

## SUPPLEMENTARY DATA

TABLE S1. List of genera containing species capable of CAM photosynthesis. Major clades are ordered following the linear classification system of APG IV (2016). References are provided for the initial reports substantiating CAM activity (as defined in Box 1) in each taxon, with additional references for reports of species sampled in their natural habitat (including carbon-isotope analyses) where appropriate. For species names that have been synonymized since first publication, the nomenclature used in the original report is indicated together with the currently accepted name in bold. Other reports of possible CAM activity that remain to be substantiated are listed in Supplementary Data Table S2.

Major clade	Genus	References <sup>1</sup>
ISOËTALES		
<b>Isoëtaceae</b>	<i>Isoëtes</i> , including <i>Stylites</i>	Keeley (1981, 1998); Keeley <i>et al.</i> (1984), as <i>Stylites andicola</i> Amstutz = <b><i>Isoëtes andicola</i></b> (Amstutz) L.D.Gómez
POLYPODIALES		
<b>Polypodiaceae</b>		
Microsoroideae	<i>Lecanopteris</i> <sup>2</sup>	J.A.M. Holtum (unpublished); <i>Lecanopteris sinuosa</i> (Wall. ex Hook.) Copel.
	<i>Microsorium</i>	Holtum and Winter (1999)
Loxogrammoideae	<i>Dictymia</i>	Griffiths (1989)
Polypodioideae	<i>Niphidium</i>	Holtum and Winter (1999), as <i>Polypodium crassifolium</i> L. = <b><i>Niphidium crassifolium</i></b> (L.) Lellinger
Platyserioideae	<i>Platyserium</i>	Winter <i>et al.</i> (1983)
	<i>Pyrrhosia</i> , including <i>Drymoglossum</i>	Winter <i>et al.</i> (1983); Hew and Wong (1974) and Wong and Hew (1976), as <i>Drymoglossum piloselloides</i> (L.) C.Presl = <b><i>Pyrrhosia piloselloides</i></b> (L.) M.G.Price
<b>Pteridaceae</b>		
Vittarioideae	<i>Anetium</i> <sup>3</sup>	Martin <i>et al.</i> (2005)
	<i>Haplopteris</i>	Martin <i>et al.</i> (2005), as <i>Vittaria flexuosa</i> Fée = <b><i>Haplopteris flexuosa</i></b> (Fée) E.H.Crane
	<i>Vittaria</i>	Carter and Martin (1994); Minardi <i>et al.</i> (2014)
CYCADALES		
<b>Zamiaceae</b>	<i>Dioon</i>	Vovides <i>et al.</i> (2002)
WELWITSCHIALES		
<b>Welwitschiaceae</b>	<i>Welwitschia</i>	Smith and Epstein (1971) <sup>4</sup> ; Dittrich and Huber (1974); Schulze <i>et al.</i> (1976); Vogel and Seely (1977); Ting and Burk (1983); von Willert (1985); Winter and Schramm (1986); von Willert <i>et al.</i> (2005)
PIPERALES		
<b>Piperaceae</b>		
Piperoideae	<i>Peperomia</i>	Warburg (1886); Virzo de Santo <i>et al.</i> (1983); Sternberg <i>et al.</i> (1984); Holthe <i>et al.</i> (1992); Holtum and Winter (2005)

## ALISMATALES

**Alismataceae***Sagittaria*

Keeley (1996, 1998)

**Araceae***Zamioculcas*Holtum *et al.* (2007)**Hydrocharitaceae***Ottelia*Zhang *et al.* (2014)*Vallisneria*Helder and van Harmelen (1982); Webb *et al.* (1988);  
Keeley (1998)

## ASPARAGALES

**Orchidaceae**

## Epidendroideae

*Acianthera*Zotz and Ziegler (1997), as *Pleurothallis verecunda* Schltr. =  
*Acianthera verecunda* (Schltr.) Pridgeon & M.W.Chase;  
Silvera *et al.* (2010); Torres-Morales *et al.* (2020)*Aerangis*Kluge *et al.* (1995)*Aeranthes*Kluge *et al.* (1995)*Anathallis*Silvera *et al.* (2005, 2009), as *Specklinia barbulata* (Lindl.)  
Luer = *Anathallis barbulata* (Lindl.) Pridgeon &  
M.W.Chase*Angraecum*Kluge *et al.* (1995, 1998)*Arachnis*Avadhani *et al.* (1982)*Aspasia*Silvera *et al.* (2005, 2009)*Barkeria*Silvera *et al.* (2009, 2010)*Bogoria*Winter *et al.* (1983), as *Sarcochilus moorei* (Rchb.f.) Schltr. =  
*Bogoria moorei* (Rchb.f.) M.A.Clem. & D.L.Jones*Brassavola*Coutinho (1969); Zotz and Ziegler (1997); Rundel *et al.*  
(1999); Silvera *et al.* (2005); Torres-Morales *et al.* (2020)*Brassia*Zotz and Ziegler (1997); Silvera *et al.* (2005)*Bryobium*Winter *et al.* (1983), as *Eria irukandjiana* St.Cloud =  
*Bryobium irukandjiana* (St.Cloud) M.A.Clem. &  
D.L.Jones*Bulbophyllum*McWilliams (1970); Winter *et al.* (1983); Silvera *et al.* (2005);  
Holtum *et al.* (2016)*Caluera*<sup>5</sup>K. Silvera (unpublished): *Caluera vulpina* Dodson &  
Determann*Campylocentrum*Winter *et al.* (1985); Mooney *et al.* (1989); Zotz and Ziegler  
(1997); Zotz (2004); Silvera *et al.* (2009, 2010); Torres-  
Morales *et al.* (2020); Oliveira *et al.* (2021)*Capanemia*<sup>5</sup>*Cattleya*, including *Sophronitis*K. Silvera (unpublished): *Capanemia micromera* Barb.Rodr.  
Warburg (1886); Coutinho (1969), as *Sophronitis cernua*  
Lindl. = *Cattleya cernua* (Lindl.) Van den Berg; Zotz and  
Ziegler (1997); Silvera *et al.* (2005); Torres-Morales *et al.*  
(2020)*Caularthron*Zotz and Ziegler (1997); Silvera *et al.* (2010)*Chiloschista*Winter *et al.* (1983); Cockburn *et al.* (1985); Benzing (1990);  
Holtum *et al.* (2016)*Cischweinfia*Silvera *et al.* (2005)*Coelogyne*, including *Pholidota*Winter *et al.* (1983), as *Pholidota pallida* Lindl. = *Coelogyne*  
*pallida* (Lindl.) Rchb.f.; Silvera *et al.* (2005)*Comparettia*, including*Scelochilus*Silvera *et al.* (2010); Torres-Morales *et al.* (2020), including  
*Scelochilus ottonis* Klotzsch = *Comparettia ottonis*  
(Klotzsch) M.W.Chase & N.H.Williams*Coryanthes*Silvera *et al.* (2005)*Cymbidium*Warburg (1886); Winter *et al.* (1983); Motomura *et al.* (2008);  
Holtum *et al.* (2016)*Cyrtopodium*

Coutinho (1969)

- Dendrobium*, including *Cadetia*,  
*Dockrillia*, *Flickingeria*, and  
*Grastidium* Nuernbergk (1961); Winter *et al.* (1983), as *Cadetia*  
*maideniana* (Schltr.) Schltr. = ***Dendrobium maidenianum***  
Schltr., *Dockrillia linguiformis* (Sw.) Brieger =  
***Dendrobium linguiforme*** Sw., and *Flickingeria convexa*  
(Blume) A.D.Hawkes = ***Dendrobium convexum*** (Blume)  
Lindl.; Sinclair (1984); Kluge *et al.* (1989); Holtum *et al.*  
(2016), as *Grastidium luteocilium* (Rupp) Rauschert =  
***Dendrobium luteocilium*** Rupp; Qui *et al.* (2016)
- Dendrophylax*, including  
*Polyradicion* Benzing and Ott (1981), as *Polyradicion lindenii* (Lindl.)  
Garay = ***Dendrophylax lindenii*** (Lindl.) Benth. ex Rolfe  
*Didymoplexis* Holtum *et al.* (2016)  
*Dimerandra* Zotz and Tyree (1996); Silvera *et al.* (2005)
- Dimerandra* Zotz and Tyree (1996); Silvera *et al.* (2005)
- Echinosepala*, including *Brenesia* Silvera *et al.* (2005), as *Brenesia lappiformis* (A.H.Heller &  
L.O.Williams) Luer = ***Echinosepala lappiformis***  
(A.H.Heller & L.O.Williams) Pridgeon & M.W.Chase  
*Elleanthus* Torres-Morales *et al.* (2020)  
*Encyclia* Coutinho (1969); Silvera *et al.* (2005); Torres-Morales *et al.*  
(2020)
- Epidendrum*, including *Lanium*  
and *Oerstedella* Bendrat (1929); Nuernbergk (1961); Coutinho (1963); Milburn  
*et al.* (1968); Coutinho (1969), as *Lanium avicula* Lindl. ex  
Benth. = ***Epidendrum avicula*** Lindl.; McWilliams (1970);  
Reinert *et al.* (1997); Zotz and Ziegler (1997); Silvera *et al.*  
(2005), as *Oerstedella pseudoschumanniana* (Fowlie)  
Hágsater = ***Epidendrum pseudoschumannianum*** Fowlie;  
Wester *et al.* (2011); Torres-Morales *et al.* (2020); Oliveira  
*et al.* (2021)
- Eriopsis* Silvera *et al.* (2005)  
*Erycina*, including *Psygmorchis* Mooney *et al.* (1989); Silvera *et al.* (2005), as *Psygmorchis*  
*pusilla* (L.) Dodson & Dressler = ***Erycina pusilla*** (L.)  
N.H.Williams & M.W.Chase
- Eulophia*, including *Acrolophia*,  
*Lissochilus*, *Oeceoclades*, and  
*Orthochilus* Kluge *et al.* (1995), as *Lissochilus beravensis* (Rchb.f.)  
H.Perrier = ***Eulophia beravensis*** Rchb.f.; Silvera *et al.*  
(2010), as *Oeceoclades maculata* (Lindl.) Lindl. =  
***Eulophia maculata*** (Lindl.) Rchb.f.; Bone *et al.* (2015), as  
*Acrolophia micrantha* (Lindl.) Pfitzer = ***Eulophia***  
***micrantha*** Lindl., and *Orthochilus aculeatus* (L.f.)  
Bytebier = ***Eulophia aculeata*** (L.f.) Spreng.
- Gomesa* Silvera *et al.* (2005), as *Oncidium flexuosum* G.Lodd. =  
***Gomesa flexuosa*** (G.Lodd.) M.W.Chase & N.H.Williams
- Gongora*, including *Acropera* Warburg (1886), as *Acropera* [*Acropegia*] *loddigesii* Lindl. =  
***Gongora galeata*** (Lindl. ex Bosse) Rchb.f.
- Guarianthe* Zotz and Ziegler (1997), as *Cattleya patinii* Cogn. =  
***Guarianthe hennisiana*** (Rolfe) Van den Berg
- Hintonella*<sup>5</sup> K. Silvera (unpublished); *Hintonella mexicana* Ames  
*Ionopsis* Silvera *et al.* (2005); Torres-Morales *et al.* (2020)  
*Jacquinilla* Zotz (2004); Torres-Morales *et al.* (2020)
- Laelia*, including *Schomburgkia* Nuernbergk (1961), as *Schomburgkia crispera* Lindl. = ***Laelia***  
***marginata*** (Lindl.) L.O.Williams; Silvera *et al.* (2005), as  
*Schomburgkia undulata* var. *lueddemannii* (Prill.) H.G.Jones  
= ***Laelia lueddemannii*** (Prill.) L.O.Williams; Silvera *et al.*  
(2010)
- Leochilus* Silvera *et al.* (2010)  
*Lockhartia* Zotz and Ziegler (1997); Zotz (2004); Silvera *et al.* (2005,  
2010)

- Luisia*  
*Lycaste*
- Macradenia*<sup>5</sup>  
*Macroclinium*  
*Maxillaria*, including  
*Camaridium*, *Heterotaxis*,  
*Ornithidium*, and *Trigonidium*
- Meiracyllium*  
*Microcoelia*, including *Gussonea*  
and multiple species segregated  
from *Solenangis*
- Micropera*  
*Mobilabium*  
*Mormodes*  
*Myoxanthus*  
*Myrmecophila*, including  
*Schomburgkia*
- Notylia*
- Oberonia*  
*Oeonia*  
*Oncidium*
- Ornithocephalus*  
*Pabstiella*  
*Peristeria*  
*Phalaenopsis*, including *Sedirea*
- Platyrhiza*<sup>5</sup>  
*Plectorrhiza*  
*Plectrophora*  
*Pleurothallis*  
*Pomatocalpa*  
*Prosthechea*  
*Psychilis*
- Psychopsis*  
*Pterostemma*  
*Quekettia*<sup>5</sup>  
*Rhinerrhiza*  
*Robiquetia*  
*Rodriguezia*
- Rossioglossum*, including  
*Chelyorchis*
- Winter *et al.* (1983); Earnshaw *et al.* (1987)  
Warburg (1886), as *Maxillaria aromatica* Graham = ***Lycaste aromatica*** (Graham) Lindl.  
K. Silvera (unpublished): *Macradenia lutescens* R.Br.  
Silvera *et al.* (2005)  
Warburg (1886), as *Ornithidium densum* Rchb.f. = ***Maxillaria densa*** Lindl.; Zotz and Ziegler (1997); Silvera *et al.* (2005), as *Heterotaxis sessilis* (Sw.) F.Barros = ***Maxillaria crassifolia*** (Lindl.) Rchb.f., and *Trigonidium egertonianum* Bateman ex Lindl. = ***Maxillaria egertoniana*** (Bateman ex Lindl.) Molinari; Silvera *et al.* (2010), as *Camaridium ctenostachys* (Rchb.f.) Schltr. = ***Maxillaria ctenostachys*** Rchb.f.  
Torres-Morales *et al.* (2020)  
Kluge *et al.* (1995), as *Gussonea aphylla* (Thouars) A.Rich. = ***Microcoelia aphylla*** (Thouars) Summerh., and *Solenangis aphylla* (Thouars) Summerh. = ***Microcoelia aphylla*** (Thouars) Summerh.; Roth-Nebelsick *et al.* (2021)  
Winter *et al.* (1983)  
Winter *et al.* (1983)  
Silvera *et al.* (2005)  
Silvera *et al.* (2010)  
Griffiths *et al.* (1989), as *Schomburgkia humboldtii* (Rchb.f.) Rchb.f. = ***Myrmecophila humboldtii*** (Rchb.f.) Rolfe; Mooney *et al.* (1989); Silvera *et al.* (2005); Ricalde *et al.* (2010); Santiago *et al.* (2017)  
Zotz (2004); Silvera *et al.* (2005, 2010); Torres-Morales *et al.* (2020)  
Winter *et al.* (1983)  
Kluge *et al.* (1995)  
Warburg (1886); Coutinho (1963); Mooney *et al.* (1989); Silvera *et al.* (2005)  
Zotz and Ziegler (1997); Silvera *et al.* (2005)  
Torres-Morales *et al.* (2020)  
Silvera *et al.* (2005)  
Nuernbergk (1963); McWilliams (1970); Winter *et al.* (1983); Hogewoning *et al.* (2021); Lee *et al.* (2021), as *Sedirea japonica* (Rchb.f.) Garay & H.R.Sweet = ***Phalaenopsis japonica*** (Rchb.f.) Kocyan & Schuit.  
K. Silvera (unpublished): *Platyrhiza quadricolor* Barb.Rodr.  
Winter *et al.* (1983)  
Silvera *et al.* (2010)  
Silvera *et al.* (2005)  
Winter *et al.* (1983)  
Silvera *et al.* (2005)  
Nuernbergk (1961), as *Encyclia atropurpurea* (Willd.) Schltr. = ***Psychilis atropurpurea*** (Willd.) Sauleda  
Torres-Morales *et al.* (2020)  
Torres-Morales *et al.* (2020)  
K. Silvera (unpublished): *Quekettia jenmanii* Rchb.f.  
Winter *et al.* (1983)  
Winter *et al.* (1983); Earnshaw *et al.* (1987)  
Zotz and Ziegler (1997); Silvera *et al.* (2005); Torres-Morales *et al.* (2020)  
Zotz and Ziegler (1997), as *Oncidium ampliatum* Lindl. = ***Rossioglossum ampliatum*** (Lindl.) M.W.Chase &

- N.H. Williams; Silvera *et al.* (2005), as *Chelyorchis ampliata* (Lindl.) Dressler & N.H. Williams = **Rossioglossum ampliatum** (Lindl.) M.W. Chase & N.H. Williams; Silvera *et al.* (2010, 2014)
- Saccolabiopsis* Winter *et al.* (1983)
- Saccolabium* Earnshaw *et al.* (1987)
- Sarcochilus* Winter *et al.* (1983)
- Scaphyglottis* Silvera *et al.* (2005)
- Schoenorchis* Winter *et al.* (1983)
- Sobralia* Silvera *et al.* (2005)
- Solenidium* Torres-Morales *et al.* (2020)
- Stanhopea* Guevara-Pérez *et al.* (2019)
- Stelis* Silvera *et al.* (2005), as *Pleurothallis racemiflora* (Sw.) Lindl. ex Hook. = **Stelis multirostris** (Rchb.f.) Pridgeon & M.W. Chase
- Taeniophyllum* Winter *et al.* (1983)
- Tetramicra* Ting (1989)
- Thrixspermum* Winter *et al.* (1983)
- Tolumnia*<sup>5</sup> K. Silvera (unpublished): *Tolumnia variegata* (Sw.) Braem
- Trachoma* Winter *et al.* (1983)
- Trichocentrum*, including Zotz and Ziegler (1997), as *Oncidium stipitatum* Lindl. = **Trichocentrum lacerum** (Lindl.) J.M.H. Shaw; Zotz (2004); Silvera *et al.* (2005, 2010); Santiago *et al.* (2017), as *Cohniella cebolleta* (Jacq.) Christenson = **Trichocentrum cebolleta** (Jacq.) M.W. Chase & N.H. Williams
- Trichoglottis* Winter *et al.* (1983); Holtum *et al.* (2016)
- Trichopilia* Silvera *et al.* (2005)
- Trichotosia* Sinclair (1984), as *Eria velutina* Lodd. ex Lindl. = **Trichotosia velutina** (Lodd. ex Lindl.) Kraenzl.
- Trizeuxis* Silvera *et al.* (2010); Torres-Morales *et al.* (2020)
- Vanda*, including *Ascocentrum* McWilliams (1970), as *Ascocentrum ampullaceum* (Roxb.) Schltr. = **Vanda ampullacea** (Roxb.) L.M. Gardiner; Winter *et al.* (1983)
- Warmingia*<sup>5</sup> K. Silvera (unpublished): *Warmingia eugenii* Rchb.f.
- Zygostates*<sup>5</sup> K. Silvera (unpublished): *Zygostates cornuta* Lindl.
- Vanilloideae *Vanilla* Warburg (1886); Bendrat (1929); Coutinho (1963); McWilliams (1970); Reinert *et al.* (1997); Zotz and Ziegler (1997); Silvera *et al.* (2005)
- Asphodelaceae**
- Alooideae *Aloe* de Vries (1884); Warburg (1886); Nuernbergk (1954, 1961); Schütte *et al.* (1967); Holdsworth (1971); Dittrich *et al.* (1973); Troughton *et al.* (1974b); Kluge *et al.* (1979); Ziegler (1979); Sternberg *et al.* (1984)
- Aloidendron* Schulze *et al.* (1991), as *Aloe dichotoma* Masson = **Aloidendron dichotomum** (Masson) Klopper & Gideon F.Sm.; Rundel *et al.* (1999), as *Aloe ramosissima* Pillans = **Aloidendron ramosissimum** (Pillans) Klopper & Gideon F.Sm.
- Aristaloe* Nuernbergk (1961), as *Aloe aristata* Haw. = **Aristaloe aristata** (Haw.) Boatwr. & J.C. Manning
- Astroloba*, including *Poellnitzia* Schütte *et al.* (1967), as *Poellnitzia rubriflora* (L. Bolus) Uitewaal = **Astroloba rubriflora** (L. Bolus) Gideon F.Sm. & J.C. Manning; Dittrich *et al.* (1973), as *Apicra* ('*Apiera*') *spiralis* (L.) Baker = **Astroloba spiralis** (L.) Uitewaal

	<i>Gasteria</i>	Nuernbergk (1961); Schütte <i>et al.</i> (1967); Troughton <i>et al.</i> (1974b); Mooney <i>et al.</i> (1977a)
	<i>Gonialoe</i>	Troughton <i>et al.</i> (1974a), as <i>Aloe variegata</i> L. = <b><i>Gonialoe variegata</i></b> (L.) Boatwr. & J.C.Manning
	<i>Haworthia</i>	Kraus (1883); Schütte <i>et al.</i> (1967); Troughton <i>et al.</i> (1974b), as [ <i>Haworthis</i> ]
	<i>Haworthiopsis</i>	Bender <i>et al.</i> (1973), as <i>Haworthia attenuata</i> (Haw.) Haw. = <b><i>Haworthiopsis attenuata</i></b> (Haw.) G.D.Rowley
	<i>Tulista</i>	Mooney <i>et al.</i> (1977a), as <i>Haworthia margaritifera</i> (L.) Haw. = <b><i>Tulista pumila</i></b> (L.) G.D.Rowley
Asphodeloideae <sup>6</sup>	<i>Bulbine</i> <sup>7</sup>	J.A.M. Holtum (unpublished): <i>Bulbine bulbosa</i> (R.Br.) Haw. and <i>B. frutescens</i> (L.) Willd.
<b>Asparagaceae</b>		
Agavoideae	<i>Agave</i> , including <i>Manfreda</i> and <i>Polianthes</i>	de Saussure (1804); Thomas and Ranson (1954); Neales <i>et al.</i> (1968); Dittrich <i>et al.</i> (1973); Mooney <i>et al.</i> (1974); Eickmeier and Bender (1976); Nobel (1976); Ziegler (1979); Heyduk <i>et al.</i> (2016), as <i>Manfreda scabra</i> (Ortega) McVaugh = <b><i>Agave scabra</i></b> Ortega; Reddy and Das (1978) and Heyduk <i>et al.</i> (2022), as <i>Polianthes tuberosa</i> L. = <b><i>Agave amica</i></b> (Medik.) Thiede & Govaerts
	<i>Beschorneria</i>	Heyduk <i>et al.</i> (2018, 2022)
	<i>Furcraea</i>	Olivares and Medina (1990), as [ <i>Fourcroya</i> ] <i>humboldtiana</i> Trel. = <b><i>Furcraea acaulis</i></b> (Kunth) B.Ullrich; Winter and Smith (2022)
	<i>Hesperaloe</i>	Ravetta and McLaughlin (1993); Heyduk <i>et al.</i> (2022)
	<i>Yucca</i>	Mooney <i>et al.</i> (1974); Smith and Madhavan (1982); Heyduk <i>et al.</i> (2019, 2022)
Nolinoideae	<i>Beaucarnea</i> <i>Sansevieria</i> <sup>8</sup>	Reyes-Garcia <i>et al.</i> (2022) Warburg (1886); Nuernbergk (1961); Milburn <i>et al.</i> (1968); Dittrich <i>et al.</i> (1973); Mooney <i>et al.</i> (1977a); Martin <i>et al.</i> (2019)
COMMELINALES		
<b>Commelinaceae</b>		
Commelinoideae	<i>Callisia</i> <i>Cyanotis</i> <i>Tradescantia</i> <i>Tripogandra</i>	Martin <i>et al.</i> (1990) Schütte <i>et al.</i> (1967) Warburg (1886); Martin <i>et al.</i> (1994) Martin <i>et al.</i> (1990)
POALES		
<b>Bromeliaceae</b>		
Bromelioideae	<i>Acanthostachys</i> <i>Aechmea</i> , including <i>Streptocalyx</i>  <i>Ananas</i>  <i>Androlepis</i> <i>Araeococcus</i>  <i>Billbergia</i>  <i>Bromelia</i>	Warburg (1886); Coutinho (1969); Medina <i>et al.</i> (1977) Warburg (1886); Coutinho (1969); Dittrich <i>et al.</i> (1973); Medina (1974); Griffiths and Smith (1983) Warburg (1886); Sideris <i>et al.</i> (1948); Seshagiri and Suryanarayanamurthy (1957); Milburn <i>et al.</i> (1968); Neales <i>et al.</i> (1968); Coutinho (1969); Bender <i>et al.</i> (1973); Dittrich <i>et al.</i> (1973); Medina (1974) Crayn <i>et al.</i> (2015) McWilliams (1970); Griffiths and Smith (1983); Crayn <i>et al.</i> (2015) Warburg (1886); Bendrat (1929); Nuernbergk (1961); McWilliams (1970); Dittrich <i>et al.</i> (1973); Medina (1974); Griffiths and Smith (1983) Nuernbergk (1961); Coutinho (1969); Medina (1974); Medina and Troughton (1974); Griffiths and Smith (1983)

	<i>Canistropsis</i>	Crayn <i>et al.</i> (2015)
	<i>Canistrum</i>	Coutinho (1963); Medina <i>et al.</i> (1977)
	<i>Cryptanthus</i>	Bendrat (1929); Dittrich <i>et al.</i> (1973); Crayn <i>et al.</i> (2015)
	<i>Deinacanthos</i>	Crayn <i>et al.</i> (2015)
	<i>Disteganthus</i>	Crayn <i>et al.</i> (2015)
	<i>Edmundoa</i>	Crayn <i>et al.</i> (2015)
	<i>Eduandrea</i>	Crayn <i>et al.</i> (2015)
	<i>Forzzaea</i>	Crayn <i>et al.</i> (2015), as <i>Cryptanthus leopoldo-horstii</i> Rauh = <b><i>Forzzaea leopoldo-horstii</i></b> (Rauh) Leme, S.Heller & Zizka
	<i>Hohenbergia</i>	Medina <i>et al.</i> (1977); Griffiths and Smith (1983)
	<i>Hohenbergiopsis</i>	Crayn <i>et al.</i> (2015)
	<i>Hylaeaicum</i> ; multiple species segregated from <i>Neoregelia</i>	Crayn <i>et al.</i> (2015), as <i>Neoregelia leviana</i> L.B.Sm. = <b><i>Hylaeaicum levianum</i></b> (L.B.Sm.) Leme & Forzza
	<i>Karawata</i>	Crayn <i>et al.</i> (2015), as <i>Aechmea multiflora</i> L.B.Sm. = <b><i>Karawata multiflora</i></b> (L.B.Sm.) J.R.Maciel & G.Sousa
	<i>Lymania</i>	Crayn <i>et al.</i> (2015)
	<i>Neoglaziovia</i>	Medina <i>et al.</i> (1977); Crayn <i>et al.</i> (2015)
	<i>Neoregelia</i>	Warburg (1886), as [ <i>Nidularia Mayendorffii</i> ] (Regel) Regel = <b><i>Neoregelia carolinae</i></b> (Beer) L.B.Sm.; Nuernbergk (1961); Coutinho (1963); McWilliams (1970); Dittrich <i>et al.</i> (1973); Medina <i>et al.</i> (1977)
	<i>Nidularium</i>	Bendrat (1929); Medina <i>et al.</i> (1977)
	<i>Ochagavia</i> <sup>9</sup>	J. Males, S.F. Worsley, and J.A.C. Smith (unpublished): <i>Ochagavia litoralis</i> (Phil.) Zizka, Trumpler & Zoellner
	<i>Orthophytum</i>	Coutinho (1969); Medina <i>et al.</i> (1977)
	<i>Portea</i>	Bendrat (1929); Medina <i>et al.</i> (1977)
	<i>Pseudananas</i>	Crayn <i>et al.</i> (2015)
	<i>Pseudaraeococcus</i>	Crayn <i>et al.</i> (2015), as <i>Araeococcus parviflorus</i> (Mart. ex Schult. & Schult.f.) Lindm. = <b><i>Pseudaraeococcus</i></b> <b><i>parviflorus</i></b> (Mart. ex Schult. & Schult.f.) R.A.Pontes & Versieux
	<i>Quesnelia</i>	Coutinho (1963, 1964, 1969); Medina <i>et al.</i> (1977)
	<i>Ronnbergia</i>	Coutinho (1963)
	<i>Sincoraea</i> ; multiple species segregated from <i>Orthophytum</i>	Crayn <i>et al.</i> (2015), as <i>Orthophytum albopictum</i> Philcox = <b><i>Sincoraea albopicta</i></b> (Philcox) Louzada & Wand.
	<i>Ursulaea</i> <sup>10</sup>	Crayn <i>et al.</i> (2015)
	<i>Wittrockia</i>	Medina <i>et al.</i> (1977); Crayn <i>et al.</i> (2015)
Hechtioideae	<i>Hechtia</i> <sup>11</sup>	Lüttge (1987); Mooney <i>et al.</i> (1989); Crayn <i>et al.</i> (2015)
Pitcairnioideae	<i>Deuterocohnia</i> , including <i>Abromeitiella</i>	Griffiths (1984), as <i>Abromeitiella brevifolia</i> (Griseb.) A.Cast.= <b><i>Deuterocohnia brevifolia</i></b> (Griseb.) M.A.Spencer & L.B.Sm.; Crayn <i>et al.</i> (2015)
	<i>Dyckia</i>	Warburg (1886); Coutinho (1969); McWilliams (1970); Medina (1974); Medina and Troughton (1974)
	<i>Encholirium</i>	Medina <i>et al.</i> (1977); Crayn <i>et al.</i> (2015)
Puyoideae	<i>Puya</i>	Mooney <i>et al.</i> (1974); Medina <i>et al.</i> (1977); Crayn <i>et al.</i> (2015)
Tillandsioideae	<i>Guzmania</i>	McWilliams (1970); Medina (1974); Medina and Troughton (1974); Smith <i>et al.</i> (1985)
	<i>Josemania</i> <sup>12</sup>	Coutinho (1963), as <i>Tillandsia asplundii</i> L.B.Sm. = <b><i>Josemania asplundii</i></b> (L.B.Sm.) W.Till & Barfuss
	<i>Lemeltonia</i>	Crayn <i>et al.</i> (2015), as <i>Tillandsia triglochinosides</i> C.Presl = <b><i>Lemeltonia triglochinosides</i></b> (C.Presl) Barfuss & W.Till
	<i>Tillandsia</i>	Warburg (1886); Coutinho (1969); McWilliams (1970); Benzing and Renfrow (1971); Smith and Epstein (1971);

- Werauhia* Bender *et al.* (1973); Dittrich *et al.* (1973); Kluge *et al.* (1973); Medina (1974); Medina and Troughton (1974) Zotz (1997), Schmidt and Zotz (2001), Pierce *et al.* (2002), and Beltrán *et al.* (2013), as *Vriesea sanguinolenta* Cogn. & Marchal = *Werauhia sanguinolenta* (Cogn. & Marchal) J.R.Grant
- SAXIFRAGALES  
**Crassulaceae**<sup>13</sup>  
 Crassuloideae *Crassula*, including *Rochea* de Saussure (1804); Mayer (1875); Kraus (1883); de Vries (1884); Bonner and Bonner (1948); Thomas and Ranson (1954); Schütte *et al.* (1967), as *Rochea [coccinea]* (L.) DC. = *Crassula coccinea* L.; Milburn (1968); Holdsworth (1971); Mooney *et al.* (1977a)
- Kalanchoideae *Adromischus* Mooney *et al.* (1977a)  
*Cotyledon* Schütte *et al.* (1967); Mooney *et al.* (1977a)  
*Kalanchoë*, including Heyne (1815), as *Cotyledon calycina* Roth = *Kalanchoë pinnata* (Lam.) Pers.; Mayer (1875), Kraus (1883), Warburg (1886), Bendrat (1929), and Nishida (1963), as *Bryophyllum calycinum* Salisb. = *Kalanchoë pinnata* (Lam.) Pers.; Kluge *et al.* (1993); Yang *et al.* (2017)  
*Bryophyllum*
- Sempervivoideae *Tylecodon* Rundel *et al.* (1999); Veste *et al.* (2001)  
*Aeonium*, including *Greenovia* de Vries (1884), as *Sempervivum glutinosum* Aiton = *Aeonium glutinosum* (Aiton) Webb & Berthel.; Neales *et al.* (1968); Dittrich (1976), as '*Aeonium [Sempervivum] poculiforme*' = *Aeonium simsii* (Sweet) Stearn; Ziegler (1979); Tenhunen *et al.* (1982), as *Greenovia aurea* (C.Sm. ex Hornem.) Webb & Berthel. = *Aeonium aureum* (C.Sm. ex Hornem.) T.H.M.Mes; Jimenez *et al.* (1983); Lösch (1984); Pilon-Smits *et al.* (1992)
- Aichryson* Lösch (1984)  
*Cremnophila* Teeri *et al.* (1981)  
*Dudleya*, including *Hasseanthus* Nishida (1963), as *Cotyledon peacockii* Baker = *Dudleya pulverulenta* (Nutt.) Britton & Rose; Ting and Dugger (1968); Bartholomew (1973); Mooney *et al.* (1974); Teeri (1982) as *Hasseanthus* (individual species not listed)
- Echeveria* de Vries (1884); Warburg (1886); Astruc (1903); Nuernbergk (1961); Bender (1971); Holdsworth (1971); Meinzer and Rundel (1973); Medina and Delgado (1976); Rundel *et al.* (1979)
- Graptopetalum* Rundel *et al.* (1979); Iwasaki *et al.* (1988)  
*Hylotelephium* Thomas and Ranson (1954), as *Sedum purpureum* (L.) Schult. = *Hylotelephium telephium* (L.) H.Ohba ssp. *telephium*; Bender *et al.* (1973), Dittrich *et al.* (1973), Groenhof *et al.* (1985), Kenyon *et al.* (1985), Lee and Griffiths (1987), and Borland and Griffiths (1990) as *Sedum telephium* L. = *Hylotelephium telephium* (L.) H.Ohba; Golovko *et al.* (2021)
- Lenophyllum* Teeri *et al.* (1981)  
*Monanthes* Tenhunen *et al.* (1982)  
*Orostachys* Oyungerel *et al.* (2004)  
*Pachyphytum* Rundel *et al.* (1979)  
*Rosularia* Habibi and Hajiboland (2011)



	<i>Sedum</i> , including <i>Diamorpha</i>	Bennet-Clark (1933); Thomas and Ranson (1954); Holdsworth (1971); Kluge (1977); Rundel <i>et al.</i> (1979); Pilon-Smits <i>et al.</i> (1991); Teeri <i>et al.</i> (1981); Martin <i>et al.</i> (1982), as <i>Diamorpha smallii</i> Britton = <b><i>Sedum smallii</i></b> (Britton) H.E.Ahles
	<i>Sempervivum</i>	de Saussure (1804); Warburg (1886); Astruc (1903); Nuernbergk (1961); Bender (1971); Osmond <i>et al.</i> (1975); Schuber and Kluge (1979); Ziegler (1979)
	<i>Umbilicus</i>	Daniel <i>et al.</i> (1984)
	<i>Villadia</i>	Teeri (1982)
VITALES		
<b>Vitaceae</b>		
Vitoidaeae	<i>Cissus</i>	Milburn <i>et al.</i> (1968); Ziegler (1979); Ting <i>et al.</i> (1983); Virzo de Santo <i>et al.</i> (1983, 1987); Olivares <i>et al.</i> (1984); Kluge <i>et al.</i> (1995)
	<i>Cyphostemma</i>	Schütte <i>et al.</i> (1967), as <i>Cissus hypoleuca</i> Harv. = <b><i>Cyphostemma hypoleucum</i></b> (Harv.) Desc. ex Wild & R.B.Drumm.; Dittrich <i>et al.</i> (1973), as <i>Cissus digitata</i> Lam. = <b><i>Cyphostemma digitatum</i></b> (Lam.) Desc.; Mooney <i>et al.</i> (1977a); Ziegler (1979); Sternberg <i>et al.</i> (1984)
ZYGOPHYLLALES		
<b>Zygophyllaceae</b>		
Larreoideae	<i>Bulnesia</i>	Mok <i>et al.</i> (2023)
CUCURBITALES		
<b>Cucurbitaceae</b>		
	<i>Seyrigia</i>	de Luca <i>et al.</i> (1977)
	<i>Xerosicyos</i>	de Luca <i>et al.</i> (1977); Winter (1979); Rayder and Ting (1983a); Kluge <i>et al.</i> (1995)
ROSALES		
<b>Urticaceae</b>		
	<i>Pilea</i>	Winter <i>et al.</i> (2021b)
MALPIGHIALES		
<b>Clusiaceae</b>		
	<i>Clusia</i>	Hartenburg (1937); Tinoco-Ojanguren and Vázquez-Yanes (1983); Ting <i>et al.</i> (1985); Schmitt <i>et al.</i> (1988); Borland <i>et al.</i> (1992); Reinert <i>et al.</i> (1997); Zotz <i>et al.</i> (1999), as <i>Havetiopsis flexilis</i> Spruce ex Planch. & Triana = <b><i>Clusia flavida</i></b> (Benth.) Pipoly
	<i>Adenia</i>	Mooney <i>et al.</i> (1977a)
<b>Passifloraceae</b>		
<b>Euphorbiaceae</b>		
Euphorbiodeae	<i>Euphorbia</i> , including <i>Monadenium</i> , <i>Pedilanthus</i> , and <i>Synadenium</i>	Nuernbergk (1961); McWilliams (1970), as <i>Monadenium lugardiae</i> [ <i>Monodenium lugardae</i> ] N.E.Br. = <b><i>Euphorbia lugardiae</i></b> (N.E.Br.) Bruyns, <i>Pedilanthus tithymaloides</i> (L.) Poit. = <b><i>Euphorbia tithymaloides</i></b> L., <i>Synadenium cupulare</i> [ <i>capulare</i> ] (Boiss.) L.C.Wheeler ex A.C.White, R.A.Dyer & B.Sloane = <b><i>Euphorbia cupularis</i></b> Boiss., and <i>Synadenium grantii</i> Hook.f. = <b><i>Euphorbia umbellata</i></b> (Pax) Bruyns; Sen (1970); Bender (1971); Sen <i>et al.</i> (1971); Dittrich <i>et al.</i> (1973); Schulze <i>et al.</i> (1976); Mooney <i>et al.</i> (1977a); Winter (1979); Sternberg <i>et al.</i> (1984); Kluge <i>et al.</i> (1995); Horn <i>et al.</i> (2014)
Crotonoideae	<i>Jatropha</i>	Winter and Holtum (2015)

## GERANIALES

**Geraniaceae***Monsonia*Schütte *et al.* (1967), as *Sarcocaulon patersonii* (DC.) G. Don = ***Monsonia patersonii*** DC.*Pelargonium*Schütte *et al.* (1967); Mooney *et al.* (1977a); Kluge and Ting (1978); Jones *et al.* (2003)

## CARYOPHYLLALES

**Aizoaceae**

## Aizoioideae

*Tetragonia*Schütte *et al.* (1967); Mooney *et al.* (1977a); Messerschmid *et al.* (2021)

## Mesembryanthemoideae

*Mesembryanthemum*, including  
*Aptenia*, *Aridaria*, *Aspazoma*,  
*Brownanthus*, *Opophytum*,  
*Phyllobolus*, *Prenia*,  
*Psilocaulon*, *Sceletium*,  
*Sphalmanthus*, and  
*Synaptophyllum*Warburg (1886); Bendrat (1929); Schütte *et al.* (1967); Treichel (1975), as *Aptenia cordifolia* (L.f.) Schwantes = ***Mesembryanthemum cordifolium*** L.f.; Mooney *et al.* (1977a), as *Psilocaulon kuntzei* (Schinz) Dinter & Schwantes = ***Mesembryanthemum kuntzei*** Schinz; von Willert *et al.* (1977), as *Aridaria* sp. = ***Mesembryanthemum*** sp., *Aspazoma amplexens* (L.Bolus) N.E.Br. = ***Mesembryanthemum amplexens*** L.Bolus, *Prenia relaxata* (Willd. ex Schweigg.) N.E.Br. = ***Mesembryanthemum pallens*** Aiton, *Sceletium* [cf.] *joubertii* L.Bolus = ***Mesembryanthemum tortuosum*** L., and *Sphalmanthus micans* L.Bolus = ***Mesembryanthemum resurgens*** Kensit; von Willert *et al.* (1992) as *Opophytum aquosum* (L.Bolus) N.E.Br. = ***Mesembryanthemum hypertrophicum*** Dinter; Rundel *et al.* (1999), as *Brownanthus nucifer* (Ihlenf. & Bittrich) Pierce & Gerbaulet = ***Mesembryanthemum nucifer*** (Ihlenf. & Bittrich) Klak, *Phyllobolus sinuosus* (L.Bolus) = ***Mesembryanthemum sinuosum*** L.Bolus, and *Synaptophyllum juttiae* (Dinter & A.Berger) N.E.Br. = ***Mesembryanthemum juttiae*** Dinter & A.Berger  
Rundel *et al.* (1999) and Winter (2019), as *Ruschia hexamera* L.Bolus = ***Antimima paripetala*** (L.Bolus) Klak; Messerschmid *et al.* (2021)  
von Willert *et al.* (1977)  
Rundel *et al.* (1999)  
Nuernbergk (1961); Winter (2019)  
Bonner and Bonner (1948), as *Mesembryanthemum edule* L. = ***Carpobrotus edulis*** (L.) N.E.Br.; Winter (1973); Treichel and Bauer (1974); Winter (2019)  
Winter (2019)  
Matimati *et al.* (2012); Winter (2019)  
Winter (2019)  
Rundel *et al.* (1999)  
Schütte *et al.* (1967); Rundel *et al.* (1999)  
Herppich and Herppich (1996); Winter (2019)  
Winter *et al.* (1981); Winter (2019)  
Rundel *et al.* (1999)  
von Willert *et al.* (1977), as *Anisocalyx vaginatus* (L.Bolus) L.Bolus = ***Drosanthemopsis vaginata*** (L.Bolus) Rauschert  
von Willert *et al.* (1977, 1980); Martin *et al.* (1988); Rundel *et al.* (1999)  
Mooney *et al.* (1977a), as *Ruschia sedoides* (Dinter & A.Berger) Friedrich = ***Eberlanzia sedoides*** (Dinter & A.Berger) Schwantes; Messerschmid *et al.* (2021)

## Ruschioideae

*Antimima**Argyroderma**Astridia**Bergeranthus**Carpobrotus**Carruanthus**Cephalophyllum**Chasmatoophyllum**Cheiridopsis**Conophytum**Delosperma**Disphyma**Dracophilus**Drosanthemopsis*, including*Anisocalyx**Drosanthemum**Eberlanzia*

<i>Erepsia</i>	Winter (2019)
<i>Faucaria</i>	Nuernbergk (1961); Winter (2019)
<i>Fenestraria</i>	K. Winter (unpublished) <sup>2</sup> : <i>Fenestraria rhopalophylla</i> (Schltr. & Diels) N.E.Br.
<i>Glottiphyllum</i>	Kraus (1883), as <i>Mesembryanthemum adscendens</i> Haw. = <b><i>Glottiphyllum longum</i></b> (Haw.) N.E.Br.; Winter (2019)
<i>Hartmanthus</i>	von Willert <i>et al.</i> (1992), as <i>Delosperma pergamentaceum</i> L.Bolus = <b><i>Hartmanthus pergamentaceus</i></b> (L.Bolus) S.A.Hammer
<i>Hereroa</i>	Winter (2019)
<i>Jacobsenia</i>	von Willert <i>et al.</i> (1977)
<i>Jordaaniella</i>	Winter (2019), as <i>Cephalophyllum cupreum</i> L.Bolus = <b><i>Jordaaniella cuprea</i></b> (L.Bolus) H.E.K.Hartmann
<i>Lampranthus</i>	von Willert <i>et al.</i> (1977); Winter (2019)
<i>Lithops</i>	Schütte <i>et al.</i> (1967); Holdsworth (1971); Dittrich <i>et al.</i> (1973); Cockburn (1974); Troughton <i>et al.</i> (1974)
<i>Malephora</i>	von Willert <i>et al.</i> (1977); Veste and Herppich (2021)
<i>Meyerophytum</i>	von Willert <i>et al.</i> (1977), as <i>Monilaria globosa</i> (L.Bolus) L.Bolus = <b><i>Meyerophytum globosum</i></b> (L.Bolus) Ihlenf.
<i>Mitrophyllum</i>	von Willert <i>et al.</i> (1977)
<i>Monilaria</i>	Veste <i>et al.</i> (2001)
<i>Oscularia</i>	Winter (2019), as <i>Lampranthus lunatus</i> (Willd.) N.E.Br. = <b><i>Oscularia lunata</i></b> (Willd.) H.E.K.Hartmann
<i>Pleiospilos</i>	Winter (2019)
<i>Prepodesma</i> <sup>14</sup>	Winter (2019), as <i>Nananthus orpenii</i> (N.E.Br.) L.Bolus = <b><i>Prepodesma orpenii</i></b> (N.E.Br.) N.E.Br.
<i>Psammophora</i>	Rundel <i>et al.</i> (1999)
<i>Rabiea</i>	Kraus (1883), as <i>Mesembryanthemum albinotum</i> Haw. = <b><i>Rabiea albinota</i></b> (Haw.) N.E.Br.
<i>Rhinophyllum</i>	Winter (2019)
<i>Ruschia</i>	Kraus (1883), as <i>Mesembryanthemum maximum</i> Haw. = <b><i>Ruschia maxima</i></b> (Haw.) L.Bolus; Warburg (1886), as <i>Mesembryanthemum [anthelminticum]</i> Dinter = <b><i>Ruschia axthelmiana</i></b> (Dinter) Schwantes, and <i>Mesembryanthemum [multiflos]</i> Haw. = <b><i>Ruschia multiflora</i></b> (Haw.) Schwantes; Matimati <i>et al.</i> (2012); Winter (2019)
<i>Sarcozona</i> <sup>15</sup>	J.A.M. Holtum (unpublished): <i>Sarcozona praecox</i> (F.Muell.) S.T.Blake
<i>Schlechteranthus</i>	Messerschmid <i>et al.</i> (2021)
<i>Stoeberia</i>	von Willert <i>et al.</i> (1977, 1983); Rundel <i>et al.</i> (1999)
<i>Titanopsis</i>	Bender <i>et al.</i> (1973); Winter (2019)
<i>Trichodiadema</i>	Schütte <i>et al.</i> (1967); Winter (2019)
<i>Vanheerdea</i>	von Willert <i>et al.</i> (1977)
Sesuvioideae	<i>Sesuvium</i>
	<i>Trianthema</i>
PORTULACINEAE	
<b>Montiaceae</b>	Australian <i>Calandrinia</i> <sup>16</sup>
	<i>Calyptridium</i>
	<i>Cistanthe</i>
	Winter <i>et al.</i> (1981); Guralnick and Jackson (2001); Winter and Holtum (2011); Hancock <i>et al.</i> (2019)
	Guralnick and Jackson (2001)
	Mooney <i>et al.</i> (1974), as <i>Calandrinia maritima</i> Nutt. = <b><i>Cistanthe maritima</i></b> (Nutt.) Carolin ex Hershk.; Kluge and Ting (1978), as <i>Talinum guadalupense</i> M.G.Dudley = <b><i>Cistanthe guadalupensis</i></b> (M.G.Dudley) Carolin ex Hershk.; Arroyo <i>et al.</i> (1990), as <i>Philippiamra celosioides</i> (Phil.)

		Kuntze = <i>Cistanthe celosioides</i> (Phil.) Carolin ex Hershk.; Holtum <i>et al.</i> (2021)
	<i>Claytonia</i>	Guralnick and Jackson (2001), as <i>Montia perfoliata</i> (Donn ex Willd.) Howell = <i>Claytonia perfoliata</i> Donn ex Willd.
	<i>Lewisia</i>	Guralnick and Jackson (2001)
	<i>Phemeranthus</i>	Martin <i>et al.</i> (1982), as <i>Talinum teretifolium</i> Pursh = <i>Phemeranthus teretifolius</i> (Pursh) Raf.; Martin and Zee (1983), as <i>Talinum calycinum</i> Engelm. = <i>Phemeranthus calycinus</i> (Engelm.) Kiger; Harris and Martin (1991), as <i>Talinum calcaricum</i> S.Ware = <i>Phemeranthus calcaricus</i> (S.Ware) Kiger, as <i>Talinum mengesii</i> W.Wolf = <i>Phemeranthus mengesii</i> (W.Wolf) Kiger, and as <i>Talinum parviflorum</i> Nutt. = <i>Phemeranthus parviflorus</i> (Nutt.) Kiger
<b>Didiereaceae</b>		
Didiereoideae	<i>Alluaudia</i>	Kluge and Ting (1978); Winter (1979); Sternberg <i>et al.</i> (1984); Kluge <i>et al.</i> (1995)
	<i>Alluaudiopsis</i>	Winter (1979)
	<i>Decarya</i>	Winter (1979); Kluge <i>et al.</i> (1995)
	<i>Didierea</i>	Kluge and Ting (1978); Winter (1979); Kluge <i>et al.</i> (1995)
Portulacarioideae	<i>Portulacaria</i> , including <i>Ceraria</i>	Schütte <i>et al.</i> (1967); Neales (1975); Mooney <i>et al.</i> (1977a); Ting and Hanscom (1977); von Willert <i>et al.</i> (1992) and Veste <i>et al.</i> (2001), as <i>Ceraria fruticulosa</i> H.Pearson & Stephens = <i>Portulacaria fruticulosa</i> (H.Pearson & Stephens) Bruyns & Klak; Guralnick and Gladsky (2017)
<b>Basellaceae</b>	<i>Anredera</i>	Holtum <i>et al.</i> (2018)
	<i>Basella</i>	Sikolia <i>et al.</i> (2008); Winter (2019)
<b>Halophytaceae</b>	<i>Halophytum</i> <sup>17</sup>	This publication: <i>Halophytum ameghinoi</i> (Speg.) Speg.
<b>Talinaceae</b>	<i>Talinum</i>	Ting (1989); Herrera <i>et al.</i> (1991); Güerere <i>et al.</i> (1996); Taisma and Herrera (1998); Guralnick and Jackson (2001); Brillhaus <i>et al.</i> (2016)
<b>Portulacaceae</b>	<i>Portulaca</i>	Koch and Kennedy (1980, 1982); Ku <i>et al.</i> (1981); Kraybill <i>et al.</i> (1996); Guralnick and Jackson (2001); Guralnick <i>et al.</i> (2002); Lara <i>et al.</i> (2004); Holtum <i>et al.</i> (2017); Winter <i>et al.</i> (2019b); Gilman <i>et al.</i> (2022)
<b>Anacampserotaceae</b>	<i>Anacampseros</i>	Schütte <i>et al.</i> (1967); Mooney <i>et al.</i> (1977a); Kluge and Ting (1978); Sternberg <i>et al.</i> (1984); Guralnick and Jackson (2001); Guralnick <i>et al.</i> (2008)
	<i>Grahamia</i>	Guralnick <i>et al.</i> (2008)
	<i>Talinopsis</i>	Guralnick and Jackson (2001)
<b>Cactaceae</b> <sup>18</sup>		
Cactoideae	<i>Acanthocereus</i>	Díaz and Medina (1984); Mooney <i>et al.</i> (1989), as <i>Peniocereus rosei</i> J.G.Ortega = <i>Acanthocereus rosei</i> (J.G.Ortega) Lodé; Ricalde <i>et al.</i> (2010); Santiago <i>et al.</i> (2017)
	<i>Bergerocactus</i>	Mooney <i>et al.</i> (1974)
	<i>Carnegiea</i>	Long (1915); Richards (1915); Despain <i>et al.</i> (1970); Nobel and Hartsock (1986); English <i>et al.</i> (2007); Hultine <i>et al.</i> (2016, 2019); Huber <i>et al.</i> (2018)
	<i>Cephalocereus</i> , including <i>Neobuxbaumia</i>	Hultine <i>et al.</i> (2016), as <i>Neobuxbau[n]mia polylopha</i> (DC.) Backeb. = <i>Cephalocereus polylophus</i> (DC.) Britton & Rose

- Cereus*, including *Subpilocereus* Díaz de Arends (1984), as *Subpilocereus repandus* (L.) Backeb. = ***Cereus repandus*** (L.) Mill.; Nobel *et al.* (1984); Nobel (1988); Lüttge *et al.* (1989a), as *Subpilocereus ottonis* Backeb. = ***Cereus horrispinus*** Backeb.; Llano and Ugan (2014)
- Chamaecereus* Troughton *et al.* (1974b); Seeni and Gnanam (1980), as *Cereus s[y]ilvestrii* Speg. = ***Chamaecereus silvestrii*** (Speg.) Britton & Rose
- Cleistocactus* Hultine *et al.* (2016)
- Cochemiea* Richards (1915), as *Mammillaria grahamii* Engelm. = ***Cochemiea grahamii*** (Engelm.) Doweld; Ting and Dugger (1968), as *Mammillaria tetrancistra* Engelm. = ***Cochemiea tetrancistra*** (Engelm.) P.B.Breslin; Mooney *et al.* (1974), as *Mammillaria dioica* K.Brandege = ***Cochemiea dioica*** (K.Brandege) Doweld, and *Mammillaria louisae* G.E.Linds. = ***Cochemiea hutchisoniana*** (H.E.Gates) P.B.Breslin & Majure ssp. *louisae* (G.E.Linds.) Majure
- Copiapoa*, including *Pilocopiapoa* Mooney *et al.* (1974), including *Pilocopiapoa solaris* F.Ritter = ***Copiapoa solaris*** (F.Ritter) F.Ritter; Mooney *et al.* (1977b); Ziegler (1996)
- Disocactus* Nuernbergk (1961), as *Phyllocactus pfersdorffii* Rümpler = ***Disocactus crenatus*** (Lindl.) M.Á.Cruz & S.Arias ssp. *kinnachii* (Bravo) M.Á.Cruz & S.Arias; Tinoco-Ojanguren and Vázquez-Yanes (1983), as *Epiphyllum crenatum* (Lindl.) G.Don = ***Disocactus crenatus*** (Lindl.) M.Á.Cruz & S.Arias
- Echinocactus* Rivera and Smith (1979)
- Echinocereus* Ting and Dugger (1968); Mooney *et al.* (1974)
- Echinopsis* Nuernbergk (1961); Hultine *et al.* (2016)
- Epiphyllum* Smith *et al.* (1985); Zotz and Ziegler (1997)
- Eriosyce*, including *Neochilena* Mooney *et al.* (1974), as [*Neochilena*] *chilensis* (Hildm. ex K.Schum.) Backeb. = ***Eriosyce chilensis*** (Hildm. ex K.Schum.) Katt.
- Escontria* Hernández-González and Briones Villareal (2007)
- Eulychnia* Mooney *et al.* (1974); Ziegler (1996)
- Ferocactus* Long (1915), as *Echinocactus wislizeni* Engelm. = ***Ferocactus wislizeni*** (Engelm.) Britton & Rose; Patten and Dinger (1969); Mooney *et al.* (1974); Nobel (1977)
- Haageocereus* Hultine *et al.* (2016)
- Hatiora* Winter (2019)
- Leucostele* Mooney *et al.* (1974) as *Trichocereus chiloensis* (Colla) Britton & Rose = ***Leucostele chiloensis*** (Colla) Schlumpb., and *Trichocereus coquimbanus* (Molina) Britton & Rose = ***Leucostele nigripilis*** (Phil.) P.C.Guerrero & Helmut Walter; Ziegler (1996) as *Echinopsis chiloensis* (Colla) H.Friedrich & G.D.Rowley = ***Leucostele chiloensis*** (Colla) Schlumpb., and *Echinopsis skottsbergii* (Backeb.) H.Friedrich & G.D.Rowley = ***Leucostele skottsbergii*** (Backeb.) P.C.Guerrero & Helmut Walter
- Lobivia* Troughton *et al.* (1974b)
- Lophocereus* Mooney *et al.* (1974); Hultine *et al.* (2016), as *Pachycereus gatesii* (M.E.Jones) D.R.Hunt = ***Lophocereus gatesii*** M.E.Jones; Huber *et al.* (2018)
- Lophophora* Ibara-Laclette *et al.* (2015)
- Mammillaria* Nuernbergk (1961)
- Melocactus* Ting (1976); Díaz de Arends (1984)

<i>Myrtillocactus</i>	Mooney <i>et al.</i> , (1974); de la Rosa-Manzano <i>et al.</i> (2016)
<i>Oreocereus</i>	Hultine <i>et al.</i> (2016)
<i>Oroya</i>	Keeley and Keeley (1989)
<i>Pachycereus</i>	Mooney <i>et al.</i> (1974); Troughton <i>et al.</i> (1974b); Ricalde <i>et al.</i> (2010), as <i>Stenocereus eichlamii</i> (Britton & Rose) Buxb. = <b><i>Pachycereus eichlamii</i></b> (Britton & Rose) D.R.Hunt; Hultine <i>et al.</i> (2016); Huber <i>et al.</i> (2018)
<i>Parodia</i> , including <i>Notocactus</i>	Troughton <i>et al.</i> (1974b), as <i>Notocactus mammulosus</i> (Lem.) A.Berger = <b><i>Parodia mammulosa</i></b> (Lem.) N.P.Taylor
<i>Peleciphora</i>	Rivera and Smith (1979), Nobel (1981), and Nobel and Hartsock (1986), as <i>Coryphantha vivipara</i> (Nutt.) Britton & Rose = <b><i>Peleciphora vivipara</i></b> (Nutt.) D.Aquino & Dan.Sánchez
<i>Pilosocereus</i>	Ting (1976), as <i>Cephalocereus royenii</i> (L.) Britton & Rose = <b><i>Pilosocereus polygonus</i></b> (Lam.) Byles & G.D.Rowley; Mooney <i>et al.</i> (1989), as <i>Cephalocereus purpusii</i> Britton & Rose = <b><i>Pilosocereus purpusii</i></b> (Britton & Rose) Byles & G.D.Rowley; Ting (1989); Ricalde <i>et al.</i> (2010); Santiago <i>et al.</i> (2017)
<i>Polaskia</i>	Hultine <i>et al.</i> (2016)
<i>Rhipsalis</i>	Dittrich <i>et al.</i> (1973); Smith <i>et al.</i> (1985); Kluge <i>et al.</i> (1995); Ocampo and Columbus (2010)
<i>Schlumbergera</i> , including <i>Zygocactus</i>	Nuernbergk (1961), Bender <i>et al.</i> (1973), Dittrich <i>et al.</i> (1973), Hanscom and Ting (1978), and Sternberg <i>et al.</i> (1984), as <i>Zygocactus truncatus</i> (Haw.) K.Schum. = <b><i>Schlumbergera truncata</i></b> (Haw.) Moran
<i>Sclerocactus</i>	Oeschger and Lerman (1970), as <i>Neolloydia intertexta</i> (Engelm.) L.D.Benson = <b><i>Sclerocactus intertextus</i></b> (Engelm.) N.P.Taylor; Rivera and Smith (1979), as <i>Echinomastus intertextus</i> (Engelm.) Britton & Rose = <b><i>Sclerocactus intertextus</i></b> (Engelm.) N.P.Taylor
<i>Selenicereus</i> , including <i>Hylocereus</i>	Smith <i>et al.</i> (1985), as <i>Hylocereus lemairei</i> (Hook.) Britton & Rose = <b><i>Selenicereus monacanthus</i></b> (Lem.) D.R.Hunt; Mooney <i>et al.</i> (1989), Santiago <i>et al.</i> (2017), and Wang <i>et al.</i> (2019) as <i>Hylocereus undatus</i> (Haw.) Britton & Rose = <b><i>Selenicereus undatus</i></b> (Haw.) D.R.Hunt; Ting (1989), as <i>Hylocereus [trigonatus] trigonus</i> (Haw.) Saff. = <b><i>Selenicereus triangularis</i></b> (L.) D.R.Hunt; Ricalde <i>et al.</i> (2010)
<i>Stenocereus</i> , including <i>Machaerocereus</i> and <i>Ritterocereus</i>	Bender (1971), as <i>Cereus peruvianus</i> C.F.Först. = <b><i>Stenocereus griseus</i></b> (Haw.) Buxb.; Mooney <i>et al.</i> (1974), as <i>Machaerocereus gummosus</i> (Engelm.) Britton & Rose = <b><i>Stenocereus gummosus</i></b> (Engelm.) A.C.Gibson & K.E.Horak; Díaz de Arends (1984), as <i>Ritterocereus griseus</i> (Haw.) Backeb.= <b><i>Stenocereus griseus</i></b> (Haw.) Buxb.; Ting (1989), as <i>Lemaireocereus hystrix</i> (Haw.) Britton & Rose = <b><i>Stenocereus heptagonus</i></b> (L.) Mottram; Hultine <i>et al.</i> (2016); Huber <i>et al.</i> (2018)
<i>Stetsonia</i>	Hultine <i>et al.</i> (2016)
<i>Trichocereus</i>	Mooney <i>et al.</i> (1974), as <i>Eulychnia spinibarbis</i> (Otto ex Pfeiff.) Britton & Rose = <b><i>Trichocereus spinibarbis</i></b> (Otto ex Pfeiff.) F.Ritter
<i>Turbincarpus</i>	de la Rosa-Manzano <i>et al.</i> (2016)
Opuntioideae <i>Austrocylindropuntia</i>	Thomas and Ranson (1954), as <i>Opuntia cylindrica</i> DC. = <b><i>Austrocylindropuntia cylindrica</i></b> (Lam.) Backeb.; Nobel and Hartsock (1986); Keeley and Keeley (1989), as

- Tephrocactus floccosus* (Salm-Dyck) Backeb. =  
***Austrocylindropuntia floccosa*** (Salm-Dyck) F.Ritter;  
Martin and Wallace (2000)
- Consolea* Ting (1976, 1989), as *Opuntia rubescens* Salm-Dyck ex DC. =  
***Consolea rubescens*** (Salm-Dyck ex DC.) Lem.
- Cylindropuntia* Spoehr (1913), as *Opuntia versicolor* Engelm. ex J.M.Coult. =  
***Cylindropuntia thurberi*** (Engelm.) F.M.Knuth ssp.  
*versicolor* (Engelm. ex J.M.Coult.) M.A.Baker; Richards  
(1915), as *Opuntia leptocaulis* DC. = ***Cylindropuntia***  
***leptocaulis*** (DC.) F.M.Knuth; Ting and Dugger (1968), as  
*Opuntia echinocarpa* Engelm. & J.M.Bigelow =  
***Cylindropuntia echinocarpa*** (Engelm. & J.M.Bigelow)  
F.M.Knuth; Patten and Dinger (1969) and Sutton *et al.*  
(1976), as *Opuntia acanthocarpa* Engelm. & J.M.Bigelow =  
***Cylindropuntia acanthocarpa*** (Engelm. & J.M.Bigelow)  
F.M.Knuth; Mooney *et al.* (1974), as *Opuntia fulgida*  
Engelm. = ***Cylindropuntia fulgida*** (Engelm.) F.M.Knuth,  
and *Opuntia prolifera* Engelm. = ***Cylindropuntia prolifera***  
(Engelm.) F.M.Knuth; Rivera and Smith (1979), as *Opuntia*  
*imbricata* (Haw.) DC. = ***Cylindropuntia imbricata*** (Haw.)  
F.M.Knuth; Hultine *et al.* (2016)
- Grusonia* Hultine *et al.* (2016)
- Maihueniopsis* Mooney *et al.* (1974), as *Opuntia ovata* Pfeiff. =  
***Maihueniopsis ovata*** (Pfeiff.) F.Ritter; Llano and Ugan  
(2014)
- Opuntia*, including *Nopalea* de Saussure (1804); Richards (1915); Spoehr (1919); Master  
(1959); Kausch (1965); Ting and Dugger (1968); Osmond *et al.*  
(1973); Szarek *et al.* (1973); Mooney *et al.* (1974);  
Nisbet and Patten (1974); Sutton *et al.* (1976); Ziegler  
(1979); Díaz de Arends (1984); Mooney *et al.* (1989), as  
*Nopalea karwinskiana* (Salm-Dyck) K.Schum. = ***Opuntia***  
***karwinskiana*** Salm-Dyck; Ting (1989), as *Nopalea*  
[*cochinellifera*] *cochinellifera* (L.) Salm-Dyck = ***Opuntia***  
***cochinellifera*** (L.) Mill.; Ocampo and Columbus (2010);  
Ricalde *et al.* (2010); Santiago *et al.* (2017), as *Nopalea*  
*gaumeri* Britton & Rose = ***Opuntia inaperta*** (Schott ex  
Griffiths) D.R.Hunt
- Pereskioopsis* Nobel and Hartsock (1986); Martin and Wallace (2000);  
Ricalde *et al.* (2010)
- Pterocactus* Llano and Ugan (2014)
- Quiabentia* Nobel and Hartsock (1986); Martin and Wallace (2000)
- Tephrocactus* Bender (1971), as *Opuntia strobiliformis* A.Berger =  
***Tephrocactus articulatus*** (Pfeiff.) Backeb.
- Pereskioideae *Maihuenia* Nobel and Hartsock (1986); Martin and Wallace (2000);  
Ocampo and Columbus (2010); Llano and Ugan (2014)
- Pereskia*<sup>19</sup> Rayder and Ting (1981); Díaz and Medina (1984); Martin  
and Wallace (2000); Edwards and Diaz (2006); Ocampo  
and Columbus (2010)
- GENTIANALES
- Rubiaceae**
- Rubioideae *Hydnophytum* Winter *et al.* (1983); Holtum *et al.* (2016)
- Myrmecodia* Winter *et al.* (1983); Tsen and Holtum (2012)
- Squamellaria* Chomicki and Renner (2016)
- Apocynaceae**
- Apocynoideae *Pachypodium* von Willert *et al.* (1980, 1992)

Asclepiadoideae	<i>Apteranthes</i>	Lange <i>et al.</i> (1975) and Winter <i>et al.</i> (1976), as <i>Caralluma negevensis</i> D.Zohary = <i>Apteranthes europaea</i> (Guss.) Murb. <b>var. judaica</b> (Zohary) Plowes
	<i>Boucerosia</i> , including <i>Frerea</i>	Lange and Zuber (1977), as <i>Frerea indica</i> Dalzell = <i>Boucerosia frerei</i> (G.D.Rowley) Meve & Liede; Reddy and Das (1978), as <i>Caralluma lasiantha</i> (Wight) N.E.Br. = <i>Boucerosia umbellata</i> (Haw.) Wight & Arn.
	<i>Caralluma</i>	Masrahi <i>et al.</i> (2012)
	<i>Caudanthera</i>	Masrahi <i>et al.</i> (2012), as <i>Caralluma edulis</i> (Edgew.) Benth. ex Hook.f. = <i>Caudanthera edulis</i> (Edgew.) Meve & Liede
	<i>Ceropegia</i> <sup>20</sup>	Warburg (1886), as [ <i>Calopegia</i> ]; Schütte <i>et al.</i> (1967); Ziegler <i>et al.</i> (1981)
	<i>Cynanchum</i> , including <i>Folotsia</i> and <i>Sarcostemma</i>	Schulze <i>et al.</i> (1976) and Rundel <i>et al.</i> (1999), as <i>Sarcostemma viminalis</i> (L.) R.Br. = <i>Cynanchum viminalis</i> (L.) L.; Winter <i>et al.</i> (1981), as <i>Sarcostemma australe</i> R.Br. = <i>Cynanchum viminalis</i> (L.) L. <b>ssp. australe</b> (R.Br.) Meve & Liede; Kluge <i>et al.</i> (1995), as <i>Folotsia madagascariensis</i> (Jum. & H.Perrier) Desc. = <i>Cynanchum toliari</i> Liede & Meve
	<i>Desmidorchis</i>	Masrahi <i>et al.</i> (2011, 2012), as <i>Caralluma acutangula</i> (Decne.) N.E.Br. = <i>Desmidorchis retrospiciens</i> Ehrenb.
	<i>Dischidia</i>	Winter <i>et al.</i> (1983); Treseder <i>et al.</i> (1995); Martin <i>et al.</i> (2009)
	<i>Duvalia</i>	Masrahi <i>et al.</i> (2015)
	<i>Hoodia</i>	Schulze <i>et al.</i> (1976); Mooney <i>et al.</i> (1977a), as <i>Trichocaulon pedicellatum</i> Schinz = <i>Hoodia pedicellata</i> (Schinz) Plowes
	<i>Hoya</i>	de Vries (1884); Warburg (1886); Nuernbergk (1961); Bender (1971); Dittrich <i>et al.</i> (1973); Winter <i>et al.</i> (1983); Rayder and Ting (1983b); Sternberg <i>et al.</i> (1984); Martin <i>et al.</i> (2009)
	<i>Huernia</i>	Dittrich <i>et al.</i> (1973); Spalding <i>et al.</i> (1979)
	<i>Orbea</i>	Nuernbergk (1961), as <i>Stapelia variegata</i> L. = <i>Orbea variegata</i> (L.) Haw.; Bender (1971), as <i>Stapelia semota</i> N.E.Br. = <i>Orbea semota</i> (N.E.Br.) L.C.Leach
	<i>Quaqua</i>	Mooney <i>et al.</i> (1977a), as <i>Caralluma mammillaris</i> (L.) N.E.Br. = <i>Quaqua mammillaris</i> (L.) Bruyns
	<i>Stapelia</i>	de Saussure (1804); de Vries (1884); Milburn <i>et al.</i> (1968); Dittrich <i>et al.</i> (1973)
LAMIALES		
<b>Plantaginaceae</b>	<i>Littorella</i>	Madsen (1987); Keeley (1996)
<b>Gesneriaceae</b>		
Didymocarpoideae	<i>Haberlea</i>	Markovska <i>et al.</i> (1989, 1997); Markovska (1999)
	<i>Ramonda</i>	Markovska <i>et al.</i> (1989, 1997)
Gesnerioideae	<i>Codonanthis</i>	Guralnick <i>et al.</i> (1986), as <i>Codonanthis crassifolia</i> (H.Focke) C.V.Morton = <i>Codonanthis crassifolia</i> (H.Focke) Chautems & Mat.Perret; Holtum and Winter (2005), as <i>Codonanthis uleana</i> Fritsch = <i>Codonanthisopsis uleana</i> (Fritsch) Chautems & Mat.Perret
<b>Lamiaceae</b>		
Lamioideae	<i>Marrubium</i>	Markovska and Dimitrov (2001)



Nepetoideae	<i>Coleus</i>	Kluge and Ting (1978), as <i>Plectranthus prostratus</i> Gürke = <b><i>Coleus prostratus</i></b> (Gürke) A.J.Paton; von Willert <i>et al.</i> (1992) and Herppich and Herppich (1996), as <i>Plectranthus marrubioides</i> Holchst. ex Benth. = <b><i>Coleus cylindraceus</i></b> (Holchst. ex Benth.) A.J.Paton; Ramana and Chaitanya (2015); Winter <i>et al.</i> (2021c)
ASTERALES		
<b>Asteraceae</b>		
Asteroideae	<i>Baculellum</i>	Thoday and Evans (1931) and Thoday and Jones (1939), as <i>Kleinia articulata</i> (L.f.) Haw. = <b><i>Baculellum articulatum</i></b> (L.f.) L.V.Ozerova & A.C.Timonin
	<i>Caputia</i>	Schütte <i>et al.</i> (1967), as <i>Kleinia tomentosa</i> Haw. = <b><i>Caputia tomentosa</i></b> (Haw.) B.Nord. & Pelser; Sternberg <i>et al.</i> (1984), Ruess and Eller (1985), and Griffiths (1988), as <i>Senecio medley-woodii</i> Hutch. = <b><i>Caputia medley-woodii</i></b> (Hutch.) B.Nord. & Pelser
	<i>Crassothonna</i>	von Willert <i>et al.</i> (1992), as <i>Othonna opima</i> Merxm. = <b><i>Crassothonna opima</i></b> (Merxm.) B.Nord.
	<i>Curio</i>	Warburg (1886), as <i>Senecio [crassifolia]</i> (DC.) Sch.Bip. = <b><i>Curio crassulifolius</i></b> (DC.) P.V.Heath; Thoday and Richards (1944), as <i>Kleinia radicans</i> (L.f.) Haw. = <b><i>Curio radicans</i></b> (L.f.) P.V.Heath; Thomas and Ranson (1954) and Dittrich <i>et al.</i> (1973), as <i>Kleinia repens</i> (L.) Haw. = <b><i>Curio repens</i></b> (L.) P.V.Heath; Nuernbergk (1961), as <i>Senecio [herreana]</i> Dinter = <b><i>Curio radicans</i></b> (Dinter) P.V.Heath; Mooney <i>et al.</i> (1977a), Sternberg <i>et al.</i> (1984), and Fioretto and Alfani (1988), as <i>Senecio radicans</i> (L.f.) Sch.Bip. = <b><i>Curio radicans</i></b> (L.f.) P.V.Heath; Earnshaw <i>et al.</i> (1987), as <i>Senecio mandraliscae</i> (Tineo) H.Jacobsen = <b><i>Curio talinoides</i></b> var. <b><i>mandraliscae</i></b> (Tineo) P.V.Heath; von Willert <i>et al.</i> (1992), as <i>Senecio corymbifer</i> DC. = <b><i>Curio corymbifer</i></b> (DC.) Eggli; Egbert and Martin (1999), as <i>Senecio rowleyanus</i> H.Jacobsen = <b><i>Curio rowleyanus</i></b> (H.Jacobsen) P.V.Heath
	<i>Kleinia</i> , including <i>Notonia</i>	Schütte <i>et al.</i> (1967), as <i>Senecio cephalophorus</i> (Compton) H.Jacobsen = <b><i>Kleinia cephalophora</i></b> Compton; Milburn <i>et al.</i> (1968) and Dittrich (1976), as <i>Notonia petraea</i> R.E.Fr. = <b><i>Kleinia petraea</i></b> (R.E.Fr.) C.Jeffrey; Bender (1971), as <i>Senecio gregorii</i> (S.Moore) H.Jacobsen = <b><i>Kleinia gregorii</i></b> (S.Moore) C.Jeffrey; Szarek and Ting (1977) and Fioretto and Alfani (1988), as <i>Senecio stapeliiformis</i> E.Phillips = <b><i>Kleinia stapeliiformis</i></b> Stapf; Chellappan <i>et al.</i> (1980), as <i>Notonia grandiflora</i> DC. = <b><i>Kleinia grandiflora</i></b> (Wall. ex DC.) N.Rani; von Willert <i>et al.</i> (1983, 1992) and Rundel <i>et al.</i> (1999), as <i>Senecio longiflorus</i> (DC.) Sch.Bip. = <b><i>Kleinia longiflora</i></b> DC.
	<i>Othonna</i>	Schütte <i>et al.</i> (1967); von Willert <i>et al.</i> (1992)
	<i>Senecio</i>	Dittrich (1976); Fioretto and Alfani (1988)

<sup>1</sup>For genera in which many CAM species have been segregated (e.g., *Microcoelia*), only those synonyms are listed for which CAM activity had been reported in the original publications.

<sup>2</sup>*Lecanopteris*: based on observations of statistically significant day–night changes in leaf titratable acidity.

<sup>3</sup>The monotypic *Anetium citrifolium* (L.) Splitg. has been proposed to be included in *Polytaenium* as *P. citrifolium* (L.) Schuettp.

<sup>4</sup>Smith and Epstein (1971) reported a  $\delta^{13}\text{C}$  value for *Welwitschia mirabilis* of  $-14.4\text{‰}$ , which is anomalously high. Values for plants sampled from field sites in Namibia have ranged between  $-17.39$  and  $-23.31\text{‰}$  (Schulze *et al.*, 1976; von Willert *et al.*, 1982, 2005), whereas cultivated material has been recorded with a value as low as  $-25.8\text{‰}$  (Ting and Burk, 1983).

<sup>5</sup>Based on unpublished  $\delta^{13}\text{C}$  values in Orchidaceae derived from herbarium material of *Caluera*, *Capanemia*, *Domingoa*, *Hintonella*, *Macradenia*, *Platyrhiza*, *Quekettia*, *Tolunnia*, *Warmingia*, and *Zygostates*.

<sup>6</sup>The most recent holistic phylogenetic treatments of Asphodelaceae are not well resolved (Treutlein *et al.*, 2003), but all phylogenies show Asphodeloideae as polyphyletic (e.g., Treutlein *et al.*, 2003; Manning *et al.*, 2014), with *Bulbine* generally sister to Aloioideae, as summarized by Smith and Figueiredo (2020).

<sup>7</sup>*Bulbine*: based on observations of statistically significant day–night changes in leaf titratable acidity.

<sup>8</sup>*Sansevieria* has been proposed to be subsumed within *Dracaena* (Lu and Morden, 2014; Mabberley, 2017; Takawira-Nyanya *et al.*, 2018).

<sup>9</sup>*Ochagavia*: based on observations of statistically significant day–night changes in leaf titratable acidity.

<sup>10</sup>The segregation of *Ursulaea* from *Aechmea* (which is highly polyphyletic) is accepted here following the taxonomy of Bratzel *et al.* (2023) and Gouda and Butcher (2023).

<sup>11</sup>The genera *Bakerantha* and *Mesoamerantha* have been proposed to be segregated from *Hechtia* as early-diverging lineages within Hechtioideae (Ramírez-Morillo *et al.*, 2018a,b); both would contain at least one CAM taxon (cf. Crayn *et al.*, 2015).

<sup>12</sup>*Josemania* has been considered a synonym of *Cipuropsis* (POWO, 2023), but we follow Barfuss *et al.* (2016) and Gouda and Butcher (2023) in recognizing *Josemania* as a distinct genus.

<sup>13</sup>All Crassulaceae are assumed CAM; the genera presented here are those with published data confirming CAM.

<sup>14</sup>*Prepodesma* is accepted, as the large dawn–dusk difference in titratable acidity reported for this taxon by Winter (2019) was reanalysed and shown to be statistically significant at  $P < 0.10$ .

<sup>15</sup>*Sarcozona*: based on observations of statistically significant day–night changes in leaf titratable acidity.

<sup>16</sup>*Calandrinia* is non-monophyletic (Hancock *et al.*, 2019) and CAM has only been observed in the monophyletic clade that includes all Australian members of *Calandrinia sensu lato*.

<sup>17</sup> $\delta^{13}\text{C}$  values were measured using a Finnigan DELTAplusXL mass spectrometer (Waltham, MA, USA) from dried, finely ground leaves.  $\delta^{13}\text{C}$  values skewed towards CAM-like values:  $-18.635\text{‰}$  (accession EJE253),  $-17.932\text{‰}$  (accession EJE254), and  $-26.482\text{‰}$  (accession EJE255), suggesting that *H. ameghinoi* is a  $\text{C}_3$ +CAM species.

<sup>18</sup>All cacti are assumed CAM; the genera presented here are those with published data confirming CAM.

<sup>19</sup>We do not include *Leuenbergeria*, but recognize that *Pereskia* is non-monophyletic.

<sup>20</sup>*Ceropegia* has recently been shown to be polyphyletic, with *Brachystelma* and the stem-succulent stapeliads (including *Apteranthes*, *Caralluma*, *Caudanthera*, *Boucerosia*, *Duvalia*, *Hoodia*, *Huernia*, *Orbea*, *Quaqua*, and *Stapelia*) nested within it. These genera are still recognized by Kew (POWO, 2023) and other authorities (Endress *et al.*, 2018), but have been proposed to be subsumed within an expanded and recircumscribed *Ceropegia* (Bruyns *et al.*, 2017).

TABLE S2. Lineages reported or suspected to use CAM, but for which further corroborative evidence is required.

Taxon	Malate or acid accumulation	Habit	Notes
<b>Aizoaceae</b>			
<i>Aizoanthemopsis hispanica</i> (L.) Klak (reported as <i>Aizoon hispanicum</i> L.)	N/A	Succulent herb	Reported $\delta^{13}\text{C} = -23.22\%$ (Ziegler <i>et al.</i> , 1981), but this on its own does not distinguish between $\text{C}_3$ and $\text{C}_3+\text{CAM}$ .
<i>Aizoanthemum galenioides</i> (Fenzl ex Sond.) Friedrich	N/A	Succulent herb	Listed in Smith and Winter (1996), but reported $\delta^{13}\text{C} = -22.0\%$ (Mooney <i>et al.</i> , 1977a) on its own does not distinguish between $\text{C}_3$ and $\text{C}_3+\text{CAM}$ .
<i>Aloinopsis malherbei</i> (L.Bolus) L.Bolus (reported as <i>Nananthus [malherbi]</i> L.Bolus) ( $\text{C}_3$ )	N/A	Succulent herb	Listed by Black and Williams (1976) and Szarek and Ting (1977), based on $\delta^{13}\text{C}$ ratio of $-30.5\%$ (Bender <i>et al.</i> , 1973), but described as ‘suspected to be CAM’. Incorrectly listed under ‘Crassulaceae’ in these publications.
<i>Amoebophyllum</i>	N/A	Succulent herb	Listed in Smith and Winter (1996), but now synonymized under <i>Glottiphyllum</i> and <i>Mesembryanthemum</i> .
<i>Lapidaria</i>	N/A	Succulent herb	Listed in Smith and Winter (1996), but primary evidence not found.
<i>Leipoldtia</i>	N/A	Succulent herb	Listed in Smith and Winter (1996). Two species reported by Rundel <i>et al.</i> (1999) both had $\text{C}_3$ -type $^{13}\text{C}$ ratios (expressed in $\Delta$ notation): <i>L. schultzei</i> (Schltr. & Diels) Friedrich and <i>L. weigangiana</i> (Dinter) Dinter & Schwantes ex H.Jacobsen.
<i>Mestoklema</i>	N/A	Succulent herb	Listed in Smith and Winter (1996). Kluge <i>et al.</i> (1995) reported an isotope ratio of $-22.8$ (3?) $\%$ for ‘ <i>Mestoklema</i> sp.’, but this does not distinguish between $\text{C}_3$ and $\text{C}_3+\text{CAM}$ .
<i>Platythya</i>	N/A	Succulent herb	Listed in Smith and Winter (1996), but now synonymized under <i>Mesembryanthemum</i> .
<i>Rhombophyllum</i>	N/A	Succulent herb	Listed in Smith and Winter (1996), but primary evidence not found.
<i>Ruscianthemum</i>	N/A	Succulent herb	Listed in Smith and Winter (1996), but now synonymized under <i>Stoeberia</i> .
<b>Amaranthaceae sensu lato (including Chenopodiaceae)</b>			
<i>Arthrocaulon macrostachyum</i> (Moric.) Piirainen & G.Kadereit (reported as <i>Salicornia virginica</i> L.) ( $\text{C}_3$ )	N/A	Succulent halophytic shrub	Mentioned in listing of Black and Williams (1976), based on succulence and dark fixation of $^{14}\text{CO}_2$ (Webb and Burley, 1965).
<i>Halothamnus subaphyllus</i> (C.A.Mey.) Botsch. (reported as <i>Aellenia subaphylla</i> (C.A.Mey.) Aellen) ( $\text{C}_4$ )	Small	Succulent halophytic shrub	Low rate of dark $^{14}\text{CO}_2$ fixation and incorporation into malate (Zalenskii and Glagoleva, 1981).

<i>Haloxylon ammodendron</i> (C.A.Mey.) Bunge ex Fenzl (reported as <i>Haloxylon</i> <i>aphyllum</i> (Minkw.) Iljin) (C <sub>4</sub> )	Small	Succulent halophytic shrub	Low rate of dark <sup>14</sup> CO <sub>2</sub> fixation and incorporation into malate and finally into sugars in the light (Zalenskiĭ and Glagoleva, 1981).
<i>Haloxylon persicum</i> Bunge (C <sub>4</sub> )	Small	Succulent halophytic shrub	δ <sup>13</sup> C = -11.8‰ (Zalenskiĭ and Glagoleva, 1981).
<i>Horaninovia ulicina</i> Fisch. & C.A.Mey. (C <sub>3</sub> )	Small	Succulent halophytic shrub	Low rate of dark <sup>14</sup> CO <sub>2</sub> fixation and incorporation into malate (Zalenskiĭ and Glagoleva, 1981).
<i>Salsola kali</i> L. (C <sub>4</sub> )	N/A	Succulent halophytic shrub	Mentioned in listing of Black and Williams (1976), based on succulence (Delf, 1912).
<i>Salsola praecox</i> (Litv.) Litv. (C <sub>4</sub> )	Small	Succulent halophytic shrub	Low rate of dark <sup>14</sup> CO <sub>2</sub> fixation and incorporation into malate (Zalenskiĭ and Glagoleva, 1981).
<i>Salicornia europaea</i> L. (reported as <i>S. annua</i> Sm. and <i>S.</i> <i>herbacea</i> L.) (C <sub>3</sub> )	N/A	Succulent halophytic shrub	Mentioned in listing of Black and Williams (1976), based on succulence (Delf, 1912; James, 1958) and dark fixation of <sup>14</sup> CO <sub>2</sub> (Webb and Burley, 1965).
<i>Salicornia meyeriana</i> Moss (C <sub>3</sub> )	Small	Succulent halophytic shrub	Up to 30% increase in nocturnal acidity (Schütte <i>et al.</i> , 1967).
<i>Suaeda maritima</i> (L.) Dumort. (C <sub>3</sub> )	N/A	Succulent halophytic shrub	Mentioned in listing of Black and Williams (1976), based on succulence (Delf, 1912).
<i>Xylosalsola richteri</i> (Moq.) Akhani & Roalson (reported as <i>Salsola richteri</i> (Moq.) Karel ex Litv.) (C <sub>4</sub> )	Small	Succulent halophytic shrub	Low rate of dark <sup>14</sup> CO <sub>2</sub> fixation and incorporation into malate; δ <sup>13</sup> C = -13.8‰ (Zalenskiĭ and Glagoleva, 1981).
<b>Amaryllidaceae</b>			
<i>Clivia nobilis</i> Lindl. (C <sub>3</sub> )	Small	Herbaceous, evergreen perennial	Small degree of daytime decrease in acidity reported by Warburg (1886), but no subsequent confirmation; family listed containing at least one CAM species by Reinert and Blankenship (2010).
<i>Haemanthus</i> (C <sub>3</sub> )	Small	Herbaceous, evergreen bulbous perennial	Small degree of daytime decrease in acidity reported in <i>Haemanthus [albus]</i> by Warburg (1886), but no subsequent confirmation. POWO (2023) does not list <i>H. albus</i> as a recognized taxon; it is likely Warburg (1886) studied <i>H. albiflos</i> Jacq.
<i>Pancratium</i> sp. (C <sub>3</sub> )	Small	Herbaceous, bulbous perennial	Small degree of daytime decrease in acidity reported by Warburg (1886), but no subsequent confirmation.
<b>Apiaceae</b>			
<i>Lilaeopsis lacustris</i> A.W.Hill (C <sub>3</sub> )	Small to moderate	Aquatic/submerged	No malate or acid accumulation has been observed in other <i>Lilaeopsis</i> species (Webb <i>et al.</i> , 1988; Keeley, 1998).
<b>Apocynaceae</b>			
<i>Adenium</i>	N/A	Stem-succulent shrub	Has been mentioned in the context of stem succulence, but no confirmed reports of CAM. The basionym of <i>Pachypodium namaquanum</i> (Wyley ex Harv.) Welw. is <i>Adenium</i> <i>namaquanum</i> Wyley ex Harv. (Rao <i>et al.</i> , 1979).
<i>Carissa spinarum</i> L. (C <sub>3</sub> )	Moderate to strong	Thin-leaved shrub to small tree	Nocturnal stomatal conductance, accumulation of malate, and PEPC activity, but C <sub>3</sub> -like δ <sup>13</sup> C ratios observed in the field (Rao <i>et al.</i> , 1979).

**Arecaceae**

*Phoenix dactylifera* L. (C<sub>3</sub>)      N/A      Evergreen palm      Small degree of daytime decrease in acidity reported by Warburg (1886), but no subsequent confirmation.

**Aristolochiaceae**

*Aristolochia bracteolata* Lam.      N/A      Prostrate perennial      Apparently large day-night changes in titratable acidity (Deshmukh and Murumkar, 1996); not yet confirmed in independent studies.  
(reported as *A. bracteata* ['Ritz.'] Retz.) (C<sub>3</sub>)

**Asteraceae**

*Borrhchia frutescens* (L.) DC.      N/A      Halophytic herb      Mentioned in listing of Black and Williams (1976), based on succulence and dark fixation of <sup>14</sup>CO<sub>2</sub> (Webb and Burley, 1965).  
(C<sub>3</sub>)

*Delairea odorata* Lem. (reported as *Senecio scandens* DC. by Fioretto and Alani (1988) and as *Senecio mikanioides* Otto ex Walp. by Sternberg *et al.* (1984)) (C<sub>3</sub>+CAM)      Small      Climbing vine with slightly succulent stems      Fioretto and Alfani (1988) report both significant and non-significant day-night changes in titratable acidity and δ<sup>13</sup>C ratio > -28‰. Sternberg *et al.* (1984) label this species as CAM-cycling. *D. odorata* is a member of the *Curio* alliance, which contains multiple other C<sub>3</sub>+CAM lineages.

[*Hoplophytum grande* É.Morren ex Baker (CAM)]      Moderate      Epiphyte      Mentioned in listing of Black and Williams (1976), based on nighttime acidification recorded by Warburg (1886), but erroneously included under Asteraceae ('Compositae'). This taxon belongs to family Bromeliaceae and is now known under its basionym *Aechmea mexicana* Baker.

*Jacobaea aquatica* (Hill) G.Gaertn., B.Mey. & Scherb. (reported as *Senecio aquaticus* Hill) (C<sub>3</sub>)      Small      Mesic herb      Fioretto and Alfani (1988) observed small fluctuations in acidity and malic acid content, albeit with standard deviations of a similar magnitude; no net-positive dark-period CO<sub>2</sub> fixation was observed, and δ<sup>13</sup>C was approximated -27‰.

*Mikania micrantha* Kunth (C<sub>3</sub>)      Small      Sprawling vine      Claimed by Liu *et al.* (2020) to show CAM activity based on evidence from enzyme activity assays, some degree of nocturnal stomatal opening, and nocturnal malate accumulation. Reported day-night changes in malate in Liu *et al.* (2020) appear to be very small (approx. 0.26 mM).

*Tripolium pannonicum* (Jacq.) Dobroc. ssp. *tripolium* (L.) Greuter (reported as *Aster tripolium* L.) (C<sub>3</sub>)      Moderate      Succulent halophytic herb      Nocturnal malate accumulation and reduced rate of respiratory CO<sub>2</sub> release towards end of night (Ganzmann and von Willert, 1972).

**Basellaceae**

*Ullucus tuberosus* Caldas (C<sub>3</sub>)      NA      Fleshy-leaved perennial with large tubers      Member of Portulacineae but only C<sub>3</sub>-like δ<sup>13</sup>C ratios have been reported (-25.8‰) (Szpak *et al.*, 2013).

**Bataceae**

*Batis maritima* L. (C<sub>3</sub>)      N/A      Succulent halophytic herb      Mentioned in listing of Black and Williams (1976), based on succulence (Delf, 1912) and dark fixation of <sup>14</sup>CO<sub>2</sub> (Webb and Burley, 1965). δ<sup>13</sup>C = -26.4‰ (Lüttge *et al.*, 1989b).

**Brassicaceae**

*Thlaspi arvense* L. (C<sub>3</sub>) Small Annual herb, predominantly temperate Day-night changes in titratable acidity (Murumkar *et al.*, 1991); not yet confirmed in independent studies.

**Bromeliaceae**

*Catopsis nutans* (Sw.) Griseb. (C<sub>3</sub>) Small Tank-forming epiphyte Medina (1974) observed small dark-period malate accumulation, but no net dark-period CO<sub>2</sub> fixation.

*Guzmania lingulata* (L.) Mez N/A Epiphyte Dittrich *et al.* (1973) measured relatively high activities of PEP carboxylase and PEP carboxykinase in this taxon, which is a shade-tolerant epiphyte with C<sub>3</sub>-type  $\delta^{13}\text{C}$  values that has shown no evidence of dark CO<sub>2</sub> fixation or significant day–night changes in titratable acidity (Medina, 1974; Griffiths and Smith, 1983; Smith *et al.*, 1985; Beltrán *et al.*, 2013).

*Vriesea platynema* Gaudich. (C<sub>3</sub>) Small Tank-forming epiphyte Medina (1974) observed small dark-period malate accumulation, but no net dark-period CO<sub>2</sub> fixation.

**Campanulaceae**

*Downingia bella* Hoover (C<sub>3</sub>) Small Submerged aquatic macrophyte Small fluctuation in malate but no fluctuations in titratable acidity; PEPC and PPDK activities similar to other aquatic CAM lineages (Keeley, 1998).

**Capparaceae**

*Cadaba aphylla* (Thunb.) Wild (CAM or C<sub>4</sub>?) N/A Leafless spinose shrub Schulze *et al.* (1976) reported a  $\delta^{13}\text{C}$  ratio of –16.93‰ for material sampled from its natural habitat; Winter (2019) suggested this taxon warrants investigation for CAM (or C<sub>4</sub>) activity.

*Capparis decidua* (Forssk.) Edgew. (C<sub>3</sub>) N/A Leafless spinose shrub Small day–night change in titratable acidity in stem tissue (Patil and Murumkar, 2017); not yet confirmed in independent studies.

**Caryophyllaceae**

*Honckenya peploides* (L.) Ehrh. (reported as *Arenaria peploides* L.) (C<sub>3</sub>) N/A Succulent halophytic herb Mentioned in listing of Black and Williams (1976), based on succulence (Delf, 1912).

**Celastraceae**

*Gymnosporia emarginata* [Laws.?] (Willd.) Thwaites (C<sub>3</sub>) Moderate to strong Thin-leaved shrub Nocturnal stomatal conductance, accumulation of malate, and PEPC activity, but C<sub>3</sub>-like  $\delta^{13}\text{C}$  ratios observed in the field (Rao *et al.*, 1979).

**Commelinaceae**

*Murdannia nudiflora* (L.) Brenan (reported as *Commelina nudiflora* L.) (C<sub>3</sub>) Moderate Prostrate perennial herb Substantial day-night changes in titratable acidity (Deshmukh and Murumkar, 2013); not yet confirmed in independent studies.

**Crassulaceae**

*Parvisedum* (C<sub>3</sub>+CAM) N/A Succulent herb Listed in Smith and Winter (1986), but no positive evidence of CAM activity (cf. Teeri *et al.*, 1981). Now synonymized under *Sedum*.

**Cyperaceae**

<i>Isolepis setacea</i> (L.) R.Br. (reported as <i>Scirpus setaceus</i> Thunb.) (C <sub>3</sub> )	Small	Aquatic/submerged	Keeley and Morton (1982)
<i>Schoenoplectus subterminalis</i> (Torr.) Soják (reported as <i>Scirpus subterminalis</i> Torr.) (C <sub>3</sub> )	Small	Aquatic/submerged	Beer and Wetzel (1981) found slight acid fluctuations, nocturnal malate accumulation, and elevated PEPC:Rubisco ratios.

**Didiereaceae**

<i>Calyptrorhiza</i> (C <sub>3</sub> )	NA	Succulent-leaved caudiciform shrub	To our knowledge, the only known $\delta^{13}\text{C}$ ratios are −24.86‰ ( <i>C. somalensis</i> Gilg) and −23.34‰ ( <i>C.</i> <i>taitensis</i> (Pax & Vatke) Brenan), consistent with C <sub>3</sub> +CAM but not conclusive (Sikolia <i>et al.</i> , 2008).
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**Ebenaceae**

<i>Diospyros ferrea</i> (Lour.) A.Chev. (reported as <i>Maba</i> <i>buxifolia</i> [Cl.?] Ch.) (C <sub>3</sub> )	Moderate to strong	Thin-leaved tree	Nocturnal stomatal conductance, accumulation of malate, and PEPC activity but C <sub>3</sub> -like $\delta^{13}\text{C}$ ratios observed in the field (Rao <i>et al.</i> , 1979)
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**Elatinaceae**

<i>Elatine californica</i> A.Gray (C <sub>3</sub> )	Small	Aquatic/submerged	Small fluctuation in malate but no fluctuations in titratable acidity; low PEPC activity and no detectable PPDk (Keeley, 1998).
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**Fabaceae**

<i>Prosopis juliflora</i> (Sw.) DC. (C <sub>3</sub> )	Small to moderate	Thin-leaved tree	Szarek and Ting (1977) and Sayed (2001) in their compilations cite Gaur (1968), who measured titratable acidity changes, but claim in text of acidity increases at night conflicts with data presented in Figure, which appear to show the opposite.
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**Geraniaceae**

<i>Geranium pratense</i> L. (C <sub>3</sub> )	Unknown	Thin-leaved herb, primarily temperate	700% nocturnal increase in titratable acidity is noted in Table VII of Bennet-Clark (1933), citing an observation of Kraus (1883), but absolute magnitude is unknown. This taxon was included in the CAM listings of Szarek and Ting (1977) and Kluge and Ting (1978), but Thomas and Beever (1949) noted that they could detect no day–night fluctuation in acidity in this species.
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**Haloragaceae**

<i>Myriophyllum quitense</i> Kunth (C <sub>3</sub> )	Small	Aquatic/submerged	Small fluctuation in malate but no fluctuations in titratable acidity (Keeley 1998).
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**Hydrangeaceae**

<i>Philadelphus microphyllus</i> A.Gray (reported as <i>P.</i> <i>microphyllus</i> C.L.Hitchc., 'Saxifragaceae', by Smith and Epstein (1971))	N/A	Deciduous shrub	Smith and Epstein (1971) reported a $\delta^{13}\text{C}$ ratio of −17.1‰ for <i>Philadelphus microphyllus</i> (Hydrangeaceae, non Saxifragaceae), but Troughton <i>et al.</i> (1974b) reported C <sub>3</sub> -like values for three other taxa in <i>Philadelphus</i> .
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**Hydrocharitaceae**

<i>Hydrilla verticillata</i> (L.f.) Royle (C <sub>4</sub> )	Small	Aquatic/submerged	Cited in Cockburn (1985). Dark CO <sub>2</sub> fixation up to 30% that of light fixation rates (Holaday and Bowes, 1990); close relative to CAM <i>Vallisneria</i> . <i>Hydrilla</i> appears to perform facultative, single-
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				cell C <sub>4</sub> photosynthesis (von Caemmerer <i>et al.</i> , 2014).
<b>Juncaceae</b>				
<i>Eleocharis maculosa</i> (Vahl) Roem. & Schult. (C <sub>3</sub> )	Small	Aquatic/submerged		*Small fluctuation in malate but no fluctuations in titratable acidity. Pulse–chase experiments show that malate is initially formed in the dark, but little malate remains by the end of the dark period (Keeley, 1998).
<b>Lamiaceae</b>				
<i>Plectranthus parviflorus</i> ‘Henckel’ (C <sub>3</sub> )	N/A	Perennial herb		Listed by Sayed (2001) as a CAM plant, citing Nobel <i>et al.</i> (1975), although that study solely concerned the effects of light intensity on leaf anatomy.
<b>Orchidaceae</b>				
<i>Aerides</i> Lour. (C <sub>3</sub> )	N/A	Epiphytic herb		Hypothesized to use CAM based on mesophyll succulence (Avadhani <i>et al.</i> , 1982).
<i>Calanthe</i> R.Br.	N/A	Epiphytic herb		Hypothesized to use CAM based on mesophyll succulence (Avadhani <i>et al.</i> , 1982).
<b>Orobanchaceae</b>				
<i>Lindenbergia muraria</i> (Roxb. ex D.Don) Brühl (reported as <i>L. urticifolia</i> Lehm.) (C <sub>3</sub> )	N/A	Annual herb		Gaur (1968) cited “Bharuca, F.R. and Dhabolkar, M.V. (1957) J. Univ. Bomb. 26, 3, 48”; but we cannot locate this publication.
<b>Oxalidaceae</b>				
<i>Oxalis</i> sp. (reported as <i>O. carnososa</i> , which could refer to <i>O. magellanica</i> G.Forst., <i>O. mollendoensis</i> J.M.H.Shaw, or <i>O. megalorrhiza</i> Jacq.) (C <sub>3</sub> +CAM?)	Small	Perennial with succulent rootstock and slightly succulent leaves and stems.		Kluge and Ting (1978) reported a diurnal acid change of 55 µeq g <sup>-1</sup> fresh weight; more recent studies of gas exchange and acid fluctuations in <i>O. megalorrhiza</i> Jacq. did not corroborate the presence of CAM in this taxon, and suggested that high (non-fluctuating) acid levels were largely due to the presence of oxalic acid (K. Winter, unpublished). Another ‘partially succulent’, drought-deciduous species of <i>Oxalis</i> from Chile, <i>O. virgosa</i> Molina (reported under the name <i>O. gigantea</i> Barnéoud) had a measured δ <sup>13</sup> C value of -25.2‰ (Mooney <i>et al.</i> , 1974).
<b>Plantaginaceae</b>				
<i>Plantago maritima</i> L. (C <sub>3</sub> )	N/A	Halophytic herb		Mentioned in listing of Black and Williams (1976), based on succulence (Delf, 1912).
<b>Poaceae</b>				
<i>Orcuttia californica</i> Vasey (C <sub>4</sub> )	Small	Aquatic/submerged		Small fluctuation in malate but none in titratable acidity. Pulse–chase experiments show that malate is initially formed in the dark, but little malate remains by the end of the dark period. Malate also accumulates in the light (Keeley, 1998).
<i>Spinifex littoreus</i> (Burm.f.) Merr. (C <sub>4</sub> +CAM)	Small	Perennial semi-succulent grass		Significant nocturnal increases in titratable acidity in some field populations (Ho <i>et al.</i> , 2019); further confirmation needed.



<b>Rapateaceae</b> (C <sub>3</sub> )	N/A	Perennial rhizomatous herbs	Listed in Reinert and Blankenship (2010), but no evidence for CAM presented. Crayn <i>et al.</i> (2001) measured $\delta^{13}\text{C}$ ratios for 85 taxa, which were all C <sub>3</sub> -like, but pointed out that the possibility of low-level CAM activity could not be excluded on the basis of isotope values alone.
<b>Salicaceae</b>			
<i>Flacourtia indica</i> (Burm.f.) Merr. (reported as <i>Flacourtia sepiaria</i> Roxb.) (C <sub>3</sub> )	Moderate to strong	Thin-leaved shrub to small tree	Nocturnal stomatal conductance, accumulation of malate, and PEPC activity but C <sub>3</sub> -like $\delta^{13}\text{C}$ values observed in the field (Rao <i>et al.</i> , 1979).
<b>Salvadoraceae</b>			
<i>Salvadora persica</i> L. (C <sub>3</sub> )	Small to moderate	Tree with thickened leaves	Twigs and thickened leaves have many active compounds with medicinal value. Szarek and Ting (1977) and Sayed (2001) in their compilations cite Gaur (1968), who measured titratable acidity changes, but claim in text of acidity increases at night conflicts with data presented in Figure, which appear to show the opposite. C <sub>3</sub> -like $\delta^{13}\text{C}$ ratios observed in the field (Winter <i>et al.</i> , 1976).
<b>Santalaceae</b>			
<i>Thesium confusum</i> J.C.Manning & F.Forest (reported as <i>Thesidium fragile</i> Sond.) (C <sub>3</sub> )	Small	Succulent hemiparasite	Up to 30% increase in nocturnal acidity (Schütte <i>et al.</i> , 1967).
<i>Viscum</i> sp. (C <sub>3</sub> )	Moderate	Succulent hemiparasite	Unknown succulent <i>Viscum</i> species from South Africa found to have up to 60% increase in nocturnal acidity (Schütte <i>et al.</i> , 1967).
<b>Sapindaceae</b>			
<i>Dodonaea viscosa</i> (L.) Jacq. (C <sub>3</sub> )	Moderate to strong	Thin-leaved shrub	Nocturnal stomatal conductance, accumulation of malate, and PEPC activity, but C <sub>3</sub> -like $\delta^{13}\text{C}$ values observed in the field (Rao <i>et al.</i> , 1979).
<b>Solanaceae</b>			
<i>Nolana rostrata</i> (Lindl.) Miers ex Dunal (reported as <i>Alona rostrata</i> Lindl. under 'Convolvulaceae' in Black and Williams (1976)) (C <sub>3</sub> )	N/A	Perennial subshrub	Mentioned in listing of Black and Williams (1976), based on $\delta^{13}\text{C}$ ratio of $-20.9\text{‰}$ (Troughton <i>et al.</i> , 1974b).
<b>Tamaricaceae</b>			
<i>Tamarix ramosissima</i> Ledeb. (C <sub>3</sub> )	N/A	Deciduous shrub to small tree	Claimed by Yan <i>et al.</i> (2022) to show CAM activity based on gene expression data that show a slight decrease in <i>PEPC</i> transcripts during the day. However, expression was low, not partitioned between paralogs, and further decreased under water stress. Other patterns of photosynthesis and CAM-related gene expression were not consistent; e.g., <i>RBCS</i> transcripts peaked at night, <i>PPDK</i> transcripts were time-invariant, and photosynthetic rates were below zero under all conditions.

**Theaceae**

*Camellia oleifera* C.Abel (C<sub>3</sub>) Small to moderate Thin-leaved shrub Fungal-induced CAM physiology and succulent leaf morphology (Yuan *et al.*, 2012).

**Urticaceae**

*Forsskaolea candida* L.f. (C<sub>3</sub>) N/A Fleshy-leaved shrub  $\delta^{13}\text{C}$  ratio of  $-21.3\text{‰}$  (Rundel *et al.*, 1999) is in range of C<sub>3</sub>+CAM; CAM also present in *Pilea* (Urticaceae)

**Zygophyllaceae**

*Roepera cordifolia* (L.f.) Beier & Thulin (reported as *Zygophyllum cordifolium* L.f.) (C<sub>3</sub>) Small to moderate Succulent shrub Nocturnal increase in titratable acidity under some conditions (Matimati *et al.*, 2012); Rundel *et al.* (1999) reported a  $\delta^{13}\text{C}$  value of  $-24.9\text{‰}$

*Zygophyllum prismatocarpum* Sond. (C<sub>3</sub>) N/A Succulent shrub  $\delta^{13}\text{C}$  ratio in the range of C<sub>3</sub>+CAM:  $-22.3\text{‰}$  (Rundel *et al.*, 1999).

*Zygophyllum stapffii* Schinz (C<sub>3</sub>) N/A Succulent shrub Variable  $\delta^{13}\text{C}$  ratios in the range of C<sub>3</sub>+CAM:  $-21.86\text{‰}$ ,  $-22.21\text{‰}$ ,  $-25.69\text{‰}$  (Schulze *et al.*, 1976).

*Zygophyllum simplex* L. (C<sub>4</sub>) N/A Succulent shrub A C<sub>4</sub> plant with typical  $\delta^{13}\text{C}$  ratios (Schulze *et al.*, 1976; Mooney *et al.*, 1977a; Ziegler *et al.*, 1981), but occasionally mentioned in the context of CAM (Mooney *et al.*, 1977a; Lehmann *et al.*, 2013, 2015; Burke, 2017)

TABLE S3. Estimated CAM species diversity in each genus containing CAM species. See main text for binning methodology. To estimate lower bounds (LB) and upper bounds (UB), we moved every genus either down or up a bin, respectively; genera binned as “few” were recategorized as “rare” (1%) when estimating lower bounds and genera binned as “all” were not altered when estimating upper bounds. Taxonomy and species counts are according to World Checklist of Vascular Plants version 10 (Govaerts *et al.*, 2021), accessed through POWO (2023), which contained 349,036 accepted, non-hybrid species names. Taxa are ordered alphabetically by family and then by genus.

Family	Genus	Species	Bin	Species with CAM (%)	Species with CAM [LB] (%)	Species with CAM [UB] (%)
Aizoaceae	<i>Antimima</i>	106	Most	80 (0.75)	53 (0.5)	106 (1.0)
Aizoaceae	<i>Argyroderma</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Aizoaceae	<i>Astridia</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Aizoaceae	<i>Bergeranthus</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Aizoaceae	<i>Carpobrotus</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Aizoaceae	<i>Carruanthus</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Aizoaceae	<i>Cephalophyllum</i>	34	All	34 (1.0)	26 (0.75)	34 (1.0)
Aizoaceae	<i>Chasmatophyllum</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Aizoaceae	<i>Cheiridopsis</i>	41	All	41 (1.0)	31 (0.75)	41 (1.0)
Aizoaceae	<i>Conophytum</i>	106	All	106 (1.0)	80 (0.75)	106 (1.0)

Aizoaceae	<i>Delosperma</i>	170	Most	128 (0.75)	85 (0.5)	170 (1.0)
Aizoaceae	<i>Disphyma</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Aizoaceae	<i>Dracophilus</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Aizoaceae	<i>Drosanthemopsis</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Aizoaceae	<i>Drosanthemum</i>	110	All	110 (1.0)	83 (0.75)	110 (1.0)
Aizoaceae	<i>Eberlanzia</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Aizoaceae	<i>Faucaria</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Aizoaceae	<i>Fenestraria</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Aizoaceae	<i>Glottiphyllum</i>	16	All	16 (1.0)	12 (0.75)	16 (1.0)
Aizoaceae	<i>Hereroa</i>	28	All	28 (1.0)	21 (0.75)	28 (1.0)
Aizoaceae	<i>Jacobsenia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Aizoaceae	<i>Jordaniella</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Aizoaceae	<i>Lampranthus</i>	123	All	123 (1.0)	93 (0.75)	123 (1.0)
Aizoaceae	<i>Lapidaria</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Aizoaceae	<i>Leipoldtia</i>	13	Most	10 (0.75)	7 (0.5)	13 (1.0)
Aizoaceae	<i>Lithops</i>	38	All	38 (1.0)	29 (0.75)	38 (1.0)
Aizoaceae	<i>Malephora</i>	17	All	17 (1.0)	13 (0.75)	17 (1.0)
Aizoaceae	<i>Mesembryanthemum</i>	106	Most	80 (0.75)	53 (0.5)	106 (1.0)
Aizoaceae	<i>Mestoklema</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Aizoaceae	<i>Meyerophytum</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Aizoaceae	<i>Mitrophyllum</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Aizoaceae	<i>Monilaria</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Aizoaceae	<i>Nananthus</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Aizoaceae	<i>Oscularia</i>	23	All	23 (1.0)	18 (0.75)	23 (1.0)
Aizoaceae	<i>Pleiospilos</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Aizoaceae	<i>Prepodesma</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Aizoaceae	<i>Psammophora</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Aizoaceae	<i>Rabiea</i>	6	Half	3 (0.5)	2 (0.25)	5 (0.75)
Aizoaceae	<i>Rhinephyllum</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Aizoaceae	<i>Rhombophyllum</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Aizoaceae	<i>Ruschia</i>	208	Most	156 (0.75)	104 (0.5)	208 (1.0)
Aizoaceae	<i>Sarcozona</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Aizoaceae	<i>Schlechteranthus</i>	15	All	15 (1.0)	12 (0.75)	15 (1.0)
Aizoaceae	<i>Sesuvium</i>	14	Most	11 (0.75)	7 (0.5)	14 (1.0)
Aizoaceae	<i>Stoeberia</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Aizoaceae	<i>Tetragonia</i>	51	All	51 (1.0)	39 (0.75)	51 (1.0)
Aizoaceae	<i>Titanopsis</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Aizoaceae	<i>Trianthera</i>	29	Half	15 (0.5)	8 (0.25)	22 (0.75)
Aizoaceae	<i>Trichodiadema</i>	32	All	32 (1.0)	24 (0.75)	32 (1.0)
Aizoaceae	<i>Vanheerdea</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Alismataceae	<i>Sagittaria</i>	39	All	39 (1.0)	30 (0.75)	39 (1.0)
Anacampserotaceae	<i>Anacampseros</i>	60	All	60 (1.0)	45 (0.75)	60 (1.0)
Anacampserotaceae	<i>Grahamia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Anacampserotaceae	<i>Talinopsis</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Apocynaceae	<i>Apteranthes</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Apocynaceae	<i>Boucerosia</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Apocynaceae	<i>Caralluma</i>	31	All	31 (1.0)	24 (0.75)	31 (1.0)

Apocynaceae	<i>Caudanthera</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Apocynaceae	<i>Ceropegia</i>	442	Most	332 (0.75)	221 (0.5)	442 (1.0)
Apocynaceae	<i>Cynanchum</i>	261	Most	196 (0.75)	131 (0.5)	261 (1.0)
Apocynaceae	<i>Desmidorchis</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Apocynaceae	<i>Dischidia</i>	126	All	126 (1.0)	95 (0.75)	126 (1.0)
Apocynaceae	<i>Duvalia</i>	18	All	18 (1.0)	14 (0.75)	18 (1.0)
Apocynaceae	<i>Hoodia</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Apocynaceae	<i>Hoya</i>	545	Most	409 (0.75)	273 (0.5)	545 (1.0)
Apocynaceae	<i>Huernia</i>	77	All	77 (1.0)	58 (0.75)	77 (1.0)
Apocynaceae	<i>Orbea</i>	59	All	59 (1.0)	45 (0.75)	59 (1.0)
Apocynaceae	<i>Orthanthera</i>	6	Most	5 (0.75)	3 (0.5)	6 (1.0)
Apocynaceae	<i>Pachypodium</i>	22	Most	17 (0.75)	11 (0.5)	22 (1.0)
Apocynaceae	<i>Quaqua</i>	20	All	20 (1.0)	15 (0.75)	20 (1.0)
Apocynaceae	<i>Stapelia</i>	31	All	31 (1.0)	24 (0.75)	31 (1.0)
Araceae	<i>Zamioculcas</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Asparagaceae	<i>Agave</i>	283	Most	213 (0.75)	142 (0.5)	283 (1.0)
Asparagaceae	<i>Beaucarnea</i>	13	Some	4 (0.25)	1 (0.05)	7 (0.5)
Asparagaceae	<i>Beschorneria</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Asparagaceae	<i>Dracaena</i>	201	Most	151 (0.75)	101 (0.5)	201 (1.0)
Asparagaceae	<i>Furcraea</i>	26	All	26 (1.0)	20 (0.75)	26 (1.0)
Asparagaceae	<i>Hesperaloe</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Asparagaceae	<i>Yucca</i>	51	Most	39 (0.75)	26 (0.5)	51 (1.0)
Asphodelaceae	<i>Aloe</i>	587	All	587 (1.0)	441 (0.75)	587 (1.0)
Asphodelaceae	<i>Aloiampelos</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Asphodelaceae	<i>Aloidendron</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Asphodelaceae	<i>Aristaloe</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Asphodelaceae	<i>Astroloba</i>	12	All	12 (1.0)	9 (0.75)	12 (1.0)
Asphodelaceae	<i>Bulbine</i>	87	Most	66 (0.75)	44 (0.5)	87 (1.0)
Asphodelaceae	<i>Gasteria</i>	26	All	26 (1.0)	20 (0.75)	26 (1.0)
Asphodelaceae	<i>Gonialoe</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Asphodelaceae	<i>Haworthia</i>	59	All	59 (1.0)	45 (0.75)	59 (1.0)
Asphodelaceae	<i>Haworthiopsis</i>	19	All	19 (1.0)	15 (0.75)	19 (1.0)
Asphodelaceae	<i>Kumara</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Asphodelaceae	<i>Tulista</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Asteraceae	<i>Baculellum</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Asteraceae	<i>Caputia</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Asteraceae	<i>Crassothonna</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Asteraceae	<i>Curio</i>	17	All	17 (1.0)	13 (0.75)	17 (1.0)
Asteraceae	<i>Kleinia</i>	55	All	55 (1.0)	42 (0.75)	55 (1.0)
Asteraceae	<i>Othonna</i>	86	Few	5 (0.05)	1 (0.01)	22 (0.25)
Asteraceae	<i>Senecio</i>	1450	Some	363 (0.25)	73 (0.05)	725 (0.5)
Basellaceae	<i>Anredera</i>	12	All	12 (1.0)	9 (0.75)	12 (1.0)
Basellaceae	<i>Basella</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Basellaceae	<i>Ullucus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Bromeliaceae	<i>Acanthostachys</i>	3	Half	2 (0.5)	1 (0.25)	3 (0.75)
Bromeliaceae	<i>Aechmea</i>	251	All	251 (1.0)	189 (0.75)	251 (1.0)
Bromeliaceae	<i>Ananas</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)

Bromeliaceae	<i>Androlepis</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Bromeliaceae	<i>Araeococcus</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Bromeliaceae	<i>Billbergia</i>	62	All	62 (1.0)	47 (0.75)	62 (1.0)
Bromeliaceae	<i>Bromelia</i>	70	All	70 (1.0)	53 (0.75)	70 (1.0)
Bromeliaceae	<i>Canistropsis</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Bromeliaceae	<i>Canistrum</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Bromeliaceae	<i>Cipuropsis</i>	12	Some	3 (0.25)	1 (0.05)	6 (0.5)
Bromeliaceae	<i>Cryptanthus</i>	61	Most	46 (0.75)	31 (0.5)	61 (1.0)
Bromeliaceae	<i>Deinacanthon</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Bromeliaceae	<i>Deuterocohnia</i>	16	All	16 (1.0)	12 (0.75)	16 (1.0)
Bromeliaceae	<i>Disteganthus</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Bromeliaceae	<i>Dyckia</i>	181	All	181 (1.0)	136 (0.75)	181 (1.0)
Bromeliaceae	<i>Edmundoa</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Bromeliaceae	<i>Eduandrea</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Bromeliaceae	<i>Encholirium</i>	33	All	33 (1.0)	25 (0.75)	33 (1.0)
Bromeliaceae	<i>Forzzaea</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Bromeliaceae	<i>Guzmania</i>	208	Some	52 (0.25)	11 (0.05)	104 (0.5)
Bromeliaceae	<i>Hechtia</i>	87	All	87 (1.0)	66 (0.75)	87 (1.0)
Bromeliaceae	<i>Hohenbergia</i>	51	All	51 (1.0)	39 (0.75)	51 (1.0)
Bromeliaceae	<i>Hohenbergiopsis</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Bromeliaceae	<i>Hylaeaicum</i>	12	All	12 (1.0)	9 (0.75)	12 (1.0)
Bromeliaceae	<i>Karawata</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Bromeliaceae	<i>Lemeltonia</i>	7	Few	1 (0.05)	1 (0.01)	2 (0.25)
Bromeliaceae	<i>Lymania</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Bromeliaceae	<i>Neoglaziovia</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Bromeliaceae	<i>Neoregelia</i>	113	All	113 (1.0)	85 (0.75)	113 (1.0)
Bromeliaceae	<i>Nidularium</i>	46	Most	35 (0.75)	23 (0.5)	46 (1.0)
Bromeliaceae	<i>Orthophytum</i>	67	All	67 (1.0)	51 (0.75)	67 (1.0)
Bromeliaceae	<i>Portea</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Bromeliaceae	<i>Pseudaraeococcus</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Bromeliaceae	<i>Puya</i>	230	Some	58 (0.25)	12 (0.05)	115 (0.5)
Bromeliaceae	<i>Quesnelia</i>	24	All	24 (1.0)	18 (0.75)	24 (1.0)
Bromeliaceae	<i>Ronnbergia</i>	20	Most	15 (0.75)	10 (0.5)	20 (1.0)
Bromeliaceae	<i>Sincoraea</i>	11	Most	9 (0.75)	6 (0.5)	11 (1.0)
Bromeliaceae	<i>Tillandsia</i>	649	Most	487 (0.75)	325 (0.5)	649 (1.0)
Bromeliaceae	<i>Werauhia</i>	94	Some	24 (0.25)	5 (0.05)	47 (0.5)
Bromeliaceae	<i>Wittrockia</i>	5	Most	4 (0.75)	3 (0.5)	5 (1.0)
Cactaceae	<i>Acanthocalycium</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Acanthocereus</i>	16	All	16 (1.0)	12 (0.75)	16 (1.0)
Cactaceae	<i>Acharagma</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Airampoa</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Aporocactus</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Ariocarpus</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Cactaceae	<i>Armatocereus</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Arrojadoa</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Arthrocerus</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Astrophytum</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)

Cactaceae	<i>Austrocactus</i>	9	All	9 (1.0)	7 (0.75)	9 (1.0)
Cactaceae	<i>Austrocylindropuntia</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Cactaceae	<i>Aylostera</i>	27	All	27 (1.0)	21 (0.75)	27 (1.0)
Cactaceae	<i>Aztekium</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Bergerocactus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Blossfeldia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Borzicactus</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Brachycereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Brasilicereus</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Brasiliopuntia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Browningia</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Cactaceae	<i>Calymmanthium</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Carnegiea</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Castellanosia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Cephalocereus</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Cactaceae	<i>Cereus</i>	25	All	25 (1.0)	19 (0.75)	25 (1.0)
Cactaceae	<i>Chamaecereus</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Cactaceae	<i>Chichimecactus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Cipocereus</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Cactaceae	<i>Cleistocactus</i>	25	All	25 (1.0)	19 (0.75)	25 (1.0)
Cactaceae	<i>Cochemia</i>	36	All	36 (1.0)	27 (0.75)	36 (1.0)
Cactaceae	<i>Coleocephalocereus</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Consolea</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Cactaceae	<i>Copiapoa</i>	37	All	37 (1.0)	28 (0.75)	37 (1.0)
Cactaceae	<i>Corryocactus</i>	15	All	15 (1.0)	12 (0.75)	15 (1.0)
Cactaceae	<i>Coryphantha</i>	43	All	43 (1.0)	33 (0.75)	43 (1.0)
Cactaceae	<i>Cremonocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Cumarinia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Cumulopuntia</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Cactaceae	<i>Cylindropuntia</i>	41	All	41 (1.0)	31 (0.75)	41 (1.0)
Cactaceae	<i>Deamia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Denmoza</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Discocactus</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Cactaceae	<i>Disocactus</i>	15	All	15 (1.0)	12 (0.75)	15 (1.0)
Cactaceae	<i>Echinocactus</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Cactaceae	<i>Echinocereus</i>	73	All	73 (1.0)	55 (0.75)	73 (1.0)
Cactaceae	<i>Echinopsis</i>	20	All	20 (1.0)	15 (0.75)	20 (1.0)
Cactaceae	<i>Epiphyllum</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Epithelantha</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Eriogyne</i>	56	All	56 (1.0)	42 (0.75)	56 (1.0)
Cactaceae	<i>Escontria</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Espostoa</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Cactaceae	<i>Espositoopsis</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Eulychnia</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Facheiroa</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Ferocactus</i>	30	All	30 (1.0)	23 (0.75)	30 (1.0)
Cactaceae	<i>Frailea</i>	19	All	19 (1.0)	15 (0.75)	19 (1.0)

Cactaceae	<i>Geohintonia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Grusonia</i>	20	All	20 (1.0)	15 (0.75)	20 (1.0)
Cactaceae	<i>Gymnocalycium</i>	66	All	66 (1.0)	50 (0.75)	66 (1.0)
Cactaceae	<i>Haageocereus</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Harrisia</i>	18	All	18 (1.0)	14 (0.75)	18 (1.0)
Cactaceae	<i>Hattiora</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Isolatocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Jasminocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Kadenicarpus</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Kroenleinia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Lagenosocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Lasiocereus</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Lemaireocereus</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Leocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Lepismium</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Cactaceae	<i>Leptocereus</i>	15	All	15 (1.0)	12 (0.75)	15 (1.0)
Cactaceae	<i>Leuchtenbergia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Leucostele</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Cactaceae	<i>Leuenbergeria</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Lobivia</i>	28	All	28 (1.0)	21 (0.75)	28 (1.0)
Cactaceae	<i>Lophocereus</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Lophophora</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Loxanthocereus</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Cactaceae	<i>Lymanbensonia</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Cactaceae	<i>Maihuenia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Maihueniopsis</i>	20	All	20 (1.0)	15 (0.75)	20 (1.0)
Cactaceae	<i>Mammillaria</i>	139	All	139 (1.0)	105 (0.75)	139 (1.0)
Cactaceae	<i>Marshallocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Matucana</i>	17	All	17 (1.0)	13 (0.75)	17 (1.0)
Cactaceae	<i>Melocactus</i>	41	All	41 (1.0)	31 (0.75)	41 (1.0)
Cactaceae	<i>Micranthocereus</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Cactaceae	<i>Mila</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Miqueliopuntia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Mirabella</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Mitrocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Morangaya</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Myrtillocactus</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Neoraimondia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Neowerdermannia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Nyctocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Obregonia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Opuntia</i>	136	All	136 (1.0)	102 (0.75)	136 (1.0)
Cactaceae	<i>Oreocereus</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Oroya</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Pachycereus</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Cactaceae	<i>Parodia</i>	65	All	65 (1.0)	49 (0.75)	65 (1.0)
Cactaceae	<i>Pediocactus</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)

Cactaceae	<i>Pelecyphora</i>	20	All	20 (1.0)	15 (0.75)	20 (1.0)
Cactaceae	<i>Peniocereus</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Pereskia</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Peresklopsis</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Cactaceae	<i>Pfeiffera</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Cactaceae	<i>Pilosocereus</i>	55	All	55 (1.0)	42 (0.75)	55 (1.0)
Cactaceae	<i>Polaskia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Praecereus</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Pseudorhipsalis</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Cactaceae	<i>Pterocactus</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Pterocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Punotia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Quiabentia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Rapicactus</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Cactaceae	<i>Rauhocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Rebutia</i>	19	All	19 (1.0)	15 (0.75)	19 (1.0)
Cactaceae	<i>Reicheocactus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Rhipsalidopsis</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Rhipsalis</i>	45	All	45 (1.0)	34 (0.75)	45 (1.0)
Cactaceae	<i>Rhodocactus</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Cactaceae	<i>Salmonopuntia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Cactaceae	<i>Samaipaticereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Schlumbergera</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Cactaceae	<i>Sclerocactus</i>	22	All	22 (1.0)	17 (0.75)	22 (1.0)
Cactaceae	<i>Selenicereus</i>	31	All	31 (1.0)	24 (0.75)	31 (1.0)
Cactaceae	<i>Setiechinopsis</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Soehrensia</i>	24	All	24 (1.0)	18 (0.75)	24 (1.0)
Cactaceae	<i>Stenocactus</i>	9	All	9 (1.0)	7 (0.75)	9 (1.0)
Cactaceae	<i>Stenocereus</i>	21	All	21 (1.0)	16 (0.75)	21 (1.0)
Cactaceae	<i>Stetsonia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Strombocactus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Strophocactus</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Tacinga</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Tephrocactus</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Cactaceae	<i>Thelocactus</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Cactaceae	<i>Trichocereus</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Turbincarpus</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Cactaceae	<i>Uebelmannia</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Vatricania</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Weberbauerocereus</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Weberocereus</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Cactaceae	<i>Xiquexique</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Cactaceae	<i>Yavia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Cactaceae	<i>Yungasocereus</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Clusiaceae	<i>Clusia</i>	322	Most	242 (0.75)	161 (0.5)	306 (0.95) <sup>1</sup>
Commelinaceae	<i>Callisia</i>	41	Most	31 (0.75)	21 (0.5)	41 (1.0)
Commelinaceae	<i>Cyanotis</i>	50	Most	38 (0.75)	25 (0.5)	50 (1.0)



Commelinaceae	<i>Tradescantia</i>	85	Most	64 (0.75)	43 (0.5)	85 (1.0)
Crassulaceae	<i>Adromischus</i>	29	All	29 (1.0)	22 (0.75)	29 (1.0)
Crassulaceae	<i>Aeonium</i>	41	All	41 (1.0)	31 (0.75)	41 (1.0)
Crassulaceae	<i>Afrovivella</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Crassulaceae	<i>Aichryson</i>	16	All	16 (1.0)	12 (0.75)	16 (1.0)
Crassulaceae	<i>Chaloupkaea</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Crassulaceae	<i>Chiastophyllum</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Crassulaceae	<i>Cotyledon</i>	18	All	18 (1.0)	14 (0.75)	18 (1.0)
Crassulaceae	<i>Crassula</i>	210	All	210 (1.0)	158 (0.75)	210 (1.0)
Crassulaceae	<i>Cremnophila</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Crassulaceae	<i>Dudleya</i>	46	All	46 (1.0)	35 (0.75)	46 (1.0)
Crassulaceae	<i>Echeveria</i>	199	All	199 (1.0)	150 (0.75)	199 (1.0)
Crassulaceae	<i>Graptopetalum</i>	19	All	19 (1.0)	15 (0.75)	19 (1.0)
Crassulaceae	<i>Hylotelephium</i>	26	All	26 (1.0)	20 (0.75)	26 (1.0)
Crassulaceae	<i>Hypagophytum</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Crassulaceae	<i>Kalanchoë</i>	165	All	165 (1.0)	124 (0.75)	165 (1.0)
Crassulaceae	<i>Kungia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Crassulaceae	<i>Lenophyllum</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Crassulaceae	<i>Meterostachys</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Crassulaceae	<i>Monanthes</i>	18	All	18 (1.0)	14 (0.75)	18 (1.0)
Crassulaceae	<i>Orostachys</i>	12	All	12 (1.0)	9 (0.75)	12 (1.0)
Crassulaceae	<i>Pachyphytum</i>	23	All	23 (1.0)	18 (0.75)	23 (1.0)
Crassulaceae	<i>Perrierosedum</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Crassulaceae	<i>Petrosedum</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Crassulaceae	<i>Phedimus</i>	17	All	17 (1.0)	13 (0.75)	17 (1.0)
Crassulaceae	<i>Pistorinia</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Crassulaceae	<i>Prometheum</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Crassulaceae	<i>Pseudosedum</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Crassulaceae	<i>Rhodiola</i>	69	All	69 (1.0)	52 (0.75)	69 (1.0)
Crassulaceae	<i>Rosularia</i>	23	All	23 (1.0)	18 (0.75)	23 (1.0)
Crassulaceae	<i>Sedum</i>	464	All	464 (1.0)	348 (0.75)	464 (1.0)
Crassulaceae	<i>Sempervivum</i>	52	All	52 (1.0)	39 (0.75)	52 (1.0)
Crassulaceae	<i>Sinocrassula</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Crassulaceae	<i>Thompsonella</i>	8	All	8 (1.0)	6 (0.75)	8 (1.0)
Crassulaceae	<i>Tylecodon</i>	50	All	50 (1.0)	38 (0.75)	50 (1.0)
Crassulaceae	<i>Umbilicus</i>	16	All	16 (1.0)	12 (0.75)	16 (1.0)
Crassulaceae	<i>Villadia</i>	29	All	29 (1.0)	22 (0.75)	29 (1.0)
Cucurbitaceae	<i>Seyrigia</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Cucurbitaceae	<i>Xerosicyos</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Didiereaceae	<i>Alluaudia</i>	6	All	6 (1.0)	5 (0.75)	6 (1.0)
Didiereaceae	<i>Allaudiopsis</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Didiereaceae	<i>Calyptrotheca</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Didiereaceae	<i>Decarya</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Didiereaceae	<i>Didierea</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Didiereaceae	<i>Portulacaria</i>	7	All	7 (1.0)	6 (0.75)	7 (1.0)
Euphorbiaceae	<i>Euphorbia</i>	2087	Most	1566 (0.75)	1044 (0.5)	2087 (1.0)
Euphorbiaceae	<i>Jatropha</i>	175	Few	9 (0.05)	2 (0.01)	44 (0.25)

Geraniaceae	<i>Monsonia</i>	26	Some	7 (0.25)	2 (0.05)	13 (0.5)
Geraniaceae	<i>Pelargonium</i>	285	Some	72 (0.25)	15 (0.05)	143 (0.5)
Gesneriaceae	<i>Codonanthe</i>	9	All	9 (1.0)	7 (0.75)	9 (1.0)
Gesneriaceae	<i>Codonanthopsis</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Gesneriaceae	<i>Haberlea</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Gesneriaceae	<i>Ramonda</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Halophytaceae	<i>Halophytum</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Hydrocharitaceae	<i>Ottelia</i>	22	Most	17 (0.75)	11 (0.5)	22 (1.0)
Hydrocharitaceae	<i>Vallisneria</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Isoëtaceae	<i>Isoëtes</i>	193	All	193 (1.0)	145 (0.75)	193 (1.0)
Lamiaceae	<i>Coleus</i>	301	Some	76 (0.25)	16 (0.05)	151 (0.5)
Lamiaceae	<i>Marrubium</i>	51	Few	3 (0.05)	1 (0.01)	13 (0.25)
Montiaceae	<i>Calandrinia</i>	37	Most	28 (0.75)	19 (0.5)	37 (1.0)
Montiaceae	<i>Calyptridium</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Montiaceae	<i>Cistanthe</i>	43	Most	33 (0.75)	22 (0.5)	43 (1.0)
Montiaceae	<i>Claytonia</i>	33	Few	2 (0.05)	1 (0.01)	9 (0.25)
Montiaceae	<i>Lewisia</i>	16	Most	12 (0.75)	8 (0.5)	16 (1.0)
Montiaceae	<i>Montia</i>	20	Most	15 (0.75)	10 (0.5)	20 (1.0)
Montiaceae	<i>Phemeranthus</i>	25	All	25 (1.0)	19 (0.75)	25 (1.0)
Montiaceae	<i>Rumic astrum</i>	66	Most	50 (0.75)	33 (0.5)	63 (0.95) <sup>2</sup>
Orchidaceae	<i>Acianthera</i>	299	Most	225 (0.75)	150 (0.5)	299 (1.0)
Orchidaceae	<i>Aerangis</i>	59	All	59 (1.0)	45 (0.75)	59 (1.0)
Orchidaceae	<i>Aeranthes</i>	44	All	44 (1.0)	33 (0.75)	44 (1.0)
Orchidaceae	<i>Aerides</i>	30	All	30 (1.0)	23 (0.75)	30 (1.0)
Orchidaceae	<i>Anathallis</i>	149	Few	8 (0.05)	2 (0.01)	38 (0.25)
Orchidaceae	<i>Angraecum</i>	223	All	223 (1.0)	168 (0.75)	223 (1.0)
Orchidaceae	<i>Arachnis</i>	16	All	16 (1.0)	12 (0.75)	16 (1.0)
Orchidaceae	<i>Aspasia</i>	7	Most	6 (0.75)	4 (0.5)	7 (1.0)
Orchidaceae	<i>Barkeria</i>	18	All	18 (1.0)	14 (0.75)	18 (1.0)
Orchidaceae	<i>Bogoria</i>	14	Few	1 (0.05)	1 (0.01)	4 (0.25)
Orchidaceae	<i>Brassavola</i>	19	All	19 (1.0)	15 (0.75)	19 (1.0)
Orchidaceae	<i>Brassia</i>	68	Most	51 (0.75)	34 (0.5)	68 (1.0)
Orchidaceae	<i>Bryobium</i>	27	Few	2 (0.05)	1 (0.01)	7 (0.25)
Orchidaceae	<i>Bulbophyllum</i>	2145	Most	1609 (0.75)	1073 (0.5)	2145 (1.0)
Orchidaceae	<i>Caluera</i>	5	Most	4 (0.75)	3 (0.5)	5 (1.0)
Orchidaceae	<i>Campylocentrum</i>	77	All	77 (1.0)	58 (0.75)	77 (1.0)
Orchidaceae	<i>Capanemia</i>	8	Most	6 (0.75)	4 (0.5)	8 (1.0)
Orchidaceae	<i>Cattleya</i>	129	Most	97 (0.75)	65 (0.5)	129 (1.0)
Orchidaceae	<i>Caularthron</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Orchidaceae	<i>Chiloschista</i>	26	All	26 (1.0)	20 (0.75)	26 (1.0)
Orchidaceae	<i>Cis Schweinfia</i>	11	Most	9 (0.75)	6 (0.5)	11 (1.0)
Orchidaceae	<i>Coelogyne</i>	595	Most	447 (0.75)	298 (0.5)	595 (1.0)
Orchidaceae	<i>Comparettia</i>	79	All	79 (1.0)	60 (0.75)	79 (1.0)
Orchidaceae	<i>Coryanthes</i>	65	Most	49 (0.75)	33 (0.5)	65 (1.0)
Orchidaceae	<i>Cymbidium</i>	85	Most	64 (0.75)	43 (0.5)	85 (1.0)
Orchidaceae	<i>Dendrobium</i>	1594	Most	1196 (0.75)	797 (0.5)	1594 (1.0)
Orchidaceae	<i>Dendrophylax</i>	15	All	15 (1.0)	12 (0.75)	15 (1.0)

Orchidaceae	<i>Didymoplexis</i>	20	All	20 (1.0)	15 (0.75)	20 (1.0)
Orchidaceae	<i>Dimerandra</i>	7	Most	6 (0.75)	4 (0.5)	7 (1.0)
Orchidaceae	<i>Domingoa</i>	4	Most	3 (0.75)	2 (0.5)	4 (1.0)
Orchidaceae	<i>Echinosepala</i>	17	Few	1 (0.05)	1 (0.01)	5 (0.25)
Orchidaceae	<i>Elleanthus</i>	128	Most	96 (0.75)	64 (0.5)	128 (1.0)
Orchidaceae	<i>Encyclia</i>	170	Most	128 (0.75)	85 (0.5)	170 (1.0)
Orchidaceae	<i>Epidendrum</i>	1764	Most	1323 (0.75)	882 (0.5)	1764 (1.0)
Orchidaceae	<i>Eria</i>	48	Most	36 (0.75)	24 (0.5)	48 (1.0)
Orchidaceae	<i>Eriopsis</i>	4	Most	3 (0.75)	2 (0.5)	4 (1.0)
Orchidaceae	<i>Erycina</i>	7	Most	6 (0.75)	4 (0.5)	7 (1.0)
Orchidaceae	<i>Eulophia</i>	281	Most	211 (0.75)	141 (0.5)	281 (1.0)
Orchidaceae	<i>Gomesa</i>	125	All	125 (1.0)	94 (0.75)	125 (1.0)
Orchidaceae	<i>Gongora</i>	69	Few	4 (0.05)	1 (0.01)	18 (0.25)
Orchidaceae	<i>Guarianthe</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Orchidaceae	<i>Hintonella</i>	1	Most	1 (0.75)	1 (0.5)	1 (1.0)
Orchidaceae	<i>Ionopsis</i>	6	Most	5 (0.75)	3 (0.5)	6 (1.0)
Orchidaceae	<i>Jacquiiniella</i>	12	Most	9 (0.75)	6 (0.5)	12 (1.0)
Orchidaceae	<i>Laelia</i>	24	All	24 (1.0)	18 (0.75)	24 (1.0)
Orchidaceae	<i>Leochilus</i>	12	All	12 (1.0)	9 (0.75)	12 (1.0)
Orchidaceae	<i>Lockhartia</i>	33	Most	25 (0.75)	17 (0.5)	33 (1.0)
Orchidaceae	<i>Luisia</i>	48	All	48 (1.0)	36 (0.75)	48 (1.0)
Orchidaceae	<i>Lycaste</i>	36	Few	2 (0.05)	1 (0.01)	9 (0.25)
Orchidaceae	<i>Macradenia</i>	13	Most	10 (0.75)	7 (0.5)	13 (1.0)
Orchidaceae	<i>Macroclinium</i>	49	Most	37 (0.75)	25 (0.5)	49 (1.0)
Orchidaceae	<i>Maxillaria</i>	651	Half	326 (0.5)	163 (0.25)	489 (0.75)
Orchidaceae	<i>Meiracyllium</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Orchidaceae	<i>Microcoelia</i>	34	All	34 (1.0)	26 (0.75)	34 (1.0)
Orchidaceae	<i>Micropera</i>	22	All	22 (1.0)	17 (0.75)	22 (1.0)
Orchidaceae	<i>Mobilabium</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Orchidaceae	<i>Mormodes</i>	85	All	85 (1.0)	64 (0.75)	85 (1.0)
Orchidaceae	<i>Myoxanthus</i>	52	Most	39 (0.75)	26 (0.5)	52 (1.0)
Orchidaceae	<i>Myrmecophila</i>	9	All	9 (1.0)	7 (0.75)	9 (1.0)
Orchidaceae	<i>Notylia</i>	55	All	55 (1.0)	42 (0.75)	55 (1.0)
Orchidaceae	<i>Oberonia</i>	272	Most	204 (0.75)	136 (0.5)	272 (1.0)
Orchidaceae	<i>Oeonia</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Orchidaceae	<i>Oncidium</i>	336	Most	252 (0.75)	168 (0.5)	336 (1.0)
Orchidaceae	<i>Ornithocephalus</i>	56	All	56 (1.0)	42 (0.75)	56 (1.0)
Orchidaceae	<i>Pabstiella</i>	133	All	133 (1.0)	100 (0.75)	133 (1.0)
Orchidaceae	<i>Peristeria</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Orchidaceae	<i>Phalaenopsis</i>	78	All	78 (1.0)	59 (0.75)	78 (1.0)
Orchidaceae	<i>Platyrrhiza</i>	1	Most	1 (0.75)	1 (0.5)	1 (1.0)
Orchidaceae	<i>Plectorrhiza</i>	5	All	5 (1.0)	4 (0.75)	5 (1.0)
Orchidaceae	<i>Plectrophora</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Orchidaceae	<i>Pleurothallis</i>	548	Most	411 (0.75)	274 (0.5)	548 (1.0)
Orchidaceae	<i>Pomatocalpa</i>	23	All	23 (1.0)	18 (0.75)	23 (1.0)
Orchidaceae	<i>Pomatocalpa</i>	23	All	23 (1.0)	18 (0.75)	23 (1.0)
Orchidaceae	<i>Prosthechea</i>	124	Most	93 (0.75)	62 (0.5)	124 (1.0)

Orchidaceae	<i>Psychilis</i>	15	Few	1 (0.05)	1 (0.01)	4 (0.25)
Orchidaceae	<i>Psychopsis</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Orchidaceae	<i>Pterostemma</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Orchidaceae	<i>Quekettia</i>	7	Most	6 (0.75)	4 (0.5)	7 (1.0)
Orchidaceae	<i>Rhinerrhiza</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Orchidaceae	<i>Robiquetia</i>	94	All	94 (1.0)	71 (0.75)	94 (1.0)
Orchidaceae	<i>Rodriguezia</i>	47	All	47 (1.0)	36 (0.75)	47 (1.0)
Orchidaceae	<i>Rossioglossum</i>	11	Most	9 (0.75)	6 (0.5)	11 (1.0)
Orchidaceae	<i>Saccolabiopsis</i>	14	All	14 (1.0)	11 (0.75)	14 (1.0)
Orchidaceae	<i>Saccolabium</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Orchidaceae	<i>Sarcochilus</i>	23	All	23 (1.0)	18 (0.75)	23 (1.0)
Orchidaceae	<i>Scaphyglottis</i>	78	Most	59 (0.75)	39 (0.5)	78 (1.0)
Orchidaceae	<i>Schoenorchis</i>	28	All	28 (1.0)	21 (0.75)	28 (1.0)
Orchidaceae	<i>Sobralia</i>	171	Most	129 (0.75)	86 (0.5)	171 (1.0)
Orchidaceae	<i>Solenangis</i>	4	All	4 (1.0)	3 (0.75)	4 (1.0)
Orchidaceae	<i>Solenidium</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Orchidaceae	<i>Specklinia</i>	109	Most	82 (0.75)	55 (0.5)	109 (1.0)
Orchidaceae	<i>Stelis</i>	1332	Some	333 (0.25)	67 (0.05)	666 (0.5)
Orchidaceae	<i>Taeniophyllum</i>	245	All	245 (1.0)	184 (0.75)	245 (1.0)
Orchidaceae	<i>Tetramicra</i>	10	All	10 (1.0)	8 (0.75)	10 (1.0)
Orchidaceae	<i>Thrixspermum</i>	191	All	191 (1.0)	144 (0.75)	191 (1.0)
Orchidaceae	<i>Tolumnia</i>	27	Most	21 (0.75)	14 (0.5)	27 (1.0)
Orchidaceae	<i>Trachoma</i>	16	All	16 (1.0)	12 (0.75)	16 (1.0)
Orchidaceae	<i>Trichocentrum</i>	90	All	90 (1.0)	68 (0.75)	90 (1.0)
Orchidaceae	<i>Trichoglottis</i>	86	All	86 (1.0)	65 (0.75)	86 (1.0)
Orchidaceae	<i>Trichopilia</i>	46	Most	35 (0.75)	23 (0.5)	46 (1.0)
Orchidaceae	<i>Trichotosia</i>	76	Few	4 (0.05)	1 (0.01)	19 (0.25)
Orchidaceae	<i>Trizeuxis</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Orchidaceae	<i>Tuberolabium</i>	9	All	9 (1.0)	7 (0.75)	9 (1.0)
Orchidaceae	<i>Vanda</i>	85	All	85 (1.0)	64 (0.75)	85 (1.0)
Orchidaceae	<i>Vanilla</i>	118	All	118 (1.0)	89 (0.75)	118 (1.0)
Orchidaceae	<i>Warmingia</i>	4	Most	3 (0.75)	2 (0.5)	4 (1.0)
Orchidaceae	<i>Zygostates</i>	25	Most	19 (0.75)	13 (0.5)	25 (1.0)
Passifloraceae	<i>Adenia</i>	106	Few	6 (0.05)	2 (0.01)	27 (0.25)
Piperaceae	<i>Peperomia</i>	1416	Half	708 (0.5)	354 (0.25)	1062 (0.75)
Plantaginaceae	<i>Littorella</i>	3	All	3 (1.0)	3 (0.75)	3 (1.0)
Polypodiaceae	<i>Dictymia</i>	2	All	2 (1.0)	2 (0.75)	2 (1.0)
Polypodiaceae	<i>Lecanopteris</i>	13	All	13 (1.0)	10 (0.75)	13 (1.0)
Polypodiaceae	<i>Microsorium</i>	32	Half	16 (0.5)	8 (0.25)	24 (0.75)
Polypodiaceae	<i>Niphidium</i>	11	All	11 (1.0)	9 (0.75)	11 (1.0)
Polypodiaceae	<i>Platyserium</i>	17	All	17 (1.0)	13 (0.75)	17 (1.0)
Polypodiaceae	<i>Pyrrosia</i>	69	Most	52 (0.75)	35 (0.5)	69 (1.0)
Portulacaceae	<i>Cistanthe</i>	43	Most	33 (0.75)	22 (0.5)	43 (1.0)
Portulacaceae	<i>Portulaca</i>	150	All	150 (1.0)	113 (0.75)	150 (1.0)
Pteridaceae	<i>Haplopteris</i>	39	Few	2 (0.05)	1 (0.01)	10 (0.25)
Pteridaceae	<i>Polytaenium</i>	12	Most	9 (0.75)	6 (0.5)	12 (1.0)
Pteridaceae	<i>Vittaria</i>	22	Most	17 (0.75)	11 (0.5)	22 (1.0)

Rubiaceae	<i>Hydnophytum</i>	57	Some	15 (0.25)	3 (0.05)	57 (1.0)
Rubiaceae	<i>Myrmecodia</i>	26	Some	7 (0.25)	2 (0.05)	26 (1.0)
Rubiaceae	<i>Squamellaria</i>	8	Some	2 (0.25)	1 (0.05)	8 (1.0)
Talinaceae	<i>Talinum</i>	27	All	27 (1.0)	21 (0.75)	27 (1.0)
Urticaceae	<i>Pilea</i>	606	Few	31 (0.05)	7 (0.01)	152 (0.25)
Vitaceae	<i>Cissus</i>	289	Most	217 (0.75)	145 (0.5)	289 (1.0)
Vitaceae	<i>Cyphostemma</i>	241	Most	181 (0.75)	121 (0.5)	241 (1.0)
Welwitschiaceae	<i>Welwitschia</i>	1	All	1 (1.0)	1 (0.75)	1 (1.0)
Zamiaceae	<i>Dioon</i>	18	Some	5 (0.25)	1 (0.05)	9 (0.5)
Zygophyllaceae	<i>Bulnesia</i>	5	Few	1 (0.05)	1 (0.01)	2 (0.25)

<sup>1</sup>The upper bound on *Clusia* was reduced from 100% because multiple lines of evidence demonstrate that at least 7 *Clusia* species are not capable of CAM (Pachon *et al.*, 2022)

<sup>2</sup>The upper bound on Australian *Calandrinia* (referred to as *Rumicastrum*, using the POWO taxonomy) was reduced from 100% because multiple lines of evidence demonstrate that at least 3 Australian *Calandrinia* species are not capable of CAM (Hancock *et al.*, 2019)

TABLE S4. Estimated CAM species diversity in each family containing CAM species. Diversity metrics were summed by family from Table S3. Taxonomy and species counts according to World Checklist of Vascular Plants version 10 (Govaerts *et al.*, 2021), accessed through POWO (2023), which contains 349,036 accepted, non-hybrid species names. Taxa are ordered from most to fewest predicted CAM species; lower bound (LB), upper bound (UB).

	Family	Total species	Species with CAM (%)	Species with CAM [LB] (%)	Species with CAM [UB] (%)
Orchidaceae	29872	10181	10181 (34.0)	6800 (22.7)	13082 (43.8)
Cactaceae	1794	1794	1794 (100.0)	1400 (78.0)	1794 (100.0)
Bromeliaceae	3567	1787	1787 (50.1)	1229 (34.5)	2120 (59.4)
Crassulaceae	1621	1621	1621 (100.0)	1229 (75.8)	1621 (100.0)
Euphorbiaceae	6530	1575	1575 (24.1)	1046 (16.0)	2131 (32.6)
Apocynaceae	6487	1367	1367 (21.1)	950 (14.6)	1684 (26.0)
Aizoaceae	1797	1274	1274 (70.9)	929 (51.7)	1435 (79.9)
Asphodelaceae	1213	793	793 (65.4)	595 (49.1)	814 (67.1)
Piperaceae	3831	708	708 (18.5)	354 (9.2)	1062 (27.7)
Asteraceae	33994	460	460 (1.4)	145 (0.4)	839 (2.5)
Asparagaceae	3359	449	449 (13.4)	302 (9.0)	584 (17.4)
Vitaceae	1022	398	398 (38.9)	266 (26.0)	530 (51.9)
Clusiaceae	919	242	242 (26.3)	161 (17.5)	306 (33.3)

Isoëtaceae	193	193	193 (100.0)	145 (75.1)	193 (100.0)
Portulacaceae	193	183	183 (94.8)	135 (69.9)	193 (100.0)
Montiaceae	276	176	176 (63.8)	121 (43.8)	224 (81.2)
Commelinaceae	763	133	133 (17.4)	89 (11.7)	176 (23.1)
Polypodiaceae	4252	111	111 (2.6)	77 (1.8)	136 (3.2)
Geraniaceae	812	79	79 (9.7)	17 (2.1)	156 (19.2)
Lamiaceae	7662	79	79 (1.0)	17 (0.2)	164 (2.1)
Anacampserotaceae	62	62	62 (100.0)	47 (75.8)	62 (100.0)
Alismataceae	114	39	39 (34.2)	30 (26.3)	39 (34.2)
Hydrocharitaceae	136	31	31 (22.8)	22 (16.2)	36 (26.5)
Urticaceae	2074	31	31 (1.5)	7 (0.3)	152 (7.3)
Pteridaceae	1371	28	28 (2.0)	18 (1.3)	44 (3.2)
Gesneriaceae	3792	27	27 (0.7)	21 (0.6)	27 (0.7)
Talinaceae	28	27	27 (96.4)	21 (75.0)	27 (96.4)
Rubiaceae	14075	24	24 (0.2)	6 (< 0.1)	91 (0.6)
Didiereaceae	20	20	20 (100.0)	18 (90.0)	20 (100.0)
Basellaceae	19	18	18 (94.7)	14 (73.7)	18 (94.7)
Cucurbitaceae	1052	12	12 (1.1)	10 (1.0)	12 (1.1)
Passifloraceae	1029	6	6 (0.6)	2 (0.2)	27 (2.6)
Zamiaceae	248	5	5 (2.0)	1 (0.4)	9 (3.6)
Plantaginaceae	2106	3	3 (0.1)	3 (0.1)	3 (0.1)
Welwitschiaceae	1	1	1 (100.0)	1 (100.0)	1 (100.0)
Halophytaceae	1	1	1 (100.0)	1 (100.0)	1 (100.0)
Araceae	4175	1	1 (< 0.1)	1 (< 0.1)	1 (< 0.1)
Zygophyllaceae	286	1	1 (0.3)	1 (0.3)	2 (0.7)

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