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THE SIZE OF THE ORCHIDACEAE AND THE SYSTEMATIC DISTRIBUTION OF EPIPHYTIC ORCHIDS

JOHN T. ATWOOD

Marie Selby Botanical Gardens, 811 South Palm Avenue,
Sarasota, Florida 33577

ABSTRACT. An estimate of the number of species in the Orchidaceae is determined to be 19,128. This number agrees well with that of Dressler (1981) and suggests that ultimately there may be 20,000–23,000 species with an improbable maximum of 25,000. No support is given for the claim that the family contains 35,000 species. Orchid epiphytes (13,962 species) account for 73 percent of the family, and 440 of 725 genera (60.7 percent) contain epiphytes.

Few systematic analyses have been attempted to determine the size of the orchid family. Garay (1960) provided an estimate of 30,000 species, Willis (1973) estimated 17,000 species, Madison (1977) estimated 30,000 species, Dressler (1981) estimated 19,192 species, and verbal claims of 35,000 have been made.

The systematic occurrence of epiphytism in the Orchidaceae has also been largely neglected. Madison (1977) estimated that about 67 percent or 20,000 orchid species are epiphytic, a report based on a family size of 30,000 species.

As a result of two symposia on epiphytes at the Marie Selby Botanical Gardens and Missouri Botanical Garden, it is clear that epiphytism is a field of inquiry still in its initial stages. It has become apparent that the size of the Orchidaceae and the extent of epiphytism in this largest of monocotyledonous families demands a more careful systematic analysis. This paper has grown from and is intended to complement a paper by Kress (1986) describing the systematic distribution of all vascular epiphytes.

MATERIALS AND METHODS

The analysis of the Orchidaceae was made using a number of resources. The New World orchids were analyzed largely by examining the more than 17,000 species files accumulated at Marie Selby Botanical Gardens in the Orchid Identification Center (OIC). These files are particularly well developed for neotropical orchids owing to the interests of several orchidologists which have been associated with Selby Gardens.

For Old World taxa a number of excellent works were consulted, e.g., Seidenfaden (1979, 1983, 1985) and Bechtel et al. (1981). The files of the OIC were also consulted, but they are less well developed for paleotropical taxa than for neotropical taxa.

In cases where little information on particular orchid groups is known, Hawkes (1965) and Willis (1973) have been consulted, but not before exhausting other resources. Estimates for the subtribe Sarcanthinae were contributed by Eric Christensen (pers. comm.). Additional papers too numerous to mention, also housed in the files of the OIC, were also consulted.

RESULTS

The distribution of genera, numbers of epiphytic species and total species numbers for the Orchidaceae (TABLE 1) is presented in the classification system by Dressler (1981) with few modifications.

The total number of orchid species estimated by the methods outlined above is 19,128. The total number of epiphytic orchid species by criteria given by Kress (1986) is 13,962 or 73 percent of the entire family. The total number of genera with epiphytic representatives is 440 of 725 or 60.7 percent.

DISCUSSION

This species estimate agrees remarkably well with Dressler's estimate (1981) of 19,192, differing by less than 0.5 percent. It also differs by only 2.1 percent with a recent estimate of 18,730 species by Rasmussen (unpubl.). The close agreement of these studies support Dressler's suggestion that the orchid family will ultimately be found to have between 20,000 and 25,000 species. However, this latter number assumes that more than 25 percent of orchid species remain to be described. This seems unlikely in a family with such widespread popular appeal that it is relatively well collected compared to most other families.

While this percentage estimate of epiphytism agrees reasonably well with Madison's estimate (1977) of 67 percent, the actual number of epiphytic species is over 6,000 less owing to previous exaggeration of species numbers.

As expected, epiphytic orchids are distributed mostly in the subfamilies Epidendroideae (88

TABLE 1. The systematic distribution of epiphytic orchid genera and species. Numbers given represent the number of epiphytic genera and species followed by the total number of genera and species.

Taxa	Genera	Species
Orchidaceae	440/725	13,962/19,128
Apostasioideae Rchb. f.	0/2	0/16
Apostasia Bl.		0/8
Neuwiedia Bl.		0/8
Cypripedioideae Lindl.	2/4	38/131
Cypripedium L.		0/40
Paphiopedilum Pfitz.		33/70
Phragmipedium Rolfe		5/15
Selenipedium Rchb. f.		0/6
Spiranthoideae Dressl.	3/84	3/1,165
Erythrodeae Dunsterv. & Garay	0/37	0/515
Tropidiinae Pfitz.	0/2	0/43
Corymborkis Thouars		0/8
Tropidia Lindl.		0/35
Goodyerinae Klotzsch	0/35	0/472
Anoectochilus Bl.		0/35
Aspidogyne Garay		0/26
Chamaegastrodia Makino & Maekawa		0/1
Cheirostylis Bl.		0/25
Cystorchis Bl.		0/8
Dicerostylis Bl.		0/3
Dossinia E. Morr.		0/1
Erythrodes Bl.		0/60
Eucosia Bl.		0/2
Eurycentrum Schltr.		0/7
Evrardia Gagnep.		0/1
Gonatostylis Schltr.		0/1
Goodyera R. Br.		0/55
Gymnochilus Bl.		0/3
Herpysma Lindl.		0/1
Hetaeria Bl.		0/27
Hylophila Lindl.		0/6
Kreodanthus Garay		0/6
Kuhlhasseltia J. J. Sm.		0/6
Lepidogyne Bl.		0/3
Ligeophila Garay		0/8
Ludisia A. Rich.		0/1
Macodes Lindl.		0/14
Moerenhoutia Bl.		0/10
Myrmechis Bl.		0/6
Orchipedum Breda		0/1
Papuaea Schltr.		0/1
Platylepis Lindl.		0/10
Platythelys Garay		0/8
Pristiglottis Cretz. & J. J. Sm.		0/13
Rhamphorhynchus Garay		0/1
Stephanothelys Garay		0/4
Tubilabium J. J. Sm.		0/2
Vrydagzynea Bl.		0/40
Zeuxine Lindl.		0/76
Cranichideae Endl.	3/47	3/650
Spiranthinae Lindl.	3/28(?)	*3/390
Beadlea Small		
Beloglottis Schltr.		
Brachystele Schltr.		
Buchtienia Schltr.		
Coccineorchis Schltr.		
Cybebus Garay		
Cyclopogon Presl		

TABLE 1. Continued.

Taxa	Genera	Species
Deiregyne Schltr.		
Discyphus Schltr.		
Eltroplectis Raf.		
Eurystyles Wawra		
Funkiella Schltr.		
Galeottiella Schltr.		
Gamosepalum Schltr.		
Hapalorchis Schltr.		
Lankesterella Ames		
Lyroglossa Schltr.		
Mesadenella Pabst & Garay		
Mesadenus Schltr.		
Pelexia L. C. Rich.		
Pseudogoodyera Schltr.		
Pteroglossa Schltr.		
Sarcoglottis Presl		
Sauroglossum Lindl.		
Schiedeella Schltr.		
Spiranthes L. C. Rich.		
Stenorrhynchus L. C. Rich.		
Synassa Lindl.		
Pachyplectroninae Schltr.	0/1	0/2
Pachyplectron Schltr.		0/2
Manniellinae Schltr.	0/1	0/1
Manniella Rchb. f.		0/1
Cranichidinae Lindl.	0/15	0/237
Aa Rchb. f.		0/12
Altensteinia HBK		0/19
Baskervillea Lindl.		0/6
Coilostylis Raf.		0/1
Cranichis Sw.		0/52
Fuertesiella Schltr.		0/1
Gomphichis Lindl.		0/25
Myrosmodes Rchb. f.		0/12
Ponthieva R. Br.		0/41
Porphyrostachys Rchb. f.		0/2
Prescottia Lindl. ex Hook.		0/24
Pseudocentrum Lindl.		0/8
Pterichis Lindl.		0/16
Solenocentrum Schltr.		0/2
Stenoptera Presl		0/16
Cryptostylidinae Schltr.	0/1	0/20
Cryptostylis R. Br.		0/20
Orchidoideae	1/114	6/2,331
Neottieae Lindl.	0/7	0/81
Limodorinae Benth.	0/5	0/52
Aphyllorchis Bl.		0/15
Cephalanthera L. C. Rich.		0/14
Epipactis Sw.		0/21
Limodorum L.		0/1
Thaia Seidenf.		0/1
Listerinae Lindl.	0/2	0/29
Listera R. Br.		0/20
Neottia L.		0/9
Diurideae Endl.	0/34	0/570
Chloraeinae Rchb. f.	0/6	0/79
Bipinnula Juss.		0/8
Chloraea Lindl.		0/45
Codonorchis Lindl.		0/3
Gavilea Poepp.		0/14

TABLE 1. Continued.

Taxa	Genera	Species
Geoblasta Barb. Rodr.		0/1
Megastylis Schltr.		0/8
Caladeniinae Pfitz.	0/16	0/123
Adenochilus Hook. f.		0/2
Aporostylis Rupp & Hatch		0/1
Arthrochilus F. Mueller		0/3
Burnettia Lindl.		0/1
Caladenia R. Br.		0/70
Caleana R. Br.		0/5
Chiloglottis R. Br.		0/8
Drakaea Lindl.		0/4
Elythranthera (Endl.) George		0/2
Eriochilus R. Br.		0/5
Glossodia R. Br.		0/5
Leporella George		0/1
Lyperanthus R. Br.		0/9
Paracaleana Blaxell		0/3
Rimacola Rupp		0/1
Spiculaea Lindl.		0/3
Pterostylidinae Pfitz.	0/1	0/71
Pterostylis R. Br.		0/71
Acianthinae Schltr.	0/4	0/86
Acianthus R. Br.		0/20
Corybas Salisb.		0/60
Stigmatodactylus Maxim. ex Makino		0/4
Townsonia Cheeseman		0/2
Diuridinae Lindl.	0/5	0/107
Calochilus R. Br.		0/10
Diuris Smith		0/45
Epiblema R. Br.		0/1
Orthoceras R. Br.		0/1
Thelymitra Foerst.		0/50
Prasophyllinae Schltr.	0/2	0/104
Microtis R. Br.		0/14
Prasophyllum R. Br.		0/90
Orchideae	1/57	0/1,297
Orchidinae	0/35	0/363
Aceras R. Br.		0/1
Amerorchis Hulten		0/1
Amitostigma Schltr.		0/15
Anacamptis L. C. Rich.		0/1
Aorchis Vermeulen		0/1
Barlia Parl.		0/2
Bartholina R. Br.		0/3
Brachycorythis Lindl.		0/25
Chamorchis Rich.		0/1
Chusua Nevski		0/17
Coeloglossum Hartman		0/1
Comperia C. Koch		0/2
Dactylorhiza Necker		0/30
Galearis Raf.		0/12
Gymnadenia R. Br.		0/10
Hemipilia Lindl.		0/16
Himantoglossum Koch		0/2
Holothrix Lindl.		0/55
Neobolusia Schltr.		0/4
Neotinea Rchb. f.		0/2
Neottianthe Schltr.		0/7
Nigritella L. C. Rich.		0/2
Ophrys L.		0/25
Orchis L.		0/35

TABLE 1. Continued.

Taxa	Genera	Species
Piperia Rydb.		0/4
Platanthera L. C. Rich.		0/40
Pseudodiphryllum Nevski		0/1
Pseudorchis S. F. Gray		0/3
Schwartzkopffia Krzl.		0/2
Schizochilus Sonder		0/26
Serapias L.		0/13
Silvorchis J. J. Sm.		0/1
Steveniella Schltr.		0/1
Symphyosepalum Hand.-Mazz.		0/1
Traunsteinera Rchb.		0/1
Habenariinae Benth.	1/21	6/929
Androcorys Schltr.		0/4
Arnottia A. Rich.		0/2
Benthamia A. Rich.		6/26
Bonatea Willd.		0/20
Centrostigma Schltr.		0/5
Cynorkis Thouars		0/125
Diphylax Hook. f.		0/1
Diplomeris D. Don		0/2
Gennaria Parl.		0/1
Habenaria Willd.		0/600
Herminium R. Br.		0/30
Megalorchis H. Perrier		0/1
Pecteilis Raf.		0/4
Peristylus Bl.		0/70
Physoceras Schltr.		0/7
Platycoryne Rchb. f.		0/17
Roeperocharis Rchb. f.		0/5
Smithorchis Tang & Wang		0/1
Stenoglottis Lindl.		0/3
Tsaiorchis Tang & Wang		0/2
Tylostigma Schltr.		0/3
Huttonaeinae Schltr.	0/1	0/5
Huttonaea Harvey		0/5
Diseae Dressl.	0/16	0/383
Disinae Benth.	0/9	0/174
Amphigena Rolfe		0/2
Brownleea Harvey ex Lindl.		0/10
Disa Bergius		0/99
Forficaria Lindl.		0/1
Herschelia Lindl.		0/15
Monadenia Lindl.		0/30
Orthopenthea Rolfe		0/1
Penthea Lindl.		0/1
Schizodium Lindl.		0/15
Satyriinae Schltr.	0/3	0/103
Pachites Lindl.		0/2
Satyridium Lindl.		0/1
Satyrium Sw.		0/100
Coryciinae Benth.	0/4	0/106
Ceratandra Ecklon ex Lindl.		0/2
Corycium Sw.		0/14
Disperis Sw.		0/75
Pterygodium Sw.		0/15
[Anomalous Tribes]	0/4	0/25
Triphoreae Dressl.	0/3	0/23
Monophyllorchis Schltr.		0/2
Psilochilus Barb. Rodr.		0/6
Triphora Nutt.		0/15

TABLE 1. Continued.

Taxa	Genera	Species
Wullschlaegelieae Dressl.	0/1	0/2
Wullschlaegelia Rchb. f.		0/2
Epidendroideae Lindl.	138/195	8,941/10,121
Vanilleae Bl.	0/12	0/239
Vanillinae Lindl.	0/4	0/152
Epistephium Humb.		0/24
Eriaxis Rchb. f.		0/3
Galeola Lour.		0/25
Vanilla Sw.		0/100
Lecanorchidinae Dressl.	0/1	0/20
Lecanorchis Bl.		0/20
Palmorchidinae Dressl.	0/2	0/13
Diceratostele Summerh.		0/1
Palmorchis Barb. Rodr.		0/12
Pogoniinae Pfitz.	0/5	0/54
Cleistes L. C. Rich.		0/45
Duckeella Porto & Brade		0/3
Isotria Raf.		0/2
Pogonia Juss.		0/2
Pogoniopsis Rchb. f.		0/2
Gastrodieae Lindl.	0/9	0/103
Nerviliinae Schltr.	0/1	0/65
Nervilia Commerson ex Gaud.		0/65
Gastrodiinae Lindl.	0/6	0/36
Auxopus Schltr.		0/2
Didymoplexiella Garay		0/6
Didymoplexis Griff.		0/10
Gastrodia R. Br.		0/16
Neoclemensia Carr		0/1
Uleiorchis Hoehne		0/1
Rhizanthellinae Rogers	0/2	0/2
Cryptanthemis Rupp		0/1
Rhizanthella Rogers		0/1
Epipogieae Parl.	0/2	0/2
Epipogium R. Br.		0/1
Stereosandra Bl.		0/1
Arethuseae Lindl.	7/32	187/560
Arethusinae Lindl.	0/1	0/1
Arethusa L.		0/1
Thuniinae Schltr.	0/1	0/6
Thunia Rchb. f.		0/6
Bletiinae Benth.	4/25	16/374
Acanthophippium Bl.		0/15
Ancistrochilus Rolfe		2/2
Anthogonium Lindl.		0/2
Arundina Bl.		0/1
Aulostylis Schltr.		0/1
Bletia R. & P.		0/30
Bletilla Rchb. f.		0/9
Calanthe R. Br.		0/150
Calopogon R. Br.		0/4
Cephalantheropsis Guillaumin		0/2
Coelia Lindl.		5/5
Chysis Lindl.		6/6
Dilochia Lindl.		3/5
Eleorchis Maekawa		0/2
Hancockia Rolfe		0/1
Hexalectris Raf.		0/8
Ipsea Lindl.		0/1
Mischobulbon Schltr.		0/7

TABLE 1. Continued.

Taxa	Genera	Species
Nephelaphyllum Bl.		0/12
Pachystoma Bl.		0/8
Phaius Lour.		0/20
Plocoglottis Bl.		0/30
Spathoglottis Bl.		0/40
Tainia Bl.		0/12
Tainiopsis Schltr.		0/1
Sobraliinae Schltr.	3/5	171/179
Arpophyllum La Ll. & Lex.		5/5
Elleanthus Presl		70/70
Sertifera Lindl. & Rchb. f.		0/6
Sobralia R. & P.		96/96
Xerorchis Schltr.		0/2
Coelogyneae Pfitz.	15/17	276/301
Coelogyninae Benth.	13/15	273/298
Basigyne J. J. Sm.		0/1
Bulleyia Schltr.		1/1
Coelogyne Lindl.		100/100
Dendrochilum Bl.		120/120
Dickasonia L. O. Wms.		1/1
Gynoglottis J. J. Sm.		1/1
Ischnogyne Schltr.		1/1
Nabaluia Ames		1/1
Neogyna Rchb. f.		1/1
Otochilus Lindl.		4/4
Panisea Lindl.		0/4
Pholidota Lindl. ex Hook.		40/40
Pleione D. Don		0/20
Pseudacoridium Ames		1/1
Sigmatogyne Pfitz.		2/2
Adrorhizinae Schltr.	2/2	3/3
Adrorhizon Hook. f.		1/1
Sirhookera O. Kuntze		2/2
Malaxideae Lindl.	3/6	606/960
Hippeophyllum Schltr.		6/6
Liparis L. C. Rich.		300/350
Malaxis Sw.		0/300
Oberonia Lindl.		300/300
Orestias Ridl.		0/3
Risleya King & Pantl.		0/1
Cryptarrheneae Dressl.	1/1	4/4
Cryptarrhena Lindl.		4/4
Calypsoeae Dressl.	0/2	0/3
Calypso Salisb.		0/1
Yoania Maxim.		0/2
Epidendreae Kunth	112/114	7,868/7,949
Eriinae Benth.	8/8	630/680
Ceratostylis Bl.		70/70
Cryptochilus Wallich		6/6
Epiblastus Schltr.		20/20
Eria Lindl.		500/500
Mediocalcar J. J. Sm.		20/20
Porpax Lindl.		8/8
Sarcostoma Bl.		2/2
Stolzia Schltr.		4/4
Podochilinae Benth. & Hook.	6/7	242/249
Agrostophyllum Bl.		60/60
Appendicula Bl.		100/100
Chilopogon Schltr.		3/3
Chitonochilus Schltr.		1/1

TABLE 1. Continued.

Taxa	Genera	Species
Cyphochilus Schltr.		0/7
Poaephyllum Ridl.		3/3
Podochilus Bl.		75/75
Thelasiinae Schltr.	7/7	254/254
Chitonanthera Schltr.		7/7
Octarrhena Thwaites		35/35
Oxyanthera Brongn.		6/6
Phreatia Lindl.		190/190
Rhynchophreatia Schltr.		5/5
Ridleyella Schltr.		1/1
Thelasis Bl.		10/10
Glomerinae Schltr.	6/6	135/135
Aglossorhyncha Schltr.		6/6
Earina Lindl.		7/7
Glomera Bl.		50/50
Glossorhyncha Ridl.		70/70
Ischnocentrum Schltr.		1/1
Sepalosiphon Schltr.		1/1
Laeliinae Benth.	43/43	1,026/1,026
Alamania La Ll. & Lex.		1/1
Artorima Dressl. & Pollard		1/1
Barkeria Knowles & Westcott		14/14
Basiphyllaea Schltr.		3/3
Brassavola R. Br.		23/23
Broughtonia R. Br.		6/6
Cattleya Lindl.		45/45
Caularthron Raf.		3/3
Constantia Barb. Rodr.		4/4
Dilomilis Raf.		4/4
Dimerandra Schltr.		2/2
Diothonaea Lindl.		7/7
Domingoa Schltr.		2/2
Encyclia Hook.		130/130
Epidanthus L. O. Wms.		3/3
Epidendrum L.		500/500
Hagsatera G. Tomayo		2/2
Helleriella Hawkes		3/3
Hexisea Lindl.		5/5
Homalopetalum Rolfe		4/4
Isabelia Barb. Rodr.		2/2
Isochilus R. Br.		13/13
Jacquiniella Schltr.		11/11
Laelia Lindl.		69/69
Leptotes Lindl.		5/5
Loefgrenianthus Hoehne		1/1
Nageliella L. O. Wms.		2/2
Neocogniauxia Schltr.		2/2
Neowilliamsia Garay		5/5
Nidema Britton & Millsp.		2/2
Oerstedella Rchb. f.		28/28
Orleanesia Barb. Rodr.		7/7
Pinelia Lindl.		3/3
Platyglottis L. O. Wms.		1/1
Ponera Lindl.		9/9
Pseudolaelia Campos-Porto & Brade		6/6
Quisqueya D. Dod		4/4
Reichenbachanthus Barb. Rodr.		5/5
Rhyncholaelia Schltr.		2/2
Scaphyglottis P. & E.		52/52
Schomburgkia Lindl.		17/17
Sophronitis Lindl.		7/7

TABLE 1. Continued.

Taxa	Genera	Species
Tetramicra Lindl.		11/11
Meiracylliinae Dressl.	1/1	2/2
Meiracyllium Rchb. f.		2/2
Pleurothallidinae Lindl.	27/28	3,381/3,405
Acostaea Schltr.		8/8
Andreettaea Luer		1/1
Barbosella Schltr.		27/27
Brachionidium Lindl.		0/24
Chamelophyton Garay		1/1
Cryptophoranthus Barb. Rodr.		36/36
Dracula Luer		93/93
Dresslerella Luer		8/8
Dryadella Luer		31/31
Lepanthes Sw.		500/500
Lepanthopsis Ames		25/25
Masdevallia R. & P.		400/400
Myoxanthus P. & E.		42/42
Octomeria R. Br.		134/134
Phloeophila Hoehne & Schltr.		7/7
Physosiphon Lindl.		6/6
Physothallis Garay		2/2
Platystele Schltr.		58/58
Pleurothallis R. Br.		1,500/1,500
Porroglossum Schltr.		21/21
Restrepia Kunth		32/32
Restrepiella Garay & Dunsterv.		1/1
Restrepiopsis Luer		17/17
Salpistele Dressl.		6/6
Scaphosepalum Pfitz.		26/26
Stelis Sw.		300/300
Trichosalpinx Luer		84/84
Trisetella Luer		15/15
Dendrobiinae Lindl.	6/6	1,147/1,147
Cadetia Gaud.		67/67
Dendrobium Sw.		900/900
Diplocaulobium Krzl.		94/94
Epigeneium Gagnep.		12/12
Flickingeria Hawkes		70/70
Pseuderia Schltr.		4/4
Bulbophyllinae Schltr.	7/7	1,026/1,026
Bulbophyllum Thouars		1,000/1,000
Chaseella Summerh.		1/1
Drymoda Lindl.		2/2
Monomeria Lindl.		4/4
Pedilochilus Schltr.		15/15
Saccoglossum Schltr.		2/2
Trias Lindl.		2/2
Sunipiinae Dressl.	1/1	25/25
Sunipia Buchanan ex Smith		25/25
Vandoideae Endl.	296/322	4,974/5,339
Polystachyeae Pfitz.	3/4	153/154
Hederorkis Thouars		2/2
Imerinaea Schltr.		1/1
Neobenthamia Rolfe		0/1
Polystachya Hook.		150/150
Vandeae Lindl.	137/138	1,969/1,972
Sarcanthinae Benth.	87/88	1,304/1,307
Abdominea J. J. Sm.		2/2
Acampe Lindl.		6/6
Adenoncos Bl.		17/17
Aerides Lour.		19/19

TABLE 1. Continued.

Taxa	Genera	Species
Amesiella Schltr. ex Garay		1/1
Arachnis Bl.		14/14
Armodorum Breda		2/2
Ascocentrum Schltr.		8/8
Ascochilopsis Carr		1/1
Ascochilus Ridl.		6/6
Ascoglossum Schltr.		1/1
Biermannia King & Pantl.		8/8
Bogoria J. J. Smith		4/4
Brachypeza Garay		7/7
Calymmanthera Schltr.		5/5
Ceratochilus Bl.		2/2
Chamaeanthus Schltr. ex J. J. Sm.		10/10
Chiloschista Lindl.		15/15
Chroniochilus J. J. Sm.		5/5
Cleisomeria Lindl. ex E. Don		2/2
Cleisocentron Bruhl		3/3
Cleisostoma Bl.		95/95
Cordiglottis J. J. Sm.		7/7
Cottonia Wight		1/1
Cryptopylos Garay		1/1
Dimorphorchis D. Don		2/2
Diplocentrum Lindl.		2/2
Diploprora Hook. f.		1/1
Doritis Lindl.		0/3
Dryadorchis Schltr.		2/2
Drymoanthus Nicholls		2/2
Eparmatostigma Garay		1/1
Esmeralda Rchb. f.		2/2
Gastrochilus D. Don		38/38
Grosourdya Rchb. f.		8/8
Haraella Kudo		1/1
Holcoglossum Schltr.		8/8
Hygrochilus Pfitz.		1/1
Hymenorchis Schltr.		9/9
Loxoma Garay		3/3
Luisia Gaud.		47/47
Macropodanthus L. O. Wms.		1/1
Malleola J. J. Sm.		34/34
Megalotus Garay		1/1
Micropera Lindl.		19/19
Microsaccus Bl.		14/14
Microtatorchis Schltr.		49/49
Mobilabium Rupp		1/1
Neofinetia Hu		1/1
Omoea Bl.		2/2
Ornithochilus Wallich ex Lindl.		1/1
Papilionanthe Schltr.		10/10
Papillalabium Dockr.		1/1
Paraphalaenopsis Hawkes		4/4
Pelatantheria Ridl.		3/3
Pennilabium J. J. Sm.		10/10
Peristeranthus T. E. Hunt		1/1
Phalaenopsis Bl.		46/46
Phragmorchis L. O. Wms.		1/1
Plectorrhiza Dockr.		3/3
Pomatocalpa Breda		46/46
Porrorhachis Garay		2/2
Porphyrodesme Schltr.		3/3
Pteroceras Hasselt ex Hasskarl		41/41
Renanthera Lour.		14/14

TABLE 1. Continued.

Taxa	Genera	Species
Renantherella Ridl.		2/2
Rhinerrhiza Rupp		2/2
Rhynchogyna Seidenf. & Garay		2/2
Rhynchostylis Bl.		3/3
Robiquetia Gaud.		39/39
Saccolabiopsis J. J. Sm.		13/13
Saccolabium Bl.		4/4
Sarcochilus R. Br.		14/14
Schoenorchis Bl.		22/22
Sedirea Garay & Sweet		2/2
Seidenfadenia Garay		1/1
Smitinandia Holttum		3/3
Stereochilus Lindl.		5/5
Taeniophyllum Bl.		187/187
Thrixspermum Lour.		165/165
Trachoma Garay		6/6
Trichoglottis Bl.		80/80
Tuberolabium Yamamoto		5/5
Uncifera Lindl.		7/7
Vanda Jones		45/45
Vandopsis Pfitz.		18/18
Ventricularia Garay		1/1
Xenikophyton Garay		1/1
Angraecinae Summerh.	16/16	383/383
Aeranthes Lindl.		30/30
Ambrella H. Perrier		1/1
Angraecum Bory		206/206
Bonniera Cordemoy		2/2
Campylocentrum Benth.		45/45
Cryptopus Lindl.		3/3
Dendrophylax Rchb. f.		5/5
Harrisella Fawc. & Rendle		4/4
Jumellea Schltr.		60/60
Lemurella Schltr.		3/3
Neobathiea Schltr.		7/7
Oeonia Lindl.		6/6
Oeoniella Schltr.		3/3
Perrierella Schltr.		1/1
Polyradicion Garay		4/4
Sobennikoffia Schltr.		3/3
Aerangidinae Summerh.	34/34	282/282
Aerangis Rchb. f.		60/60
Ancistrorhynchus Finet		13/13
Angraecopsis Krzl.		14/14
Barombia Schltr.		1/1
Beclardia A. Rich.		1/1
Bolusiella Schltr.		10/10
Calyptrochilum Krzl.		2/2
Cardiochilus Cribb		2/2
Chamaeangis Schltr.		15/15
Chauliodon Summerh.		1/1
Cyrtorchis Schltr.		18/18
Diaphananthe Schltr.		45/45
Dinklageella Mansfeld		1/1
Distylodon Summerh.		1/1
Eggelingia Summerh.		2/2
Encheiridion Summerh.		1/1
Eurychone Schltr.		2/2
Lemurorchis Krzl.		1/1
Listrostachys Rchb. f.		3/3
Microcoelia Lindl.		26/26

TABLE 1. Continued.

Taxa	Genera	Species
Mystacidium Lindl.		5/5
Nephrangis Summerh.		1/1
Plectrelminthus Raf.		1/1
Podangis Schltr.		1/1
Rangaeris Summerh.		6/6
Rhaesteria Summerh.		1/1
Rhipidoglossum Schltr.		4/4
Solenangis Schltr.		2/2
Sphyrarhynchus Mansfeld		1/1
Summerhayesia Cribb		2/2
Taeniorrhiza Summerh.		1/1
Triceratorhynchus Summerh.		1/1
Tridactyle Schltr.		35/35
Ypsilopus Summerh.		2/2
Maxillarieae Pfitz.	56/71	1,183/1,257
Corallorhizinae Camus et al.	0/9	0/46
Aplectrum Nutt.		0/1
Corallorhiza R. Br.		0/15
Cremastra Lindl.		0/2
Dactylostalix Rchb. f.		0/1
Didiciea King. & Pantl.		0/1
Ephippianthus Rchb. f.		0/1
Govenia Lindl. ex Lodd.		0/13
Oreorchis Lindl.		0/9
Tipularia Nutt.		0/3
Zygopetalinae Schltr.	21/27	193/221
Aganisia Kaempfer ex Sprengel		1/1
Batemannia Lindl.		4/4
Bollea Rchb. f.		7/7
Chaubardia Rchb. f.		3/3
Chaubardiella Garay		6/6
Cheiradenia Lindl.		2/2
Chondrorhyncha Lindl.		16/16
Cochleanthes Raf.		20/20
Dodsonia Ackerman		2/2
Hoehneella Ruschi		2/2
Huntleya Batem. ex Lindl.		10/10
Kefersteinia Rchb. f.		25/25
Koellensteinia Rchb. f.		1/11
Mendoncella Hawkes		11/11
Neogardneria Schltr.		1/1
Otostylis Schltr.		0/3
Pabstia Garay		5/5
Paradisianthus Rchb. f.		0/4
Pescatorea Rchb. f.		14/14
Promenaea Lindl.		15/15
Stenia Lindl.		1/1
Vargasiella C. Schweinf.		0/2
Warrea Lindl.		0/3
Warreella Schltr.		0/3
Warreopsis Garay		0/3
Zygopetalum Hook.		40/40
Zygosepalum Rchb. f.		7/7
Bifrenariinae Dressl.	4/4	57/57
Bifrenaria Lindl.		27/27
Rudolfiella Hoehne		2/2
Teuscheria Garay		6/6
Xylobium Lindl.		22/22
Lycastinae Schltr.	3/3	54/54
Anguloa R. & P.		10/10
Lycaste Lindl.		43/43

TABLE 1. Continued.

Taxa	Genera	Species
Neomoorea Rolfe		1/1
Maxillariinae Benth.	9/9	652/652
Anthosiphon Schltr.		1/1
Chrysocycnis Lind. & Rchb. f.		5/5
Cryptocentrum Benth.		14/14
Cyrtidium Schltr.		4/4
Maxillaria R. & P.		600/600
Mormolyca Fenzl		6/6
Pityphyllum Schltr.		4/4
Scuticaria Lindl.		6/6
Trigonidium Lindl.		12/12
Dichaeinae Schltr.	1/1	45/45
Dichaea Lindl.		45/45
Telipogoninae Schltr.	4/4	108/108
Dipterostele Schltr.		2/2
Stellilabium Schltr.		16/16
Telipogon Kunth		82/82
Trichoceros Kunth		8/8
Ornithocephalinae Schltr.	14/14	74/74
Centroglossa Barb. Rodr.		6/6
Chytroglossa Rchb. f.		4/4
Dipteranthus Barb. Rodr.		2/2
Dunstervillea Garay		1/1
Eloyella P. Ortiz		3/3
Hintonella Ames		1/1
Hofmeisterella Rchb. f.		1/1
Ornithocephalus Hook.		28/28
Phymatidium Lindl.		7/7
Platyrhiza Barb. Rodr.		1/1
Rauhiella Pabst & Braga		1/1
Sphyrastylis Schltr.		6/6
Thysanoglossa Porto & Brade		1/1
Zygostates Lindl.		12/12
Cymbidieae Pfitz.	100/109	1,669/1,956
Cyrtopodiinae Benth.	15/24	139/424
Acrolophia Pfitz.		0/9
Ansellia Lindl.		2/2
Bromheadia Lindl.		11/11
Chrysoglossum Bl.		0/10
Claderia Hook. f.		2/2
Cyanaeorchis Thouars		0/1
Cymbidiella Rolfe		3/3
Cymbidium Sw.		50/50
Cyrtopodium R. Br.		12/12
Diglyphosa Bl.		0/2
Dipodium R. Br.		12/12
Eriopsis Lindl.		2/3
Eulophia R. Br.		0/200
Eulophiella Rolfe		2/2
Galeandra Lindl.		20/20
Gastrorchis Thouars		0/20
Geodorum Jackson		0/8
Grammangis Rchb. f.		2/2
Grammatophyllum Bl.		12/12
Graphorkis Thouars		5/5
Grobya Lindl.		3/3
Oeceoclades Lindl.		0/31
Porphyroglottis Ridl.		1/1
Pteroglossaspis Rchb. f.		0/3
Genyorchidinae Schltr.	1/1	6/6
Genyorchis Schltr.		6/6

TABLE 1. Continued.

Taxa	Genera	Species
Thecostelinae Schltr.	1/1	5/5
Thecostele Rchb. f.		5/5
Acriopsidinae Dressl.	1/1	12/12
Acriopsis Reinward ex Bl.		12/12
Catasetinae Schltr.	5/5	166/166
Catasetum L. C. Rich. ex Kunth		76/76
Clowesia Lindl.		5/5
Cycnoches Lindl.		17/17
Dressleria Dodson		4/4
Mormodes Lindl.		64/64
Stanhopeinae Benth.	17/17	211/211
Acineta Lindl.		10/10
Cirrhaea Lindl.		3/3
Coeliopsis Rchb. f.		2/2
Coryanthes Hook.		20/20
Gongora R. & P.		40/40
Houlletia Brongn.		8/8
Kegeliella Mansfeld		4/4
Lacaena Lindl.		3/3
Lueddemannia Lind. & Rchb. f.		1/1
Lycomormium Rchb. f.		5/5
Paphinia Lindl.		8/8
Peristeria Hook.		8/8
Polycycnis Rchb. f.		20/20
Schlimmia Planch. & Lind. ex Lindl. & Paxt.		5/5
Sievekingia Rchb. f.		15/15
Stanhopea Frost ex Hook.		55/55
Trevoria Lehmann		4/4
Pachyphyllinae Pfitz.	2/2	34/34
Fernandezia R. & P.		9/9
Pachyphyllum Kunth		25/25
Oncidiinae Benth.	58/58	1,096/1,098
Ada Lindl.		9/9
Amparoa Schltr.		2/2
Antillanorchis Garay		1/1
Aspasia Lindl.		6/6
Brachtia Rchb. f.		6/6
Brassia R. Br.		38/38
Capanemia Barb. Rodr.		16/16
Caucaea Schltr.		1/1
Cischweinfia Dressl. & N. Wms.		6/6
Cochlioda Lindl.		7/7
Comparettia P. & E.		11/11
Cypholoron Dodson & Dressl.		2/2
Diadenium P. & E.		2/2
Erycina Lindl.		2/2
Gomesa R. Br.		9/9
Helcia Lindl.		1/1
Hybochilus Schltr.		2/2
Ionopsis Kunth		3/3
Leochilus Knowles & Wescott		16/16
Lockhartia Hook.		29/29
Lophiaris Raf.		25/25
Macradenia R. Br.		11/11
Macroclinium Dodson		25/25
Mesospinidium Rchb. f.		7/7
Mexicoa Garay		1/1
Miltonia Lindl.		12/12
Miltoniopsis Godefr.-Lebeuf		6/6
Neodryas Rchb. f.		4/4

TABLE 1. Continued.

Taxa	Genera	Species
Neokoehleria Schltr.		7/7
Notylia Lindl.		46/46
Odontoglossum Kunth (s.l.)		140/140
Oliveriana Rchb. f.		4/4
Oncidium Sw.		430/432
Ornithophora Barb. Rodr.		2/2
Otoglossum (Schltr.) Garay & Dunsterv.		8/8
Palumbina Rchb. f.		1/1
Papperitzia Rchb. f.		1/1
Plectrophora Focke		6/6
Polyotidium Garay		1/1
Psychopsis Raf.		4/4
Psygmorchis Dodson & Dressl.		6/6
Pterostemma Krzl.		1/1
Quekettia Lindl.		5/5
Rodriguezia R. & P.		34/34
Rodrigueziopsis Schltr.		2/2
Rossioglossum (Schltr.) Garay & Kennedy		5/5
Rusbyella Rolfe		2/2
Sanderella O. Kuntze		2/2
Saundersia Rchb. f.		1/1
Scelochilus Klotzsch		34/34
Sigmatostalix Rchb. f.		35/35
Solenidium Lindl.		3/3
Symphyglossum Schltr.		4/4
Systeloglossum Schltr.		5/5
Trichocentrum P. & E.		23/23
Trichopilia Lindl.		21/21
Trizeuxis Lindl.		1/1
Warmingia Rchb. f.		2/2

* Owing to current controversies concerning generic circumscriptions, only an estimate for the subtribe is given here.

percent) and Vandoideae (93 percent). There would appear to be a correlation of increasing epiphytism with other derived characters as the Apostasioideae (0 percent), Spiranthoideae (0.26 percent) and Orchidoideae (0.26 percent) are relatively primitive and primarily terrestrial. In accordance with this correlation, the second most advanced subfamily, Epidendroideae, includes 5 percent fewer epiphytes than the most advanced subfamily, Vandoideae. But the Cypripedioideae with 29 percent epiphytic species (primarily the tree-crown and cliff-inhabiting *Phragmipedium caudatum* complex as well as numerous species of *Paphiopedilum*) does not conform to such correlation if it is indeed a primitive subfamily. However, this problem is solved if we accept these genera as advanced relative to their obligately terrestrial counterparts, *Selenipedium* and *Cypripedium,* albeit on a primitive ground plan (Atwood, 1984).

By various estimates (e.g., Haywood, 1978; Cronquist, 1981) the Asteraceae, the largest family of dicotyledonous plants, contains 20,000–25,000 species. The Orchidaceae and the Asteraceae are essentially of equal size. It is interesting to note that both families are considered to be the most advanced among the monocots and dicots, respectively, but have exploited very different ecological possibilities. The orchids have exploited very specific, often unusual habitats where competition from other plants is minimized. Hence we see terrestrial orchids as characteristic denizens of northern bogs, and epiphytism seems a logical consequence to adaptation to unoccupied ecological space. The orchids have also increased efficiency of pollen transfer by compacting their pollen into easily transportable pollinia, thus effecting the production of thousands of seeds per successful pollination event. With such an efficient system of pollen transfer, the orchids have exploited several instincts of diverse pollinators from food foraging, whether or not by deception, to pseudocopulation and egg laying in a false brood site.

This is often accomplished by exploiting a single species of insect. The sunflowers overcome the problem of competition by quickly and aggressively invading open, terrestrial, often seasonably dry habitats, especially disturbed sites and rarely of unusual habitats such as tree canopies. Their populations tend to be large by comparison with orchids, and repeated visits by numerous pollinators negates the necessity of efficient pollen transfer. Diversity of pollination systems is low and repeated visits reinforced by food rewards is the rule. Pollination by deception is unknown. As a consequence of this, flowers of the Asteraceae are less diverse and usually aggregated in more or less amorphous capitula. Reproduction is often by asexual means, either vegetatively by stoloniferous habit or by asexual seed set. Whatever accounts for the species richness of these two most advanced of families, they have achieved their sizes through very different modes of evolution.

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