyletic.

33. Family Lomariopsidaceae. — Lomariopsids; incl. Nephrolepidaceae, sword ferns. Four genera: *Cyclopeltis*, *Lomariopsis*, *Nephrolepis*, and *Thysanosoria*[1]; ca. 70 species. Characters: rhizomes creeping or sometimes climbing (plants hemiepiphytic); petioles with round vascular bundles arranged in a gutter-shape; blades 1-pinnate, pinnae entire or crenate, often articulate, auriculate in some genera; veins free, ± parallel or pinnate; sori discrete, round, and with round-reniform to reniform indusia, or exindusiate, or sporangia acrostichoid and the fronds dimorphic; spores bilateral, monolete, variously winged or ornamented; $x = 41$ (lower numbers known in some *Lomariopsis* species).

Based on published and unpublished results, it appears likely that these genera form a monophyletic group, despite the fact that such an assemblage has never been proposed. Lomariopsidaceae (sensu Kramer in Kubitzki, 1990; Moran in Davidse & al., 1995) was construed to comprise six genera (containing ca. 800+ species): *Bolbitis* (and segregates *Edanyoa*, *Egenolfia*), *Elaphoglossum*, *Lomagramma*, *Lomariopsis*, *Teratophyllum*, and *Thysanosoria*[1]. Based on available evidence, we place all of the aforementioned genera except *Lomariopsis* (and *Thysanosoria*, which lacks molecular data, but appears to be closely related to *Lomariopsis*) in the Dryopteridaceae (see above). *Nephrolepis*, with ca. 20 spp., has sometimes been included in a monogeneric family Nephrolepidaceae (Kramer in Kubitzki, 1990). It has been resolved and supported as sister to a large clade comprising the Tectariaceae, Oleandraceae, Polypodiaceae, and Davalliaceae (Hasebe & al., 1995; Schneider & al., 2004c); however, *Lomariopsis* was not included in these analyses. When *Lomariopsis* is included, *Nephrolepis* is resolved as sister to it, and these two genera, in turn, are strongly supported as sister to the aforementioned larger clade (Tsutsumi & Kato, 2006) and therefore to be expunged from the Dryopteridaceae. Although we have here decided to tentatively include *Nephrolepis* in the Lomariopsidaceae, the monophyly of this clade requires additional scrutiny, and thus Nephrolepidaceae may eventually require recognition.

34. Family Tectariaceae. — Tectarioids; incl. "Dictyoxiphiaceae", "Hypoderriaceae". 8–15 genera: *Aenigmopteris*[1], *Arthropteris*, *Heterogonium*, *Hypoderris*[1], *Pleocnemia*, *Psammiosorus*, *Psomiocarpa*[1], *Pteridrys*, *Tectaria* s.l. (incl. *Amphiblestra*[1], *Camptodium*[1], *Chlamydogramme*[1], *Cionidium*, *Ctenitopsis*, *Dictyoxiphium*, *Fadyenia*, *Hemigramma*, *Pleuroderris*[1], *Pseudotectaria*[1], *Quercifilix*, and perhaps other genera mentioned above), and *Triplophyllum* (Holttum, 1986); ca. 230 species, most in *Tectaria* s.l. Generic limits, especially within *Tectaria* s.l., are still very much in doubt. The family appears monophyletic with the definition given. Including Tectariaceae within an expanded Dryopteridaceae renders the latter polyphyletic. *Ctenitis*, *Lastreopsis*, and several other genera here included in Dryopteridaceae have often been considered closely related to tectarioid ferns (Pichi Sermolli, 1977; Holttum, 1986; Moran in Davidse & al., 1995), but molecular data suggest otherwise (Hasebe & al., 1995). Terrestrial, pantropical. Characters: rhizomes usually short-creeping to ascending, dictyostelic, bearing scales; petioles not abscising, with a ring of vascular bundles in cross-section; blades simple, pinnate, or bipinnate, sometimes decompound; indument of jointed, usually short stubby hairs on the axes, veins, and sometimes laminar tissue, especially on rachises and costae adaxially; veins free or often highly anastomosing, sometimes with included veinlets; indusia reniform or peltate (lost in several lineages); spores brownish, reniform, monolete, variously ornamented; $x = 40$ (a few genera with $x = 41$, some dysploids with $x = 39$).

Arthropteris is apparently not closely related to *Oleandra*, as previously suggested (Kramer in Kubitzki, 1990), nor to *Nephrolepis*, as suggested by Pichi Sermolli (1977). Analyses that have included it show it to be sister to tectarioid ferns (Hasebe & al., 1995; Tsutsumi & Kato, 2006). *Psammiosorus*, a monotypic genus endemic to Madagascar, has in turn been placed close to *Arthropteris* (Kramer, in Kubitzki, 1990) or even within *Arthropteris* (Tryon & Lugardon, 1991, on the basis of the spore ornamentation). Therefore, both *Arthropteris* and *Psammiosorus* are tentatively assigned to Tectariaceae, although a Tectariaceae that includes them is more difficult to define morphologically.

35. Family Oleandraceae. — Monogeneric, ca. 40 spp., sister to Davalliaceae + Polypodiaceae (Hasebe & al., 1995; Schneider & al., 2004; Tsutsumi & Kato, 2006). Kramer (in Kubitzki, 1990), included two genera in addition to *Oleandra*: *Arthropteris* (ca. 12 spp.), and *Psammiosorus* (monotypic), but with this broader circumscription, the family is clearly polyphyletic; we include both of these genera in Tectariaceae. Species are terrestrial, epilithic or often secondary hemiepiphytes. Characters: blades simple; leaves articulate, abscising cleanly upon senescence from pronounced phyllopodia; sori indusiate, indusia round-reniform; spores reniform, monolete; $x = 41$.

36. Family Davalliaceae. — Davallioids; excl. Gymnogrammitidaceae. 4–5 genera: *Araiostegia*, *Davallia* (incl. *Humata*, *Parasorus*, *Scyphularia*), *Davallodes*, *Pachypleuria*; ca. 65 spp. Monophyletic, sister to Polypodiaceae (Hasebe & al., 1995; Ranker & al., 2004; Schneider & al., 2004d; Tsutsumi & Kato, 2005), but more information needed. *Gymnogrammitis* and *Leucostegia* are often included in Davalliaceae but the former belongs in Polypodiaceae (Schneider & al., 2002b),

while the latter is seemingly allied to *Hypodematium* (Dryopteridaceae; Tsutsumi & Kato, 2005). Generic limits of *Araiostegia*, *Davallia*, and *Pachypleuria* relative to each other are ill-defined, and all of these genera appear to be paraphyletic or polyphyletic (Tsutsumi & Kato, 2005). Paleotropics and subtropics, Pacific Basin. Characters: plants epiphytic (most genera) or epipetric; rhizomes long-creeping, dictyostelic, dorsiventral, bearing scales; old leaves cleanly abscising at petiole bases; blades usually 1–4-pinnate (rarely simple), monomorphic (rarely dimorphic); veins free, forking or pinnate; indument generally lacking on blades and axes, but sometimes of articulate hairs; sori abaxial, inframarginal to well back from the margin, ± round, with cup-shaped to reniform or lunate indusia (rarely forming a submarginal coenosorus in *Parasorus*); sporangia with 3-rowed, usually long stalks; annuli vertical; spores ellipsoid, monolete, yellowish to tan, perine various, but usually not strongly winged or cristate; gametophytes green, cordate; $x = 40$.

37. Family Polypodiaceae. — Polygrams; incl. Drynariaceae, Grammitidaceae (grammitids), Gymnogrammitidaceae, Loxogrammaceae, Platyceriaceae, Pleurisoriopsidaceae. Ca. 56 genera, ca. 1200 spp. Pantropical, a few temperate. Genera include *Acrosorus*, *Adenophorus* (Ranker & al., 2003), *Aglaomorpha* (incl. *Photinopteris*, *Merinthosorus*, *Pseudodrynaria*, *Holostachyum*; Janssen & Schneider, 2005), *Arthromeris*, *Belvisia*, *Calymmodon*, *Campyloneurum*, *Ceradenia*, *Christiopteris* (Kreier & Schneider, unpubl.), *Chrysogrammitis*, *Cochlidium*, *Colysis*, *Ctenopteris*, *Dicranoglossum*, *Dictymia*, *Drynaria* (Janssen & Schneider, 2005), *Enterosora*, *Goniophlebium* s.l., *Grammitis*, *Lecanopteris* (Haufler & al., 2003), *Lellingeria*, *Lemmaphyllum*, *Lepisorus* (incl. *Platygyria*), *Leptochilus*, *Loxogramme* (incl. *Anarthropteris*, a monotype from New Zealand; Kreier & Schneider, in press), *Melpomene*, *Microgramma* (incl. *Solanopteris*), *Micropolypodium*, *Microsorum*, *Neocheiropteris* (incl. *Neolepisorus*), *Neurodium*, *Niphidium*, *Pecluma*, *Phlebodium*, *Phymatosorus*, *Platycerium* (Kreier & Schneider, 2006), *Pleopeltis*, *Polypodioides*, *Polypodium*, *Prosaptia*, *Pyrrosia* (incl. *Drymoglossum*), *Scleroglossum*, *Selliguea* (incl. *Crypsinus*, *Polypodiopteris*), *Serpocaulon* (Smith & al., in press), *Synammia* (Schneider & al., 2006), *Terpsichore*, *Themelium*, *Thylacopteris* (Schneider & al., 2004a), and *Zygophlebia*[1]. Additional monotypic genera, include *Caobangia*[1], *Drymotaenium*, *Gymnogrammitis*, *Kontumia*[1] (Wu & al., 2005), *Luisma*[1], *Pleurosoriopsis*, and *Podosorus*[1].

Polypodiaceae s.s., as often recognized (e.g., by Kramer in Kubitzki, 1990), is paraphyletic, because it excludes the grammitids, often segregated as Grammitidaceae (Ranker & al., 2004; Schneider & al., 2004d). Generic boundaries need clarification, and, in particular, *Polypodium* and *Microsorum*, two of the largest assemblages, are known to be polyphyletic (Schneider & al., 2004d). Certain previously misplaced genera are now shown to be nested within Polypodiaceae, e.g., *Pleurosoriopsis* (Hasebe & al., 1995, Schneider & al., 2004d) and *Gymnogrammitis* (Schneider & al., 2002b). Polypodiaceae contains large wholly Neotropical and wholly Paleotropical clades (Schneider & al., 2004d).

Mostly epiphytic and epipetric, a few terrestrial; pantropical. Characters: rhizomes long-creeping to short-creeping, dictyostelic, bearing scales; petioles cleanly abscising near their bases or not (most grammitids), leaving short phyllopodia; blades monomorphic or dimorphic, mostly simple to pinnatifid or 1-pinnate (uncommonly more divided); indument lacking or of hairs and/or scales on the blade; veins often anastomosing or reticulate, sometimes with included veinlets, or veins free (most grammitids); indument various, of scales, hairs, or glands; sori abaxial (rarely marginal), round to oblong or elliptic, occasionally elongate, or the sporangia acrostichoid, sometimes deeply embedded; sori exindusiate, sometimes covered by caducous scales when young (e.g., *Lepisorus*, *Pleopeltis*); sporangia with 1–3-rowed, usually long stalks, frequently with paraphyses on sporangia or on receptacle; spores hyaline to yellowish, reniform, and monolete (non-grammitids), or greenish and globose-tetrahedral, trilete (most grammitids); perine various, usually thin, not strongly winged or cristate; mostly $x = 35, 36, 37$ (25 and other numbers also known).

Within Polypodiaceae, as defined above, nest the grammitid ferns (Ranker & al., 2004; Schneider & al., 2004d). Tryon & Tryon (1982) and Hennipman (1996) subsumed the grammitids in Polypodiaceae, as we do here. Grammitids (ca. 20 genera, 600 species, pantropical) do share a large number of morphological synapomorphies: veins free (mostly); scales lacking on blades; setiform, often dark red-brown hairs on leaves; sporangial stalks 1-rowed; spores green, trilete; gametophytes ribbon-shaped. Some genera of grammitids have now been shown to be polyphyletic, e.g., *Ctenopteris*, *Grammitis*, *Micropolypodium*, and *Terpsichore*, while others are likely monophyletic, e.g., *Ceradenia*, *Melpomene*, *Prosaptia* s.l. (Ranker & al., 2004).

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Appendix 1. Supra-ordinal names applied to extant ferns. Boldface indicates names adopted in this classification. * refers to Kenrick & Crane, 1997.

Subclass Blechnidae Doweld
Subclass Cyatheidae Doweld
Class Cyatheopsida Doweld
Subclass Dennstaedtiidae Doweld
Subclass Equisetidae Warming
Division Equisetophyta D. H. Scott
Subdivision Equisetophytina Reveal
Class Equisetopsida* C. Agardh
Subclass *Filicidae* Hook. & Arn., *nom. illeg.*
Division *Filicophyta* J. Mackay, *nom. illeg.*
Class *Filicopsida* C. Agardh, *nom. illeg.*
Subclass Gleichenidae Doweld
Class Gleicheniopsida Doweld
Class Hymenophyllopsida Doweld
Subclass Marattiidae Klinge
Division Marattiophyta Heintze
Class Marattiopsida Doweld
Subclass Marsileidae Doweld
Class Marsileopsida Trevis.
Class Matoniopsida Doweld
Subclass Matoniidae Doweld
Infradivision *Moniliformopses**, *nom. illeg.*
Subclass Ophioglossidae* Klinge
Division Ophioglossophyta Bek.
Subdivision Ophioglossophytina Doweld
Class Ophioglossopsida Thomé
Subclass Osmundidae Doweld
Class Osmundopsida Doweld
Subclass Plagiogyriideae Doweld
Subclass Polypodiidae* Cronquist, Takht. & Zimmerm.
Division Polypodiophyta Cronquist, Takht. & Zimmerm.
Subdivision Polypodiophytina Reveal
Class Polypodiopsida Cronquist, Takht. & Zimmerm.
Subclass Psilotidae Reveal*
Division Psilotophyta Heintze
Subdivision Psilotophytina Tippo ex Reveal
Class Psilotopsida* D. H. Scott
Subclass Pteridiidae Schmakov
Subkingdom Pteridobiotina Underw.
Division Pteridophyta Schimp.
Superdivision Pteridophytanae Doweld
Subdivision Pteridophytina Engl.
Class Pteridopsida Ritgen
Subclass Salviniidae Cronquist, Takht. & Zimmerm. ex Reveal
Class Salviniopsida Kamelin & Schmakov
Subclass Schizaeidae Doweld
Class Schizaeopsida Doweld

Appendix 2. Ordinal and subordinal names applied to extant ferns. In this list, an equal sign (=) indicates that we regard the first name as a synonym of the one we adopt. * refers to orders adopted by Pichi Sermolli (1977); most of these names are not validly published. Boldface indicates orders adopted in our classification. A name in quotes indicates that it is not validly published.

Order "*Aspidiales*": used by various authors, e.g., Pichi Sermolli (1958, 1977), *nom. illeg.* = Polypodiales
Order Aspleniales Pic. Serm. ex Reveal = Polypodiales
Order Athyriales Schmakov = Polypodiales
Order Blechnales Pic. Serm. ex Reveal = Polypodiales
Order Christenseniales Doweld = Marattiales
Order Cyatheales A.B. Frank
Suborder Cyatheineae Bessey
Order "*Davalliales*", *nom. illeg*. = Polypodiales
Order Dennstaedtiales Doweld (name also used by Pichi Sermolli, 1977, where it is a *nom. nud*.) = Polypodiales
Order Dicksoniales Pic. Serm. ex Reveal = Cyatheales
Order Dipteridales Doweld = Gleicheniales
Order Dryopteridales Schmakov = Polypodiales
Order Equisetales DC. ex Bercht. & J. Presl
Suborder Equisetineae Rabenh.
Order *Filicales* Dumort., *nom. illeg*.
Order Gleicheniales* Link
Suborder Gleicheniineae Bessey
Order "*Hydropteridales*" (Hydropterides) used by many authors, e.g., Copeland (1947), Kubitzki (1990) = Salviniales
Order Hymenophyllales A.B. Frank
Suborder Hymenophyllineae Bessey
Order Hymenophyllopsidales Pic. Serm. ex Reveal = Cyatheales
Order Lindsaeales Doweld = Polypodiales
Order Lonchitidales Doweld = Polypodiales
Order Loxomatales Pic. Serm. ex Reveal = Cyatheales
Order Marattiales Link
Order Marsileales Bartl. = Salviniales
Order Matoniales Pic. Serm. ex Reveal = Gleicheniales
Order Metaxyales Doweld = Cyatheales
Order Monachosorales Doweld = Polypodiales
Order Negripteridales Pic. Serm. ex Reveal = Polypodiales
Order Ophioglossales Link
Order Osmundales Link
Suborder Osmundineae Bessey
Order Parkeriales A.B. Frank = Polypodiales
Order Pilulariales Bercht. & J. Presl = Salviniales
Order Plagiogyriales Pic. Serm. ex Reveal = Cyatheales
Order Platyzomatales* Pic. Serm. ex Reveal = Polypodiales
Order Polypodiales Link
Suborder Polypodiineae Bessey
Order Psilotales Prantl
Suborder Psilotineae Engl.
Order Pteridales* Doweld = Polypodiales
Order Saccolomatales Doweld = Polypodiales
Order Salviniales Bartl.
Order Schizaeales Schimp.
Suborder Schizaeineae Bessey
Order Stromatopteridales* Pic. Serm. ex Reveal = Gleicheniales
Order Thelypteridales Doweld = Polypodiales

Appendix 3. Familial names applied to extant ferns, and their taxonomic disposition. Family names accepted by us are in boldface. Synonyms are in *italics*. Unpublished or otherwise illegitimate names are in quotation marks. An equal sign (=) is intended to indicate that we regard the first name as a heterotypic synonym of the family name we adopt.

Acrostichaceae Mett. ex A.B. Frank = Pteridaceae
Actiniopteridaceae Pic. Serm. = Pteridaceae
Adiantaceae Newman, *nom. cons*. over Parkeriaceae = Pteridaceae
Alsophilaceae C. Presl = Cyatheaceae
Anemiaceae Link; here included in Schizaeales
Angiopteridaceae Fée ex J. Bommer = Marattiaceae
Anopteraceae Doweld = Pteridaceae
Antrophyaceae Ching = Pteridaceae
"*Aspidiaceae*" Burnett, *nom. illeg*. = Dryopteridaceae
Aspleniaceae Newman; here included in Polypodiales
Athyriaceae Alston = Woodsiaceae
Azollaceae Wettst. = Salviniaceae
Blechnaceae Newman; here included in Polypodiales
Bolbitidaceae Ching = Dryopteridaceae
Botrychiaceae Horan. = Ophioglossaceae
Ceratopteridaceae Underw. = Parkeriaceae = Pteridaceae
Cheilanthaceae B.K. Nayar = Pteridaceae
Cheiropleuriaceae Nakai = Dipteridaceae
Christenseniaceae Ching = Marattiaceae
Cibotiaceae Korall; here included in Cyatheales
Cryptogrammaceae Pic. Serm. = Pteridaceae
Culcitaceae Pic. Serm.; here included in Cyatheales
Cyatheaceae Kaulf.; here included in Cyatheales
Cystodiaceae J.R. Croft = Lindsaeaceae
Cystopteridaceae Schmakov
Danaeaceae C. Agardh = Marattiaceae
Davalliaceae M.R. Schomb.; here included in Polypodiales
Dennstaedtiaceae Lotsy; here included in Polypodiales
Dicksoniaceae M.R. Schomb., *nom. cons*. over Thyrsopteridaceae; here included in Cyatheales
Dicranopteridaceae Ching ex Doweld = Gleicheniaceae
"*Dictyoxiphiaceae*" Ching, *nom. nud*. = Tectariaceae
"*Didymochlaenaceae*" Ching, *nom. nud*. = Dryopteridaceae, tentatively
Dipteridaceae Seward & E. Dale; here included in Gleicheniales
Drynariaceae Ching = Polypodiaceae
Dryopteridaceae Herter, *nom. cons*. over Peranemataceae; here included in Polypodiales
Elaphoglossaceae Pic. Serm. = Dryopteridaceae
Equisetaceae Michx. ex DC.; here included in Equisetales
"*Filicaceae*" Juss., *nom. illeg.*
Gleicheniaceae C. Presl; here included in Gleicheniales
Grammitidaceae Newman [often misspelled Grammitaceae] = Polypodiaceae
Gymnogrammitidaceae Ching (incl. Gymnogrammaceae, spelling variant used by some authors) = Polypodiaceae
Helminthostachyaceae Ching = Ophioglossaceae
Hemionitidaceae Pic. Serm. = Pteridaceae
Hymenophyllaceae Mart.; here included in Hymenophyllales
Hymenophyllopsidaceae Pic. Serm. = Cyatheaceae
Hypodematiaceae Ching = Dryopteridaceae, tentatively
"*Hypoderriaceae*" Ching, nom. nud., used by various authors, incl. Dickason (1946) = Tectariaceae
Hypolepidaceae Pic. Serm. = Dennstaedtiaceae
"*Kaulfussiaceae*" Campb., *nom. illeg*. = Marattiaceae
Lindsaeaceae C. Presl; here included in Polypodiales
Lomariopsidaceae Alston; here included in Polypodiales

Appendix 3. Continued.

Lonchitidaceae Doweld = Lindsaeaceae
Lophosoriaceae Pic. Serm.; here included in Dicksoniaceae
Loxogrammaceae Ching ex Pic. Serm. = Polypodiaceae
Loxomataceae C. Presl [often misspelled "Loxsomaceae"]; here included in Cyatheales
Lygodiaceae M. Roem.; here included in Schizaeales
Marattiaceae Kaulf., *nom. cons. prop*.; here included in Marattiales; antedated by Danaeaceae (Murdock & al., subm.)
Marsileaceae Mirb.; here included in Salviniales
Matoniaceae C. Presl; here included in Gleicheniales
Metaxyaceae Pic. Serm.; here included in Cyatheales
Mohriaceae C.F. Reed. = Anemiaceae
Monachosoraceae Ching = Dennstaedtiaceae
Negripteridaceae Pic. Serm. = Pteridaceae
Nephrolepidaceae Pic. Serm. = Lomariopsidaceae, tentatively
Oleandraceae Ching ex Pic. Serm.; here included in Polypodiales
Onocleaceae Pic. Serm.; here included in Polypodiales
Ophioglossaceae Martynov; here included in Ophioglossales
Osmundaceae Martynov; here included in Osmundales
Parkeriaceae Hook. = Pteridaceae
Peranemataceae (C. Presl) Ching = Dryopteridaceae
Pilulariaceae Mirb. ex DC. (Pilulariae) = Marsileaceae
Plagiogyriaceae Bower; here included in Cyatheales
Platyceriaceae Ching = Polypodiaceae
Platyzomataceae Nakai = Pteridaceae
Pleurosoriopsidaceae Kurita & Ikebe ex Ching = Polypodiaceae
Polypodiaceae J. Presl; here included in Polypodiales
Psilotaceae J.W. Griff. & Henfr.; here included in Psilotales
Pteridaceae E.D.M. Kirchn.; here included in Polypodiales
Pteridiaceae Ching = Dennstaedtiaceae
Saccolomataceae Doweld; here included in Polypodiales
Salviniaceae Martynov; here included in Salviniales
Schizaeaceae Kaulf.; here included in Schizaeales
Sinopteridaceae Koidz., *nom. rej.* in favor of Adiantaceae = Pteridaceae
"*Sphaerostephanaceae*" Ching, *nom. nud*. = Thelypteridaceae
Stenochlaenaceae Ching = Blechnaceae
Stromatopteridaceae Bierh. = Gleicheniaceae
Taenitidaceae Pic. Serm. = Pteridaceae
Tectariaceae Panigrahi; here included in Polypodiales
Thelypteridaceae Pic. Serm.; here included in Polypodiales
Thyrsopteridaceae C. Presl; here included in Cyatheales
Tmesipteridaceae Nakai = Psilotaceae
Trichomanaceae Burmeist. = Hymenophyllaceae
Vittariaceae Ching = Pteridaceae
Woodsiaceae Herter: here included in Polypodiales

Appendix 4. Familial, ordinal, and supra-ordinal names for extant ferns, with citations from Reveal & Doweld (subm.), as revised from Hoogland & Reveal (2005), to comply with the *Vienna Code*. Orthographic variations in spelling, in original references, are in quotation marks. *Italicized* names are not validly published. * refers to ordinal names used by Pichi Sermolli (1977), some of them unpublished, some published by earlier authorities. Commonly used "descriptive names" (Art. 16.1), e.g., Hydropterides, are also given, but no attempt has been made to include all such names, or to determine first usage; no good index is available for these.

•Fam. Acrostichaceae Mett. ex A.B. Frank, Syn. Pflanzenk., ed. 2, 3: 1453, 1458. 1874; *nom. rej.* in favor of Adiantaceae.
•Fam. Actiniopteridaceae Pic. Serm., Webbia 17: 5. 31 Aug 1962.
•Fam. Adiantaceae Newman, Hist. Brit. Ferns: 5. 1–5. Feb 1840; *nom. cons.* over Parkeriaceae (1825).
•Fam. Alsophilaceae C. Presl, Gefässbündel Farrn: 22 (footnote), 32. 1847.
•Fam. Anemiaceae Link, Fil. Spec.: 23. 3–10 Sep 1841.
•Fam. Angiopteridaceae Fée ex J. Bommer, Bull. Soc. Bot. Belgique 5: 345, 359. before 28 May 1867 ("Angiopterideae").
•Fam. Anopteraceae Doweld, Tent. Syst. Pl. Vasc.: li. 23 Dec 2001.
•Fam. Antrophyaceae Ching, Acta Phytotax. Sin. 16(3): 11. Aug 1978. – basionym: Antrophyoideae Link, Fil. Spec.: 140. 3–10 Sep 1841 ("*Antrophyaceae*").
•Fam. *Aspidiaceae* Burnett, Outl. Bot.: 324, 1156. Feb 1835; *nom. illeg.* (Arts. 18.3). The name is illegitimate because it was based on an illegitimate generic name (Art. 18.3).
Order *Aspidiales**, *nom. illeg*., used by various authors, e.g., Pichi Sermolli (1958, 1977); does not satisfy Art. 16.1(a), that a name be taken from a legitimate name of an included family.
•Fam. Aspleniaceae Newman, Hist. Brit. Ferns: 6. 1–5 Feb 1840.
Order Aspleniales Pic. Serm. ex Reveal, Phytologia 79: 72. 29 Apr 1996.
•Fam. Athyriaceae Alston, Taxon 5: 25. 25 Mar 1956.
Order Athyriales Schmakov, Turczaninowia 4: 55. 15 May 2001.
•Fam. Azollaceae Wettst., Handb. Syst. Bot. 2: 77. Nov 1903.
•Fam. Blechnaceae Newman, Hist. Brit. Ferns, ed. 2: 8. 1844.
Order Blechnales* Pic. Serm. ex Reveal, Phytologia 74: 175. 25 Mar 1993.
Subclass Blechnidae Doweld, New Syllabus: 368. May 2006.
•Fam. Bolbitidaceae Ching, Acta Phytotax. Sin. 16(3): 15. Aug 1978. – basionym: Bolbitideae Pic. Serm., Webbia 23: 381. 30 Jun 1969.
•Fam. Botrychiaceae Horan., Char. Ess. Fam.: 15. 30 Jun 1847.
•Fam. Ceratopteridaceae Underw., Our Native Ferns, ed. 6: 65, 78. Jul–Aug 1900.
•Fam. Cheilanthaceae B.K. Nayar, Taxon 19: 233. 29 Apr 1970.
•Fam. Cheiropleuriaceae Nakai, Bot. Mag. (Tokyo) 42: 210. Apr 1928.
•Fam. Christenseniaceae Ching, Bull. Fan Mem. Inst. Biol., Bot. 10: 227. 25 Dec 1940.
Order Christenseniales Doweld, Tent. Syst. Pl. Vasc.: vii. 23 Dec 2001.
•Fam. Cibotiaceae Korall in A. R. Smith & al., Taxon 55: 712. 2006. – basionym: Cibotioideae B. K. Nayar, Taxon 19: 234. 1970.
•Fam. Cryptogrammaceae Pic. Serm., Webbia 17: 299. 20 Apr 1963.
•Fam. Culcitaceae Pic. Serm., Webbia 24: 702. 28 Apr 1970.
•Fam. Cyatheaceae Kaulf., Wesen Farrenkr.: [119]. Jul–Sep 1827.
Order Cyatheales A.B. Frank, Syn. Pflanzenk., ed. 2, 3: 1452, 1456. 1877 ("*Cyatheaceae*").
Subclass Cyatheidae Doweld, Tent. Syst. Pl. Vasc.: xii. 23 Dec 2001.
Suborder Cyatheineae Bessey, Bot. High Schools: 376. 14–21 Aug 1880 ("*Cyatheaceae*").
Class Cyatheopsida Doweld, Tent. Syst. Pl. Vasc.: xii. 23 Dec 2001.
•Fam. Cystodiaceae J.R. Croft, Kew Bull. 41: 797. 20 Oct 1986.

Appendix 4. Continued.

•Fam. Cystopteridaceae Schmakov, Turczaninowia 4: 60. 15 May 2001. – basionym: Cystopteridinae Payer, Bot. Crypt.: 198. 1850 ("*Cystopterideae*").
•Fam. Danaeaceae C. Agardh, Aphor. Bot. 117. 19 Jun 1822; *nom. rej. prop*. in favor of Marattiaceae, *nom. cons. prop*. (Murdock & al., subm.).
•Fam. Davalliaceae M.R. Schomb., Reis. Br.-Guiana 2: 883. 12–15 Jul 1848. – basionym: Davallieae Gaudich. in Freyc., Voy. Uraniae, Bot. 370. 18 Jul 1829.
Order Davalliales, *nom. illeg.*: used by Pichi Sermolli (1958).
•Fam. Dennstaedtiaceae Lotsy, Vortr. Bot. Stammesgesch. 2: 655. 9 Aug 1909 ("*Dennstaedtineaceae*").
Order Dennstaedtiales Doweld, Tent. Syst. Pl. Vasc.: x. 23 Dec 2001.
Subclass Dennstaedtiidae Doweld, Tent. Syst. Pl. Vasc.: x. 23 Dec 2001.
•Fam. Dicksoniaceae M.R. Schomb., Reis. Br.-Guiana 2: 1047. 12–15 Jul 1848; *nom. cons.* over Thyrsopteridaceae (1847) – basionym: Dicksonieae Gaudich., in Freycinet, Voy. Uranie, Bot.: 367. 18 Jul 1829.
Order Dicksoniales* Pic. Serm. ex Reveal, Phytologia 74: 175. 25 Mar 1993.
•Fam. Dicranopteridaceae Ching ex Doweld, Tent. Syst. Pl. Vasc.: x. 23 Dec 2001; *nom. invalid.* in Ching, Acta Phytotax. Sin. 3: 94. 1954.
•Fam. *Dictyoxiphiaceae* Ching, Sunyatsenia 5: 218. 1940; *nom. nud.*, without Latin description.
•Fam. *Didymochlaenaceae* Ching, Sunyatsenia 5: 253. 1940; *nom. nud.*, without Latin description.
•Fam. Dipteridaceae Seward & E. Dale, Philos. Trans., ser. B, 194: 487, 499, 502. Dec 1901 ("*Dipteridinae*"). – basionym: Dipteridinae Diels, in Engler & Prantl, Nat. Pflanzenfam. I, 4: 167. 21 Jul 1899.
Order Dipteridales Doweld, Tent. Syst. Pl. Vasc.: x. 23 Dec 2001.
•Fam. Drynariaceae Ching, Acta Phytotax. Sin. 16(4): 19. Nov 1978.
•Fam. Dryopteridaceae Herter, Rev. Sudamer. Bot. 9: 15. 1949; *nom. cons.* over Peranemataceae Ching.
Order Dryopteridales Schmakov, Turczaninowia 4: 66, 67. 15 May 2001.
•Fam. Elaphoglossaceae Pic. Serm., Webbia 23: 209. 20 Nov 1968.
•Fam. Equisetaceae Michx. ex DC., Essai Propr. Méd. Pl.: 49. Jul 1804.
Order Equisetales DC. ex Bercht. & J. Presl, Prir. Rostlin: 271. Jan–Apr 1820 ("*Equisetaceae*").
Subclass Equisetidae Warming, Osnov. Bot.: 221. 22–28 Apr 1883 ("*Equisetinae*").
Suborder Equisetineae Rabenh., Deutschl. Krypt.-Fl. 2: xvi, 332. Jan–Feb 1849 ("*Equisetaceae*").
Division Equisetophyta D.H. Scott, Stud. Foss. Pl.: 13, 489, 492, 493. Sep 1900 ("*Equisetales*").
Subdivision Equisetophytina Reveal, Phytologia 79: 70. 29 Apr 1996.
Class Equisetopsida C. Agardh, Classes Pl.: 7. 20 May 1825 ("*Equisetaceae*").
•Fam. *Filicaceae* Juss., Gen. Pl.: 14. 4 Aug 1789. ("*Filices*"); *nom. illeg.* (Art. 18.3).
Order *Filicales* Dumort., Anal. Fam. Pl.: 67. 1829. ("*Filicarieae*"); *nom. illeg.* (Art. 16.1).
Subclass *Filicidae* Hook. & Arn., Brit. Fl., ed. 6, 1: 564. Jul 1850. ("Filices"); *nom. illeg.* (Art. 16.1).
Division *Filicophyta* J. Mackay, Fl. Hiber.: 336. Jul 1836; *nom. illeg.* (Art. 16.1).
Class *Filicopsida* C. Agardh, Aphor. Bot.: 114. 19 Jul 1822. ("*Filices*"); *nom. illeg.* (Art. 16.1). Used by many authors, including K&C, 1997, for what we here call Polypodiopsida.
•Fam. Gleicheniaceae C. Presl, Reliq. Haenk. 1: 70. Jun–Nov 1825 ("*Gleicheniae*"). – basionym: [unranked] Gleicheneae R. Br., Prodr. 160. 27 Mar 1810.
Order Gleicheniales* Link, Handbuch 3: 10. 1833 ("*Gleicheneae*").
Subclass Gleichenidae Doweld, New Syllabus: 337. May 2006.
Suborder Gleicheniineae Bessey, Bot. High Schools: 376. 14–21 Aug 1880 ("*Gleicheniaceae*").
Class Gleicheniopsida Doweld, Tent. Syst. Pl. Vasc.: ix. 23 Dec 2001.
•Fam. Grammitidaceae Newman, Hist. Brit. Ferns: 7. 1–5 Feb 1840 ("*Grammitideae*"). Often misspelled *Grammitaceae*; see, e.g., Pichi Sermolli, 1993).
•Fam. Gymnogrammitidaceae Ching, Acta Phytotax. Sin. 11: 12. Jan 1966. Often misspelled *Gymnogrammaceae*.
•Fam. Helminthostachyaceae Ching, Bull. Fan Mem. Inst. Biol., Bot. 10: 235. 15 Mar 1941.
•Fam. Hemionitidaceae Pic. Serm., Webbia 21: 487. 15 Jul 1966.
Order Hydropterides Campbell, Mosses and Ferns: 304, 307. 1895. Descriptive name (Art. 16.1).
•Fam. Hymenophyllaceae Mart., Consp. Regni Veg.: 3. Sep–Oct 1835.
Order Hymenophyllales* A.B. Frank, Syn. Pflanzenk., ed. 2, 3: 1452, 1474. 1877 ("*Hymenophyllaceae*").
Suborder Hymenophyllineae Bessey, Bot. High Schools: 376. 14–21 Aug 1880 ("*Hymenophyllaceae*").
Class Hymenophyllopsida Doweld, Tent. Syst. Pl. Vasc.: ix. 23 Dec 2001.
•Fam. Hymenophyllopsidaceae Pic. Serm., Webbia 24: 712. 28 Apr 1970.
Order Hymenophyllopsidales Pic. Serm. ex Reveal, Phytologia 74: 175. 25 Mar 1993.
•Fam. Hypodematiaceae Ching, Acta Phytotax. Sin. 13(1): 96. Jan 1975.
•Fam. *Hypoderriaceae* Ching, Sunyatsenia 5: 245. 1940; *nom. nud*., without Latin description.
•Fam. Hypolepidaceae Pic. Serm., Webbia 24: 705. 28 Apr 1970.
•Fam. *Kaulfussiaceae* Campb., Evol. Land Pl. 333. 1940; *nom. illeg.* (Art. 18.3), because it is based on the illegitimate generic name *Kaulfussia* Blume (1828), non Dennstedt (1818), nec Nees (1820).– basionym: Kaulfussioideae Campb., Struct. Moss. Ferns, ed. 2, 298, 300. Sep 1905 ("*Kaulfussieae*"), *nom. illeg.* See also Pichi Sermolli Webbia 12: 353. 1957.
•Fam. Lindsaeaceae C. Presl, in M. R. Schomb., Reis. Br.-Guiana 2: 883. 12–15 Jul 1848.
Order Lindsaeales Doweld, New Syllabus: 353. May 2006.
•Fam. Lomariopsidaceae Alston, Taxon 5: 25. 25 Mar 1956.
•Fam. Lonchitidaceae Doweld, New Syllabus: 353. May 2006.
Order Lonchitidales Doweld, New Syllabus: 353. May 2006.
•Fam. Lophosoriaceae Pic. Serm., Webbia 24: 700. 28 Apr 1970.
•Fam. Loxogrammaceae Ching ex Pic. Serm., Webbia 29: 11. 10 Feb 1975.
•Fam. Loxomataceae C. Presl, Gefässbündel Farrn: 31. 1847 ("*Loxsomaceae*").
Order Loxomatales* Pic. Serm. ex Reveal, Phytologia 74: 175. 25 Mar 1993 ("*Loxsomales*").
•Fam. Lygodiaceae M. Roem., Handb. Allg. Bot. 3: 520. 1840 ("*Lygodieae*").
•Fam. Marattiaceae Kaulf., Enum. Filic.: 31. 8 Apr–29 May 1824; *nom. cons. prop*. over Danaeaceae (1822) (Murdock & al., subm.).

Appendix 4. Continued.

Order Marattiales Link, Hort. Berol. 2: 148. Jul–Dec 1833 ("*Marattiaceae*").
Subclass Marattiidae Klinge, Fl. Est-Liv-Churland 1: 93. 22–28 Jun 1882 ("*Marattiaceae*").
Division Marattiophyta Heintze, Cormofyt. Fylog.: 22. 1927.
Class Marattiopsida Doweld, Tent. Syst. Pl. Vasc.: vii. 23 Dec 2001.
•Fam. Marsileaceae Mirb. in Lam. & Mirb., Hist. Nat. Vég. 5: 126. 21 Nov 1802 ("*Marsileae*").
Order Marsileales Bartl., in Martius, Consp. Regn. Veg.: 4. Sep–Oct 1835 ("*Marsileaceae*").
Subclass Marsileidae Doweld, Tent. Syst. Pl. Vasc.: x. 23 Dec 2001.
Class Marsileopsida Trevis., Bull. Soc. Roy. Bot. Belgique 16: 5. after 6 May 1877 ("*Marsigliales*").
•Fam. Matoniaceae C. Presl, Gefässbündel Farrn: 32. 1847.
Order Matoniales* Pic. Serm. ex Reveal, Phytologia 74: 175. 25 Mar 1993.
Subclass Matoniidae Doweld, New Syllabus: 338. May 2006.
Class Matoniopsida Doweld, Tent. Syst. Pl. Vasc.: vii. 23 Dec 2001.
•Fam. Metaxyaceae Pic. Serm., Webbia 24: 701. 28 Apr 1970.
Order Metaxyales Doweld, Tent. Syst. Pl. Vasc.: xii. 23 Dec 2001.
•Fam. Mohriaceae C.F. Reed, Bol. Soc. Brot., ser. 2, 21: 168. 11 May 1948.
•Fam. Monachosoraceae Ching, Acta Phytotax. Sin. 16(4): 17. Nov 1978.
Order Monachosorales Doweld, New Syllabus: 356. May 2006.
Infradivision *Moniliformopses* Kenrick & P. Crane; *nom. nud.* in Kenrick & Crane, 1997.
•Fam. Negripteridaceae Pic. Serm., Nuovo Giorn. Bot. Ital., ser. 2, 53: 160. 25 Nov 1946.
Order Negripteridales* Pic. Serm. ex Reveal, Phytologia 74: 176. 25 Mar 1993.
•Fam. Nephrolepidaceae Pic. Serm., Webbia 29: 8. 10 Feb 1975.
•Fam. Oleandraceae Ching ex Pic. Serm., Webbia 20: 745. 20 Dec 1965.
•Fam. Onocleaceae Pic. Serm., Webbia 24: 708. 28 Apr 1970.
•Fam. Ophioglossaceae Martynov, Tekhno-Bot. Slovar: 438. 3 Aug 1820 ("*Ophioglosseae*") – basionym: [unranked] Ophioglosseae R. Br., Prodr.: 163. 27 Mar 1810.
Order Ophioglossales Link, Hort. Berol. 2: 151. Jul–Dec 1833 ("*Ophioglossaceae*").
Subclass Ophioglossidae Klinge, Fl. Est-Liv-Churland 1: 94. 22–28 Jun 1882 ("*Ophioglosseae*").
Division Ophioglossophyta Bek., Kurs Bot. 1: 89. 1863 ("*Ophioglosseae*").
Subdivision Ophioglossophytina Doweld, Tent. Syst. Pl. Vasc.: ix. 23 Dec 2001.
Class Ophioglossopsida Thomé, Lehrb. Bot., ed. 4: 205. 31 Mar 1874 ("*Ophioglosseae*").
•Fam. Osmundaceae Martynov, Tekhno-Bot. Slovar: 445. 3 Aug 1820.
Order Osmundales Link, Hort. Berol. 2: 138. Jul–Dec 1833 ("Osmundaceae").
Subclass Osmundidae Doweld, New Syllabus: 334. May 2006.
Suborder Osmundineae Bessey, Bot. High Schools: 377. 14–21 Aug 1880 ("*Osmundaceae*").
Class Osmundopsida Doweld, Tent. Syst. Pl. Vasc.: ix. 23 Dec 2001.
•Fam. Parkeriaceae Hook., Exot. Fl. 2: ad t. 147. Mar 1825; *nom. rej.* in favor of Adiantaceae.
Order Parkeriales A.B. Frank, Syn. Pflanzenk., ed. 2, 3: 1452, 1458. 1877 ("*Parkeriaceae*").
•Fam. Peranematiaceae Ching, Sunyatsenia 5: 208, 246. 30 Oct 1940 ("*Perenemaceae*"); *nom. rej.* in favor of Dryopteridaceae Herter (1949). – basionym: Peranemateae C. Presl, [Tent. pterid.] Abh. Königl. Böhm. Ges. Wiss., ser. 4, 5. 64. before 2 Dec 1836.
•Fam. Pilulariaceae Mirb. ex DC., Essai Propr. Méd. Pl.: 48. Jul 1804 ("*Pilulariae*").
Order Pilulariales Bercht. & J. Presl, Prir. Rostlin: 272. Jan–Apr 1820 ("*Pilulariae*").
•Fam. Plagiogyriaceae Bower, Ann. Bot. (London) 40: 484. Apr 1926.
Order Plagiogyriales Pic. Serm. ex Reveal, Phytologia 74: 176. 25 Mar 1993.
Subclass Plagiogyriidae Doweld, Tent. Syst. Pl. Vasc.: xii. 23 Dec 2001.
•Fam. Platyceriaceae Ching, Acta Phytotax. Sin. 16(3): 18. Aug 1978.
•Fam. Platyzomataceae Nakai, Bull. Natl. Sci. Mus. Tokyo 29: 4. Dec 1950.
Order Platyzomatales* Pic. Serm. ex Reveal, Phytologia 74: 176. 25 Mar 1993.
•Fam. Pleurosoriopsidaceae Kurita & Ikebe ex Ching, Acta Phytotax. Sin. 16(4): 17. Nov 1978.
•Fam. Polypodiaceae J. Presl & C. Presl, Delic. Prag.: 159. Jul 1822.
Order Polypodiales* Link, Hort. Berol. 2: 5. Jul–Dec 1833 ("*Polypodiaceae*").
Subclass Polypodiidae Cronquist, Takht. & Zimmerm., Taxon 15: 133. Apr 1966.
Suborder Polypodiineae Bessey, Bot. High Schools: 377. 14–21 Aug 1880 ("Polypodiaceae").
Division Polypodiophyta Cronquist, Takht. & Zimmerm., Taxon 15: 133. Apr 1966.
Subdivision Polypodiophytina Reveal, Phytologia 79: 70. 29 Apr 1996.
Class Polypodiopsida Cronquist, Takht. & Zimmerm., Taxon 15: 133. Apr 1966.
•Fam. Psilotaceae J.W. Griff. & Henfr., Microgr. Dict.: 540. 1 Nov 1855 ("Psiloteae").
Order Psilotales Prantl, Lehrb. Bot., ed. 5: 183. 5 Jan 1884 ("Psilotaceae").
Subclass Psilotidae Reveal, Phytologia 79: 70. 29 Apr 1996.
Suborder Psilotineae Engl., Syllabus, ed. 2: 64. May 1898.
Division Psilotophyta Heintze, Cormofyt. Fylog.: 22. 1927.
Subdivision Psilotophytina Tippo ex Reveal, Phytologia 79: 70. 29 Apr 1996.
Class Psilotopsida D.H. Scott, Stud. Foss. Pl., ed. 2: 616, 631, 632. May 1909.
•Fam. Pteridaceae E.D.M. Kirchn., Schul-Bot. 109. 13–20 Oct 1831 ("*Pteroideae*"). Often cited as Pteridaceae Reichb., Handb. Nat. Pflanzensyst. 138. 1837.
Order Pteridales* Doweld, Tent. Syst. Pl. Vasc.: xi. 23 Dec 2001.
•Fam. Pteridiaceae Ching, Acta Phytotax. Sin. 13(1): 96. Jan 1975.
Subclass Pteridiidae Schmakov, Turczaninowia 4: 42. 15 May 2001.
Subkingdom Pteridobiotina Underw., in Britton & A. Br., Illus. Fl. N. U.S. 1: 1. 15 Aug 1896 ("*Pteridophyta*").
Division Pteridophyta Schimp. in Zittel, Handb. Palaeontol. 2(1): 1. 15 Sep 1879.
Superdivision Pteridophytanae Doweld, Tent. Syst. Pl. Vasc.: v. 23 Dec 2001.

Appendix 4. Continued.

Subdivision Pteridophytina Engl., Führer Garten Breslau: 10, 11. May 1886 ("*Pteridophyta*"). Class Pteridopsida Ritgen, Aufeinanderfolge Org. Gest.: 63. 1828 ("*Filices s. Pterides*").
•Fam. Saccolomataceae Doweld, New Syllabus: 354. May 2006.
Order Saccolomatales Doweld, New Syllabus: 354. May 2006.
•Fam. Salviniaceae Martynov, Tekhno-Bot. Slovar: 559. 3 Aug 1820 ("*Salviniae*").
Order Salviniales Link, Hort. Berol. 3: 155. Jul–Dec 1833 ("*Salviniaceae*").
Subclass Salviniidae Pic. Serm. ex Reveal, Phytologia 79: 70. 29 Apr 1996.
Class Salviniopsida Kamelin & Schmakov, in Kamelin, Fl. Altaia: 253. 15 May 2005.
•Fam. Schizaeaceae Kaulf., Wesen Farrenkr.: [119]. Jul–Sep 1827.
Order Schizaeales* Schimp., Traité Paléont. Vég. 1: 674. Mar 1869.
Subclass Schizaeidae Doweld, New Syllabus: 346. May 2006.
Suborder Schizaeineae Bessey, Bot. High Schools: 377. 14–21 Aug 1880 ("*Schizaeaceae*").
Class Schizaeopsida Doweld, Tent. Syst. Pl. Vasc.: x. 23 Dec 2001.
•Fam. Sinopteridaceae Koidz., Acta Phytotax. Geobot. 3: 50. 30 May–20 Jul 1934.
•Fam. *Sphaerostephanaceae* Ching, Sunyatsenia 5: 240. 1940; *nom. nud*., without Latin description.
•Fam. Stenochlaenaceae Ching, Acta Phytotax. Sin. 16(4): 18. Nov 1978.
•Fam. Stromatopteridaceae Bierh., Phytomorphology 18: 263. 15 Dec 1968. – basionym: Stromatopteridoideae Nakai, Bull. Natl. Sci. Mus. Tokyo 29: 32. 1950.
Order Stromatopteridales* Pic. Serm. ex Reveal, Phytologia 74: 176. 25 Mar 1993.
•Fam. Taenitidaceae Pic. Serm., Webbia 29: 1. 10 Feb 1975.
•Fam. Tectariaceae Panigrahi, J. Orissa Bot. Soc. 8: 41. 1986.
•Fam. Thelypteridaceae Pic. Serm., Webbia 24: 709. 28 Apr 1970.
Order Thelypteridales Doweld, Tent. Syst. Pl. Vasc.: xi. 23 Dec 2001.
•Fam. Thyrsopteridaceae C. Presl, Gefässbündel Farrn: 22, 38. 1847 ("*Thyrsopterideae*"); *nom. rej.* in favor of Dicksoniaceae (1848).
•Fam. Tmesipteridaceae Nakai, Chosakuronbun Mokuroku [Ord. Fam. Trib. Nov.] 206. 1943.
•Fam. Trichomanaceae Burmeist., Handb. Naturgesch. 1: 196. 12–17 Dec 1836 ("*Trichomanoideae*").
•Fam. Vittariaceae Ching, Sunyatsenia 5: 210, 232. 30 Oct 1940. – basionym: Vittarieae C. Presl, [Tent. Pterid.] Abh. Königl. Böhm. Ges. Wiss., ser. 4, 5: 164. before 2 Dec 1836 ("*Vittariaceae*").
•Fam. Woodsiaceae Herter, Revista Sudamer. Bot. 9: 14. Jun 1949. – basionym: Woodsieae A. Gray, Man. Bot., ed. 2. 588. 1 Sep 1856.

Appendix 5. Index to genera with family assignments proposed in this classification. All accepted genera (but not all synonyms) in Kramer in Kubitzki (1990) are accounted for here. Genera newly described or recircumscribed since 1990 are also included. Accepted names in roman; synonyms in *italics*. Family numbers assigned in text.

Abacopteris = Cyclosorus
Abrodictyum (6)
Acrophorus (32)
Acrorumohra (32)
Acrosorus (37)
Acrostichum (26)
Actiniopteris (26)
Actinostachys (12)
Acystopteris (29)
Adenoderris (32)
Adenophorus (37)
Adiantopsis (26)
Adiantum (26)
Aenigmopteris (34)
Afropteris = Pteris
Aglaomorpha (37)
Aleuritopteris (26)
Allantodia = Diplazium
Alsophila (20)
Amauropelta = Thelypteris
Ampelopteris = Cyclosorus
Amphiblestra = Tectaria
Amphineuron = Cyclosorus
Ananthacorus (26)
Anarthropteris = Loxogramme
Anchistea = Woodwardia
Anemia (11)
Anetium (26)
Angiopteris (4)
Anogramma (26)
Anopteris = Pteris
Antigramma = Asplenium
Antrophyum (26)
Arachniodes (32)
Araiostegia (36)
Archangiopteris = Angiopteris
Argyrochosma (26)
Arthromeris (37)
Arthropteris (34)
Aspidotis (26)
Aspleniopsis = Austrogramme
Asplenium (27)
Astrolepis (26)
Ataxipteris (32)
Athyriopsis = Deparia
Athyrium (29)
Austrogramme (26)
Azolla (14)
Belvisia (37)
Blechnum (30)
Blotiella (25)
Bolbitis (32)
Bommeria (26)
Botrychium (1)
Botrypus = Botrychium
Brainea (30)
Callipteris = Diplazium
Callistopteris (6)
Calochlaena (21)
Calymmodon (37)
Camptodium = Tectaria
Camptosorus = Asplenium
Campyloneurum (37)
Caobangia (37)
Cardiomanes = Hymenophyllum
Cassebeera (26)
Cephalomanes (6)
Ceradenia (37)
Ceratopteris (26)
Cerosora (26)
Ceterach = Asplenium
Ceterachopsis = Asplenium
Cheilanthes (26)
Cheilanthopsis (29)
Cheiloplecton (26)
Cheiroglossa = Ophioglossum
Cheiropleuria (8)
Chieniopteris = Woodwardia
Chingia = Cyclosorus
Chlamydogramme = Tectaria
Christella = Cyclosorus
Christensenia (4)
Christiopteris (37)
Chrysochosma = Notholaena
Chrysogrammitis (37)
Cibotium (19)
Cionidium = Tectaria
Cnemidaria = Cyathea
Cochlidium (37)
Colysis (37)
Coniogramme (26)
Coptodipteris (25)
Cornopteris (29)
Coryphopteris = Thelypteris
Cosentinia (26)
Costaricia = Dennstaedtia
Coveniella (32)
Crepidomanes (6)
Crypsinus = Selliguea
Cryptogramma (26)
Ctenitis (32)
Ctenitopsis = Tectaria
Ctenopteris (37)
Culcita (17)
Currania = Gymnocarpium
Cyathea (20)
Cyclodium (32)
Cyclogramma = Cyclosorus
Cyclopeltis (33)
Cyclosorus (28)
Cyrtogonellum (32)
Cyrtomidictyum (32)
Cyrtomium (32)
Cystodium (23)
Cystopteris (29)
Danaea (4)
Davallia (36)
Davalliopsis = Trichomanes
Davallodes (36)
Dennstaedtia (25)
Deparia (29)
Diacalpe = Peranema
Dicksonia (21)
Dicranoglossum (37)
Dicranopteris (7)
Dictymia (37)
Dictyocline = Cyclosorus
Dictyodroma = Deparia
Dictyoxiphium = Tectaria
Didymochlaena (32)
Didymoglossum (6)
Diellia = Asplenium
Diplaziopsis (29)
Diplazium (29)
Diplopterygium (7)
Dipteris (8)
Doodia (30)
Doryopteris (26)
Drymoglossum = Pyrrosia
Drymotaenium (37)

Appendix 5. Continued.

Drynaria (37)
Dryoathyrium = Deparia
Dryopolystichum (32)
Dryopsis (32)
Dryopteris (32)
Edanyoa = Bolbitis
Egenolfia = Bolbitis
Elaphoglossum (32)
Enterosora (37)
Equisetum (3)
Eriosorus (26)
Fadyenia = Tectaria
Feea = Trichomanes
Fourniera = Sphaeropteris
Glaphyropteridopsis = Cyclosorus
Glaphyropteris = Cyclosorus
Gleichenella (7)
Gleichenia (7)
Goniophlebium (37)
Goniopteris = Cyclosorus
Gonocormus = Crepidomanes
Grammitis (37)
Gymnocarpium (29)
Gymnogramma = Hemionitis
Gymnogrammitis (37)
Gymnopteris = Hemionitis
Gymnosphaera = Alsophila
Haplopteris (26)
Hecistopteris (26)
Helminthostachys (1)
Hemidictyum (29)
Hemigramma = Tectaria
Hemionitis (26)
Hemitelia = Cyathea
Heterogonium (34)
Hippochaete = Equisetum
Histiopteris (25)
Holcochlaena (26)
Holodictyum = Asplenium
Holostachyum = Aglaomorpha
Homalosorus (29)
Humata = Davallia
Hyalotricha = Campyloneurum
Hyalotrichopteris = Campyloneurum
Hymenasplenium (27)
Hymenocystis = Woodsia
Hymenoglossum = Hymenophyllum
Hymenophyllopsis (20)
Hymenophyllum (6)
Hypodematium (32)
Hypoderris (34)
Hypolepis (25)
Idiopteris = Pteris
Jamesonia (26)
Japanobotrychium = Botrychium
Kontumia (37)
Kuniwatsukia = Athyrium
Lacostea = Trichomanes
Lacosteopsis = Vandenboschia
Lastrea = Thelypteris
Lastreopsis (32)
Lecanium = Didymoglossum
Lecanopteris (37)
Lellingeria (37)
Lemmaphyllum (37)
Lepisorus (37)
Leptochilus (37)
Leptogramma = Cyclosorus
Leptolepia (25)
Leptopteris (5)
Leptorumohra = Arachniodes
Leucostegia (32)
Lindsaea (23)
Lindsayoides = Nephrolepis
Lithostegia (32)
Litobrochia = Pteris
Llavea (26)
Lomagramma (32)
Lomaphlebia = Grammitis?
Lomaria = Blechnum
Lomariopsis (33)
Lonchitis (23)
Lophosoria (21)
Lorinseria = Woodwardia
Loxogramme (37)
Loxoma (16)
Loxoscaphe = Asplenium
Loxsomopsis (16)
Luisma (37)
Lunathyrium = Deparia
Lygodium (10)
Macroglena = Abrodictyum
Macrothelypteris (28)
Mankyua (1)
Marattia (4)
Marginariopsis = Pleopeltis
Marsilea (13)
Matonia (9)
Matteuccia (31)
Maxonia (32)
Mecodium = Hymenophyllum
Megalastrum (32)
Melpomene (37)
Meniscium = Cyclosorus
Menisorus = Cyclosorus
Merinthosorus = Aglaomorpha
Meryngium = Hymenophyllum
Mesophlebion = Cyclosorus
Metathelypteris = Thelypteris
Metaxya (22)
Microgonium = Didymoglossum
Microgramma (37)
Microlepia (25)
Micropolypodium (37)
Microsorum (37)
Microstaphyla = Elaphoglossum
Microtrichomanes = Hymenophyllum
Mildella (26)
Mohria = Anemia
Monachosorum (25)
Monogramma (26)
Monomelangium = Diplazium
Neocheiropteris (37)
Nephelea = Alsophila
Nephopteris (26)
Nephrolepis (33)
Neurocallis (26)
Neurodium (37)
Neuromanes = Trichomanes
Niphidium (37)
Notholaena (26)
Nothoperanema = Dryopteris
Ochropteris (26)
Odontosoria (23)
Oenotrichia (25)
Oenotrichia p.p (32)
Oleandra (35)
Olfersia (32)
Onoclea (31)
Onocleopsis (31)
Onychium (26)
Ophioderma = Ophioglossum
Ophioglossum (1)
Oreopteris = Thelypteris
Ormoloma (23)
Orthiopteris = Saccoloma
Osmunda (5)
Pachypleuria (36)
Paesia (25)
Paltonium = Neurodium
Papuapteris = Polystichum
Paraceterach (26)
Parahemionitis (26)
Parasorus = Davallia
Parathelypteris = Thelypteris
Pecluma (37)
Pelazoneuron = Cyclosorus
Pellaea (26)
Peltapteris = Elaphoglossum
Pentagramma (26)
Pentarhizidium (31)
Peranema (32)
Phanerophlebia (32)
Phanerosorus (9)
Phegopteris (28)
Phlebodium (37)
Photinopteris = Aglaomorpha
Phyllitis = Asplenium
Phymatosorus (37)
Pilularia (13)
Pityrogramma (26)
Plagiogyria (18)
Platycerium (37)
Platygyria = Lepisorus
Platyloma (26)
Platyzoma (26)
Plecosorus = Polystichum
Pleocnemia (34)
Pleopeltis (37)
Plesioneuron = Cyclosorus
Pleuroderris = Tectaria
Pleurosoriopsis (37)
Pleurosorus = Asplenium
Pneumatopteris = Cyclosorus
Podosorus (37)
Polybotrya (32)
Polyphlebium (6)
Polypodioides (37)
Polypodiopteris (37)
Polypodium (37)
Polystichopsis (32)
Polystichum (32)
Polytaenium (26)
Pronephrium = Cyclosorus
Prosaptia (37)
Protowoodsia (29)
Psammiosorus (34)
Pseudocolysis = Pleopeltis
Pseudocyclosorus = Cyclosorus
Pseudocystopteris (29)
Pseudodrynaria = Aglaomorpha
Pseudophegopteris (28)
Pseudotectaria = Tectaria
Psilotum (2)
Psomiocarpa (34)
Pteridium (25)
Pteridoblechnum (30)
Pteridrys (34)
Pteris (26)
Pterozonium (26)
Ptilopteris = Monachorosum
Pycnodoria = Pteris
Pyrrosia (37)
Quercifilix = Tectaria
Radiovittaria (26)
Regnellidium (13)
Revwattsia (32)
Rhachidosorus (29)
Rheopteris (26)
Rosenstockia = Hymenophyllum
Rumohra (32)
Saccoloma (24)
Sadleria (30)
Saffordia = Trachypteris
Sagenia = Tectaria
Salpichlaena (30)
Salvinia (14)
Sceptridium = Botrychium
Schaffneria = Asplenium
Schizaea (12)
Scleroglossum (26)
Scoliosorus (26)
Scyphularia = Davallia
Selliguea (37)
Serpocaulon (37)
Serpyllopsis = Hymenophyllum
Sinephropteris = Asplenium
Sinopteris = Aleuritopteris
Solanopteris = Microgramma
Sphaerocionium = Hymenophyllum
Sphaeropteris (20)
Sphaerostephanos = Cyclosorus
Sphenomeris (23)
Steenisioblechnum (30)
Stegnogramma = Cyclosorus
Steiropteris = Cyclosorus
Stenochlaena (30)
Stenolepia (32)
Sticherus (7)
Stigmatopteris (32)
Stromatopteris (7)
Synammia (37)
Syngramma (26)
Taenitis (26)
Tapeinidium (23)
Tectaria (34)
Teratophyllum (32)
Terpsichore (37)
Thamnopteris = Asplenium
Thelypteris (28)
Themelium (37)
Thylacopteris (37)
Thyrsopteris (15)
Thysanosoria (33)
Tmesipteris (2)
Todea (5)
Trachypteris (26)
Trichoneuron (32)
Trichipteris = Cyathea
Trichomanes (6)
Trigonospora = Cyclosorus
Triplophyllum (34)
Trismeria = Pityrogramma
Vaginularia = Monogramma
Vandenboschia (6)
Vittaria (26)
Weatherbya = Lemmaphyllum
Woodsia (29)
Woodwardia (30)
Xiphopteris = Cochlidium
Xyropteris (23)
Zygophlebia (37)