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Occurrence of crassulacean acid metabolism in Colombian orchids determined by leaf carbon isotope ratios

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Many Orchidaceae, especially those occupying periodically dry, epiphytic microhabitats in the humid tropics, are believed to engage in the water-conserving crassulacean acid metabolism (CAM) photosynthetic pathway. However, the photosynthetic pathway has been studied in only *c*. 5% of all orchid species. Here we extend the survey to 1079 orchid species, mainly from Colombia, by assessing the presence of CAM based on the carbon isotopic signature ($\delta^{13}C$ values) of herbarium specimens. Ninety-six species, representing 8.9% of those analysed, had $\delta^{13}C$ values less negative than −20‰, indicating CAM. Epiphytism was the predominant life form (75.2% of species sampled), and 9.4% of these epiphytes showed a CAM-type isotopic signature. Isotope values suggested CAM in 19 terrestrial orchid species, 14 species from high elevation (2000–3400 m) and species from six genera that were previously unknown to engage in CAM (*Jacquiniella*, *Meiracyllium*, *Pabstiella*, *Psychopsis*, *Pterostemma* and *Solenidium*). We conclude that CAM is the major pathway of carbon acquisition in a small but broadly distributed fraction of tropical orchids and is more prevalent at lower elevations.

ADDITIONAL KEYWORDS: Andes – climate – Colombia – $\delta^{13}C$ – epiphytes – Orchidaceae – photosynthetic pathway – WorldClim.

INTRODUCTION

Orchidaceae are one of the two largest families of vascular plants, with 899 genera and 30 105 species worldwide (http://plantsoftheworldonline.org, 2019), and represent *c*. 8% of all vascular plant species. Orchids are especially known for their spectacular floral diversity and intricate adaptations to pollinators (Nilson, 1992; Cozzolino & Widmer, 2005; Gaskett, 2011). Orchids are also an outstanding example of adaptive radiation (Chase *et al.*, 2003), with species occupying distinct habitats and showing different growth forms, including soil-rooted terrestrial plants, lithophytic and epiphytic species that live independently of soil. Orchids are cosmopolitan in distribution and most diverse in the tropics, where they are typically found as epiphytes (Chase *et al.*, 2003, 2015; Cribb *et al.*, 2003, Cribb & Govaerts, 2005, Christenhusz & Byng, 2016). Orchids occur in a wide range of habitats, from wet tropical forest to dry forest, from sea level to elevations approaching 5000 m and from cool to hot biomes, although their distribution varies greatly among continents (Cribb *et al.*, 2003, Cribb & Govaerts, 2005). New species of orchids are described every year, especially in the remote tropical biodiversity hotspots of the world (Joppa *et al.*, 2011).

The water-conserving CAM pathway has been estimated to occur in *c*. 7% of all vascular plant species and has been demonstrated in *c*. 400 genera in 35 families (Winter & Smith, 1996; Holtum *et al.*, 2007; Winter, Holtum & Smith, 2015). Improving estimates of the number of CAM species requires detailed screening of species-rich families with large expected numbers of CAM species, such as Orchidaceae, and from regions of the world where orchids are highly diverse, such as the Andes of Colombia. It is currently estimated that up to

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50% of Neotropical orchid species show some degree of CAM (Silvera, Santiago & Winter, 2005; Silvera *et al.*, 2010), although only *c*. 5% of orchids worldwide have been screened for the presence of CAM, by stable carbon isotope composition, titratable acidity or CO_2 gas exchange.

In this study, we surveyed the orchid flora of Colombia for the occurrence of CAM using the leaf carbon isotopic signature (δ^{13}C value) of herbarium specimens. Colombia is home to an estimated 4270 orchid species from *c*. 274 genera, representing *c*. 15% of the total number of orchid species. Moreover, *c*. 1572 orchid species in Colombia are considered endemic (Betancur *et al.*, 2015), and nearly 10% of orchid species in Colombia are under threat of extinction (Calderón-Sáenz, 2006). The rise of the Andes during the Cenozoic (van der Hammen & Hooghiemstra, 2001) resulted in a variety of ecosystems and climate zones, offering a unique opportunity to explore patterns of CAM distribution in relation to microclimate and habitat. In particular, Colombian orchid species span a wide range of climatic zones and biomes, from sea level to nearly 4000 m in the Andean summits, including lowland wet and dry forests, cloud forests and paramos. Colombia has two recognized hotspots of biological diversity, the tropical Andes with 20 000 endemic plant species and the Chocó/Darien region with 2250 endemic species (Myers *et al.*, 2000). Building on a previous isotopic survey of 1002 orchid species from Panama and Costa Rica (Silvera *et al.*, 2010), we ask how CAM is distributed across orchids of Colombia and whether CAM occurs at sites of high orchid diversity in the Andes. Finally, we provide further clues on the relationships between CAM occurrence, biogeography and climate and their role in orchid diversification.

MATERIAL AND METHODS

Site description

The Andes of South America harbour a large proportion of the world's plant species (Myers *et al.*, 2000; Pérez-Escobar *et al.*, 2017), with orchids being one of the most diverse plant groups (Gentry & Dodson, 1987). The Andes of Colombia and Ecuador are the richest in orchid species (Cribb *et al.*, 2003). In the northern Andes, > 50% of all vascular epiphytic species are orchids (Pérez-Escobar *et al.*, 2017), many of which are endemic (Cribb & Govaerts, 2005).

In Colombia, three Andean mountain ranges split the country into a series of plains and valleys. Abrupt changes in habitats occur in response to elevational changes in temperature, solar radiation, soil characteristics and precipitation. Vegetation types change accordingly, from tropical lowland forest to cloud forest and paramo (a cold high-elevation grassland and wetland ecosystem with high diversity) (Cleef, 2005). The Caribbean region includes patches of dry forest, including the isolated massif of the Sierra Nevada de Santa Marta at 5700 m elevation, which hosts ecosystems that range from xeric at the base and cold and snowy at the top. The Pacific region is, in contrast, one of the wettest regions of the world, with up to 12 m of rainfall annually, and it hosts one of the most diverse forests of the tropics in the Chocó region. Finally, towards the east, close to the border with Venezuela, an extensive grassland known as Llanos is intermingled with seasonally inundated forest along the Orinoco River basin and the Amazon forest and other seasonally inundated tropical forests in the southeast. In this study, we surveyed herbarium specimens from orchid species corresponding to all these ecosystems (Fig. 1).

Species sampling

To assess the relative abundance and distribution of C_3 and CAM photosynthesis in orchids from Colombia we measured foliar δ^{13}C of 1192 herbarium specimens. Specimens included 178 genera and 1079 orchid species (excluding duplicates). These included 1056 species from Colombia and 23 species from other countries, including Ecuador (14), Bolivia (three), El Salvador (one), Costa Rica (four) and Brazil (one). The complete list of taxa, taxonomic authority, accession and voucher details, carbon isotope ratio and ecological information are provided in Table 1.

Leaf samples were obtained from 18 Colombian herbaria: Andes Herbarium (ANDES), Universidad de Antioquia Herbarium (HUA), Federico Medem Bogotá Herbarium (FMB), Pontificia Universidad Javeriana Herbarium (HPUJ), Joaquín Antonio Uribe Botanical Garden Herbarium (JAUM), Luis Sigifredo Espinal Tascón Herbarium (CUVC), Universidad del Cauca Herbarium (CAUP), Universidad del Tolima Herbarium Dendrology section (TOLI)/Dendrology sec), Universidad del Tolima General Herbarium (TOLI), José Cuatrecasas Arumi Valle Herbarium (VALLE), Universidad de Caldas Herbarium (FAUC), Universidad del Quindío Herbarium (HUQ), Colombian Amazonic Herbarium (COAH), Chocó Herbarium (CHOCÓ), Juan María Céspedes Botanical Garden Herbarium (TULV), Guillermo Piñeres Botanical Garden Foundation Herbarium (JBGP), Llanos Herbarium (LLANOS) and the personal collection of R. T. González (Pers. Coll. Univer. del Pacífico) and Pablo Stevenson (ANDES/P. stevenson Coll.). Because we sampled all orchid species available at each herbarium, certain

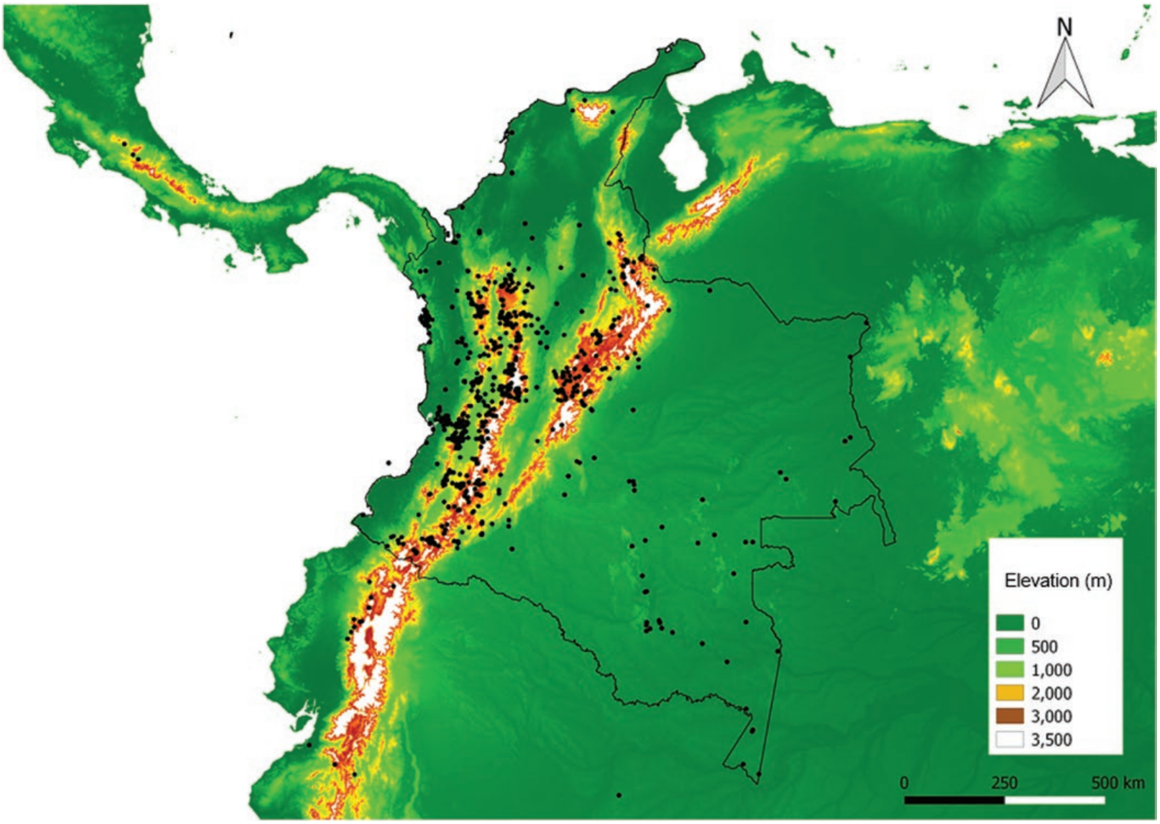

Figure 1. Geographical locations for 1079 orchid species from 1192 samples analysed in this study. Data points were provided from samples with sufficient georeferenced information.

genera were over-represented (e.g. *Epidendrum* L.). Likewise, species from tropical cloud and rainforests with greater species richness were particularly abundant in our analysis. Some geographical regions in Colombia are not well represented in herbaria collections, such as Orinoquia, Amazonas and the Atlantic coast (Fig. 1).

From each herbarium specimen *c*. 5 mg of mature dry leaf tissue from the leaf lamina was taken for carbon isotope determination. Only mature leaves were collected to reduce the variability of $\delta^{13}C$ values associated with leaf developmental stage (Cernusak *et al.*, 2009). For each sample, we recorded collection number, herbarium code, geographical coordinates, elevation, growth form (epiphyte, lithophyte or terrestrial) and collection locality. We followed nomenclatural changes from The Plant List (http://www.theplantlist.org/) and provide in parentheses the name originally recorded in the herbarium specimens where these are now considered synonyms. We also included in the species count samples of uncertain taxonomic status, labelled 'cf.' and 'aff.'. Species with a name that has not been validly published yet are included with an asterisk in Table 1. Species classification into subfamilies, tribes and subtribes of Orchidaceae followed the classification schemes of Chase *et al.* (2015) and Freudenstein & Chase (2015). Abbreviations for authorities follow The International Plant Names Index (IPNI) (2012).

Carbon isotope analysis

From each herbarium sample, the ^{13}C:^{12}C ratio was determined by isotope ratio mass spectrometry at the Smithsonian Tropical Research Institute using a Flash HT elemental analyser coupled to a Delta V Isotope Ratio spectrometer through a ConFlo III interface (Thermo Scientific, Bremen, Germany), with a precision of ± 0.02 ‰. Isotopic signature ($\delta^{13}C$) was calculated relative to the internationally accepted standard Vienna Pee Dee Belemnite (VPDB) from *Belemnitella americana* (Cernusak *et al.*, 2013; Crayn *et al.*, 2015) using the formula:

$$\delta^{13}\mathrm{C}\ (‰) = [(^{13}\mathrm{C}/^{12}\mathrm{C\ sample})/(^{13}\mathrm{C}/^{12}\mathrm{C\ standard})-1] \times 1000$$

Plants were classified as C_3 if their isotopic values were more negative than −20‰ and as CAM if

Table 1. δ[13]C values for 1079 orchid species from 1192 herbarium specimens comprising 1056 species from Colombia and 23 species from Ecuador, Bolivia, El Salvador, Costa Rica and Brazil. Elevation and growth form (G) are provided from information extracted from the herbarium sheet label. E refers to epiphytes, T to terrestrial forms and L to lithophytes. Country is indicated next to the herbarium acronyms only for samples collected outside of Colombia. Number of species for each genus is provided in parentheses, followed by the number of species with CAM-type isotopic signatures (δ[13]C values less negative than –20‰) over the total number of species analysed and by the percentage of species with CAM-type isotopic signatures for that taxon based on our survey.

Taxon	Accession/Voucher details‡	δ[13]C (‰)	G	Elevation (m)
ORCHIDACEAE				
SUBFAMILY CYPRIPEDIOIDEAE				
***Cypripedium* L. (61; 0/1 = 0%)**				
C. acaule Aiton (= *Fissipes acaulis* (Aiton) Small)	MOH 1 (JAUM)	–27.1		
***Paphiopedilum* Pfitzer (139; 0/1 = 0%)**				
P. insigne (Wall. ex Lindl.) Pfitzer	J. F. Restrepo 997 (CAUP)	–25.6	E	1884
***Phragmipedium* Rolfe (25; 0/3 = 0%)**				
P. andreettae P.J.Cribb & Pupulin	J. F. Restrepo 609 (CAUP)	–31.0	E	1000
P. longifolium (Rchb.f. & Warsz.) Rolfe	B. R. Ramírez & D. Macías 18477 (CUVC)	–31.1	T	175
P. schlimii (Rchb.f.) Rolfe	J. Betancur, *et al.* 12730 (CUVC)	–30.9	T	1709
***Selenipedium* Rchb.f. (5; 0/1 = 0%)**				
S. chica Rchb.f.	N. Pino, *et al.* 112 (CHOCO)	–30.5	T	85
SUBFAMILY EPIDENDROIDEAE				
Subtribe Coelogyninae (0/2 = 0%)				
***Coelogyne* Lindl. (198; 0/1 = 0%)**				
C. cristata Lindl.	J. F. Restrepo 479 (CAUP)	–27.5	E	1884
Tribe Arethuseae				
Subtribe Arethuseae				
***Arundina* Blume (2; 0/1 = 0%)**				
A. graminifolia (D.Don) Hochr.	B.R. Ramírez, *et al.* 12461 (FMB)	–27.5	T	100
Tribe Collabieae				
***Spathoglottis* (48; 0/1 =0%)**				
S. plicata Blume	L. F. Rojas & C. Rojas 9 (LLANOS)	–31.0	T	593
Tribe Cymbidieae				
Subtribe Catasetinae				
***Catasetum* Rich. ex Kunth (187; 0/6 = 0%)**				
C. bicolor Klotzsch	M. Ospina 157 (JAUM)	–29.8	E	27
C. aff. *callosum* Lindl.	L. F. Rojas & C. Rojas 7 (LLANOS)	–30.3	E	593
C. discolor Lindl.	M. V. Arbeláez & F. Sueroque 238 (HUA)	–31.4	E	225
C. ochraceum Lindl.	V. Londoño, *et al.* 70 (CUVC)	–22.9	T	1145
C. tabulare Lindl.	L. F. Prado & J. Contreras 323 (FMB)	–27.5	E	200
C. aff. *viridiflavum* Hook.	D. Cárdenas 1803 (JAUM)	–30.3	E	175
***Clowesia* Lindl. (8; 0/1 = 0%)**				
C. warczewitzii (Lindl. & Paxton) Dodson	N. Pino, *et al.* 581 (CHOCO)	–27.3	E	285
***Cycnoches* Lindl. (34; 0/2 = 0%)**				
C. aff. *chlorochilon* Klotzsch	J. Brand & A. Cogollo 96 (JAUM)	–29.8	E	80
C. densiflorum Rolfe	P. Ortiz-Valdivieso & S. Restrepo 588 (HPUJ)	–31.3	E	1500
***Galeandra* Lindl. (38; 0/4 = 0%)**				
G. baueri Lindl. (= *Galeandra cristata* Lindl.)	Anon. *s.n.* (JAUM)	–26.7		
G. beyrichii Rchb.f.	M. Rincón 1205 (TOLI)	–31.1	T	801
G. devoniana Schomb. ex Lindl.	A. Rudas, *et al*. 7180 (COAH)	–28.2	T	80
G. dives Rchb.f. & Warsz.	J. A. Sánchez 1132 (TOLI)	–31.8	E	230
Subtribe Coeliopsidinae				
***Peristeria* Hook. (13; 0/1 = 0%)**				

Table 1. Continued

Taxon	Accession/Voucher details‡	δ¹³C (‰)	G	Elevation (m)
P. elata Hook.	J. P. Tobón 1353 (JAUM)	–29.2	T	1600
Subtribe Cymbidiinae				
Cymbidium Sw. (79; 0/1 = 0%)				
C. sp.	C. Barbosa 1762 (FMB)	–29.4	T	957
Subtribe Cyrtopodiinae				
***Cyrtopodium* R.Br. (48; 0/3 = 0%)**				
C. andersonii (Lamb. ex Andrews) R.Br. in W.T.Aiton	D. Cárdenas, *et al.* 6541 (COAH)	–26.9	L	399
C. cristatum Lindl.	J. Zarucchi & C. Barbosa 3638 (FMB)	–29.2	T	90
C. paniculatum (Ruiz & Pav.) Garay	A. Niessen & O. De La Roque *s.n.* (CUVC)	–25.2	L	
Subtribe Eriopsidinae				
***Eriopsis* Lindl. (5; 0/2 = 0%)**				
E. biloba Lindl.	M. V. Arbeláez & F. Sueroque 172 (COAH)	–27.9	E	225
E. sp.	C. Barbosa 7631 (313) (FMB)	–25.5	E	463
Subtribe Eulophiinae				
***Eulophia* R.Br. (206; 0/1 = 0%)**				
E. alta Fawc. & Rendle	P. Stevenson 1903 (ANDES/P. stevenson Coll.)	–31.7	T	350
***Oeceoclades* Lindl. (37; 1/1 = 100%)**				
O. maculata (Lindl.) Lindl.	D. Tuberquía, *et al.* 2109 (HUA)	–16.2	T	920
Subtribe Maxillariinae				
***Anguloa* Ruiz & Pav. (13; 0/5 = 0%)**				
A. clowesii Lindl.	G. I. Alzate & J. M. Estrada 12 (FAUC)	–26.5	E	2150
A. dubia Rchb.f.	E. Domínguez & N. Urán 32 (JAUM)	–27.0	E	2000
A. uniflora Ruiz & Pav.	J. F. Restrepo 994 (CAUP)	–27.6	E	1884
A. virginalis Linden ex Schltr.	J. F. Restrepo 995 (CAUP)	–26.9	E	1500
A. ×*ruckeri* Lindl.	J. F. Restrepo 996 (CAUP)	–25.8	E	1884
***Bifrenaria* Lindl. (21; 0/1 = 0%)**				
B. longicornis Lindl. [= *Adipe longicornis* (Lindl.) M.Wolff]	M. Córdoba, *et al.* 2133 (FMB)	–30.7	E	200
B. longicornis Lindl.	O. Mohr & M. Sosa 15 (COAH)	–31.5	E	108
***Camaridium* Lindl. (81; 0/5 = 0%)**				
C. bracteatum Schltr. [= *Maxillaria bracteata* (Schltr.) Ames & Correll]	K. Barringer & J. Utley 3382A (HUA) Costa Rica	–22.7	E	1768
C. carinulatum (Rchb.f.) M.A.Blanco (= *Maxillaria carinulata* Rchb.f.)	G. M. Urreta 274b (HPUJ)	–27.1	E	1100
C. exaltatum Kraenzl. [= *Maxillaria exaltata* (Kraenzl.) C.Schweinf.]	P. Ortiz-Valdivieso 4172 (HPUJ)	–29.7	E	400
C. ochroleucum Lindl.	J. Betancur, *et al.* 5390 (COAH)	–33.3	E	1585
C. ochroleucum Lindl. (= *Maxillaria camaridii* Rchb.f.)	P. Stevenson 2170 (ANDES/P. stevenson Coll.)	–28.3	E	350
C. vestitium (Sw.) Lindl. [= *Maxillaria parviflora* (Poepp. & Endl.) Garay]	G. M. Urreta 159 (HUA)	–26.0	E	100
C. vestitium (Sw.) Lindl. [= *Maxillaria conferta* (Griseb.) C.Schweinf. ex León]	G. M. Urreta 159 (JAUM)	–26.1	E	100
***Christensonella* Szlach., Mytnik, Górniak & Śmiszek (16; 0/1 = 0%)**				
C. uncata (Lindl.) Szlach., Mytnik, Górniak & Śmiszek	R. Callejas, *et al.* 5242 (HUA)	–32.1	E	360

Table 1. Continued

Taxon	Accession/Voucher details‡	δ13C (‰)	G	Elevation (m)
C. uncata (Lindl.) Szlach, Mytnik, Górniak & Śmiszek (= *Maxillaria uncata* Lindl.)	G. M. Urreta 155 (HUA)	–28.9	E	75
***Cryptocentrum* Benth. (20; 0/8 = 0%)**				
C. flavum Schltr.	L. P. Botero & G. E. Páez 49 (TOLI)	–27.1	E	80
C. gracillimum Ames & C.Schweinf.	G. Bolaños & M. Rada 1 (TOLI)	–24.5	E	1519
C. latifolium Schltr.	O. Pérez & E. Parra 151 (CUVC)	–26.9	E	1600
C. lehmannii (Rchb.f.) Garay	A. Cogollo & J. G. Ramírez 3244 (JAUM)	–27.9	E	832.5
C. aff. *peruvianum* (Cogn.) C. Schweinf. (= *C.* aff. *hoppi* Schltr.)	O. Pérez & E. Parra 793 (CUVC)	–34.2	E	1900
C. standleyi Ames	O. Pérez, *et al.* 376 (VALLE)	–29.8	E	150
C. sp1.	H. Mendoza, *et al.* 7453 (FMB)	–26.3	E	2000
C. sp2.	M. Rincón 142 ((TOLI)/Dendrology sec.)	–30.0	E	100
***Cyrtidiorchis* Rauschert (5; 0/2 = 0%)**				
C. frontinoensis (Garay) Rauschert	L. Rodríguez, *et al.* 39 (VALLE)	–29.0	E	1500
C. rhomboglossa (F.Lehm. & Kraenzl.) Rauscher	S. Espinal & J. E Ramos 2902 (CUVC)	–25.1	E	1750
***Heterotaxis* Lindl. (14; 1/3 = 33.3%)**				
H. discolor (Lodd. ex Lindl.) Ojeda & Carnevali (= *Maxillaria discolor* Rchb.)	G. M. Urreta 158b (HPUJ)	–31.6	E	50
H. equitans (Schltr.) Ojeda & Carnevali	P. Silverstone & N. Paz 3228 (CUVC)	–13.9	E	950
H. equitans (Schltr.) Ojeda & Carnevali [= *Maxillaria equitans* (Schltr.) Garay]	J. Cano *s.n.* (JAUM)	–14.9	E	224
H. villosa (Barb.Rodr.) F.Barros	M. P. Galeano, *et al.* 514 (COAH)	–33.4	E	185
***Hylaeorchis* Carnevali & G.A.Romero (1; 0/1 = 0%)**				
H. petiolaris (Schltr.) Carnevali & G.A.Romero [= *Bifrenaria rudolfii* (Hoehne) Carnevali & G.A.Romero]	S. Madriñan & C. E. Barbosa 924 (FMB)	–35.6	E	200
***Inti* M.A.Blanco (2; 0/2 = 0%)**				
I. bicallosa (Rchb.f.) M.A.Blanco [= *Maxillaria bicallosa* (Rchb.f.) Garay]	G. M. Urreta 157c (HPUJ)	–23.9	E	70
I. chartacifolia (Ames & C.Schweinf.) M.A.Blanco (= *Maxillaria chartacifolia* Ames & C.Schweinf.)	G. M. Urreta 282B (HPUJ)	–25.7	E	50
***Lycaste* Lindl. (45; 0/4 = 0%)**				
L. macrophylla Lindl.	M. de Fraume 12 (FAUC)	–26.4	T	2103
L. ×niesseniae Oakeley	J. F. Restrepo 628 (CAUP)	–27.6	E	1884
L. schilleriana Rchb.f.	J. F. Restrepo 455 (CAUP)	–26.3	E	1884
L. xytriophora Linden & Rchb.f.	J. F. Restrepo 630 (CAUP)	–27.3	E	1884
***Mapinguari* Carnevali & R.B.Singer (5; 0/1 = 0%)**				
M. neophyllus (Rchb.f.) Baumbach (= *Maxillaria neophylla* Rchb.f.)	D. Benítez & G. Londoño 413 (JAUM)	–27.7	E	2670
***Maxillaria* Ruiz & Pav. (320; 0/39 = 0%)**				
M. aequiloba Schltr.	H. C. Vera 3 (CUVC)	–28.4	E	1930
M. amesiana Mast.	P. Ortiz-Valdivieso 447 (HPUJ)	–24.3	E	1800
M. anatomorum Rchb.f.	J. S. García-Revelo & A. D. García-Ramírez 20 (CUVC)	–34.2	E	2212
M. cf. *atrorubens**	P. Silverstone-Sopkin, *et al.* 3931 (CUVC)	–23.8	E	2424
M. brachybulbon Schltr.	G. M. Urreta 152A (HPUJ)	–31.7	E	100
M. caucae Garay	J. F. Restrepo 336 (CAUP)	–27.6	E	1400
M. caulina Schltr.	P. A. Silverstone, *et al.* 4349 (CUVC)	–28.9	E	2525

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
M. ecuadorensis Schltr.	D. A. García-Ramírez & J. S. García-Revelo 66 (CUVC)	–33.6	E	2099
M. embreei Dodson	R. Callejas 7188 (HUA)	–26.4	E	1850
M. cf. *embreei* Dodson	L. A. de Escobar, *et al.* 8648 (HUA)	–29.3	T	1700
M. fletcheriana Rolfe	J. F. Restrepo 472 (CAUP)	–27.9	E	1884
M. floribunda Lindl.	B. E. Salgado-Negret 89 (CAUP)	–27.8	E	2500
M. fractiflexa Rchb.f.	J. Betancur, *et al.* 12718 (CUVC)	–29.6	T	2200
M. grandiflora Lindl.	C. Acevedo, *et al.* 2939 (FMB)	–30.9	T	2600
M. hennisiana Schltr.	E. P. Killip & J. Cuatrecasas 38950 (VALLE)	–30.6	E	0
M. langlassei Schltr.	D. A. García-Ramírez & J. S. García-Revelo 22 (CUVC)	–31.9	E	1605
M. lepidota Lindl.	J. L. Zarucchi, *et al.* 5640 (HUA)	–31.3	E	1830
M. aff. *longicaulis* Schltr.	O. Pérez, *et al.* 1004 (CUVC)	–27.9	E	1800
M. longipetala Ruiz & Pav. [= *Lycaste longipetala* (Ruiz & Pav.) Garay]	C. Berrío, *et al.* 48 (HUQ)	–31.5	T	2870
M. cf. *longissima* Lindl.	P. A. Silverstone, *et al.* 2865 (CUVC)	–32.7	E	2310
M. luteoalba Lindl.	Y. Rueda-Valoyes & J. García-Arias 9 (CHOCO)	–29.4	T	86.9
M. marmoliana Dodson	Mejía-Rosero & Pino-Andrade 28 (CHOCO)	–28.4	E	44
M. meridensis Lindl.	R. Callejas & M. V Arbeláez 9597 (HUA)	–28.1	T	1800
M. nanegalensis Rchb.f.	D. A. García-Ramírez 84 (CUVC)	–28.5	E	2186
*M. nigropunctata**	J. F. Restrepo 623 (CAUP)	–26.7	E	1884
M. parkeri Hook.	R. Arévalo 325 (COAH)	–31.9	E	500
M. pentura Lindl.	MOH 73 (JAUM)	–27.6	T	1900
M. pleiantha Schltr.	P. Ortiz-Valdivieso 4339 (HPUJ)	–25.9		
M. pleuranthoides (Schltr.) Garay	B. R. Ramírez 7513 (CAUP)	–28.4	T	3100
M. porrecta Lindl.	D. Cárdenas, *et al.* 13315 (COAH)	–32.3	E	350
M. porrecta Lindl. (= *M. brunnea* Linden & Rchb.f.)	J. S. García-Revelo & A. D. García-Ramírez 46 (CUVC)	–30.9	E	2072
M. pseudoreichenheimiana Dodson	A.H. Gentry, *et al.* 47814 (CUVC)	–30.4	E	100
M. reichenheimiana Rchb.f.	J. F. Restrepo 622 (CAUP)	–31.1	E	1884
M. ringens Rchb.f.	J. F. Restrepo & N. Erazo 170 (CAUP)	–35.7	E	1750
M. cf. *rodrigueziana* J.T.Atwood & Mora-Ret.	P. Silverstone-Sopkin, *et al.* 3850 (CUVC)	–30.7	T	2070
M. rotundilabia C.Schweinf.	V. H. Grande, *et al.* 122 (HUQ)	–31.9	E	3160
M. setigera Lindl.	L. Rodríguez 70 (CUVC)	–31.1	E	700
M. setigera Lindl. (= *M. leptosepala* Hook.)	Mejía-Rosero & Pino-Andrade 9 (CHOCO)	–30.5	E	0
M. speciosa Rchb.f.	T. B. Croat 56721 (JAUM)	–26.2	T	1960
M. subulifolia Schltr.	J. Betancur, *et al.* 13073 (HUA)	–27.2	E	1600
M. triloris É.Morren	J. A. Echeverri-Garzón 12 (FAUC)	–26.8	E	3100
***Maxillariella* M.A.Blanco & Carnevali (45; 0/9 = 0%)**				
M. cf. *alba* (Hook.) M.A.Blanco & Carnevali [= *Maxillaria* cf. *alba* (Hook.) Lindl.]	N. F. Alzate 401 (CUVC)	–29.2	E	1800
M. arbuscula (Lindl.) M.A.Blanco & Carnevali (= *Maxillaria arbuscula* Rchb.f.)	J. F. Restrepo 304 (CAUP)	–29.3	E	1700
M. cassapensis (Rchb.f.) M.A.Blanco & Carnevali (= *Maxillaria ramosa* Ruiz & Pav.)	N. H. Ospina-Calderón 305 (CUVC)	–32.7	E	1537
M. graminifolia (Kunth) M.A.Blanco & Carnevali (= *Maxillaria graminifolia* Rchb.f.)	MOH *s.n.* (JAUM)	–28.9	E	2421

Table 1. Continued

Taxon	Accession/Voucher details‡	δ13C (‰)	G	Elevation (m)
M. guareimensis (Rchb.f.) M.A.Blanco & Carnevali (= *Maxillaria guareimensis* Rchb.f.)	P. Viveros, *et al.* 106 (HUQ)	–35.3	E	1100
M. cf. *infausta* (Rchb.f.) M.A.Blanco & Carnevali (= *Maxillaria* cf. *infausta* Rchb.f.)	J. Cuatrecasas 14903 (VALLE)	–29.5	E	1011
M. lawrenceana (Rolfe) M.A.Blanco & Carnevali [= *Maxillaria lawrenceana* (Rolfe) Garay & Dunst. in Dunst. & Garay]	O. Meneses, *et al.* 346 (CUVC)	–26.7	E	1230
M. procurrens (Lindl.) M.A.Blanco & Carnevali (= *Maxillaria procurrens* Lindl.)	P. Viveros, *et al.* 28 (HUQ)	–29.8	E	1650
M. spilotantha (Rchb.f.) M.A.Blanco & Carnevali	M. Rincón 380 ((TOLI)/Dendrology sec.)	–32.2	E	2580
***Mormolyca* Fenzl (23; 0/6 = 0%)**				
M. acutifolia (Lindl.) M.A.Blanco (= *Maxillaria acutifolia* Lindl.)	G. M. Urreta 171b (HPUJ)	–29.5	E	50
M. cf. *hedwigiae* (Hamer & Dodson) M.A.Blanco (= *Maxillaria* cf. *hedwigiae* Hamer & Dodson)	O. Pérez & M. Kolanowska 1052 (VALLE)	–30.7	E	100
M. lehmanii (Rolfe) M.A.Blanco (= *Chrysocycnis lehmanii* Rolfe)	J. E. Ramos 5837 (CUVC)	–25.6	E	2200
M. rufescens (Lindl.) M.A.Blanco (= *Maxillaria rufescens* Lindl.)	J. Cuatrecasas 15707 (VALLE)	–29.8	E	27.5
M. schlimii (Linden & Rchb.f.) M.A.Blanco (= *Chrysocycnis schlimii* Linden & Rchb.f.)	M. Ospina 704 (JAUM)	–26.5	E	2085
M. tenuibulba (Christenson) M.A.Blanco (= *Maxillaria tenuibulba* Christenson)	J. A. Vargas-Figueroa 161 (CUVC)	–30.2	E	1807
***Neomoorea* Rolfe (1; 0/1 = 0%)**				
N. sp.	H. Mendoza, *et al.* 10283 (FMB)	–31.7	E	350
***Ornithidium* Salisb. ex R.Br. (54; 0/12 = 0%)**				
O. adendrobium (Rchb.f.) M.A.Blanco & Ojeda (= *Maxillaria adendrobium* (Rchb.f.) Dressler)	P. Ortiz-Valdivieso 4315 (HPUJ)	–29.7	E	1300
O. affine (Poepp. & Endl.) M.A.Blanco & Ojeda	C. Londoño, *et al.* 1153 (COAH)	–31.5	E	250
O. aggregatum Rchb.f. (= *Maxillaria aggregata* Lindl.)	C. Barbosa 2859 (FMB)	–30.4	E	3211
O. cf. *aggregatum* Rchb.f.	P. Stevenson, *et al.* 3288 (ANDES/P. stevenson Coll.)	–28.9	E	1900
O. aureum Poepp. & Endl.	W. Devia, *et al.* 4101 (TULV)	–26.9	E	250
O. aureum Poepp. & Endl. [= *Maxillaria aurea* (Poepp. & Endl.) L.O.Williams]	F. González 324 (FMB)	–26.8	T	2398
O. cf. *fulgens* Rchb.f. [= *Maxillaria* cf. *fulgens* (Rchb.f.) L.O.Williams]	P. A. Morales, *et al.* 654 (HUA)	–30.0	T	2454
O. montezumae Arévalo & Christenson	D. A. García-Ramírez 134 (CUVC)	–29.7	T	2200
O. nubigenum Rchb.f. [= *Maxillaria nubigena* (Rchb.f. ex Walp) C.Schweinf.]	B. R. Ramírez, *et al.* 14978 (FMB)	–27.0	E	2000
O. pastoense Schltr. (= *Maxillaria deuteropastensis* P.Ortiz)	E. Rentería, *et al.* 3848 (JAUM)	–29.7	T	1300
O. pendens (Pabst) Senghas (= *Maxillaria pendens* Pabst)	P. Ortiz-Valdivieso 121 (HPUJ)	–26.9	E	1700
O. pendulum (Poepp. & Endl.) Cogn. [= *Maxillaria pendula* (Poepp. & Endl.) C.Schweinf.]	P. Ortiz-Valdivieso 292 (HPUJ)	–22.5		
O. serrulatum Lindl. (= *Maxillaria alticola* C.Schweinf.)	J. L. Zarucchi & F. J. Roldán 7280 (HUA)	–27.0	T	2300
***Pityphyllum* Schltr. (5; 0/1 = 0%)**				
P. laricinum (Kraenzl.) Schltr.	J. Betancur, *et al.* 5173 (COAH)	–31.0	E	1400
P. laricinum (Kraenzl.) Schltr.	M. Schneider 498 (HUA)	–27.9	L	2000
***Rhetinantha* M.A.Blanco (13; 0/2 = 0%)**				

Table 1. Continued

Taxon	Accession/Voucher details‡	δ¹³C (‰)	G	Elevation (m)
R. acuminata (Lindl.) M.A.Blanco	P. Stevenson, *et al.* 3013 (ANDES/P. stevenson Coll.)	–30.9	E	1900
R. acuminata (Lindl.) M.A.Blanco (= *Maxillaria acuminata* Lindl.)	P. Ortiz-Valdivieso 112 (HPUJ)	–32.6	E	2050
R. friedrichsthalii (Rchb.f.) M.A.Blanco	G. Reina, *et al.* 1124 (CUVC)	–24.8	E	1842
***Sauvetrea* Szlach. (11; 0/2 = 0%)**				
S. alpestris (Lindl.) Szlach. (= *Maxillaria chlorochila* F.Lehm. & Kraenzl.)	P. Ortiz-Valdivieso 4290 (HPUJ)	–31.9	E	1800
S. aff. *alpestris* (Lindl.) Szlach. (= *Maxillaria* aff. *alpestris* Lindl.)	P. Stevenson, *et al.* 3213 (ANDES/P. stevenson Coll.)	–27.4	E	1900
***Sudamerlycaste* Archila (44; 0/5 = 0%)**				
S. ciliata (Ruiz & Pav.) Archila [= *Lycaste ciliata* (Ruiz & Pav.) Veitch]	P. Viveros, *et al.* 32 (HUQ)	–30.7	E	1650
S. fimbriata (Poepp. & Endl.) Archila	N. H. Ospina-Calderón 346 (CUVC)	–29.1	E	1413
S. fimbriata (Poepp. & Endl.) Archila [= *Ida fimbriata* (Poepp. & Endl.) A.Ryan & Oakeley]	Arend 3218 (FMB)	–28.3	E	1613
S. fulvescens (Hook.) Archila	J. F. Restrepo 602 (CAUP)	–28.1	E	1500
S. grandis (A.Ryan & Oakeley) Archila	V. H. Grande, *et al.* 123 (HUQ)	–25.8	T	2800
S. sp.	P. Silverstone 1066 (TULV)	–25.5	E	1550
***Teuscheria* Garay (7; 0/1 = 0%)**				
T. pickiana (Schltr.) Garay	J. Cuatrecasas 14901 (VALLE)	–26.2	E	1040
***Trigonidium* Lindl. (13; 0/5 = 0%)**				
T. aff. *egertonianum* Bateman	O. Pérez & M. Kolanowska 1047 (CUVC)	–26.9	E	100
T. obtusum Lindl.	C. Barbosa 7543 (225) (COAH)	–33.3	E	463
T. riopalenquense Dodson	M. Rincón 127 ((TOLI)/Dendrology sec.)	–30.8	E	100
T. sp1.	J. F. Restrepo 490 (CAUP)	–27.3	E	1884
T. sp2.	C. Barbosa 7379 (61) (FMB)	–31.6	E	
***Xylobium* Lindl. (31; 0/7 = 0%)**				
X. corrugatum Rolfe	Anon. *s.n.* (VALLE)	–27.7		
X. foveatum G.Nicholson	P. Silverstone-Sopkin, *et al.* 8623 (CUVC)	–24.9	E	950
X. leontoglossum Benth. ex Rolfe	H. Mendoza, *et al.* 14621 (FMB)	–31.4	E	2150
X. pallidiflorum G.Nicholson	E. Escobar 236 (VALLE)	–29.9	E	1550
X. variegatum (Ruiz & Pav.) Garay & Dunst.	L. Rivas & D. Herrera 19 (HUQ)	–30.7	E	1495
X. cf. *variegatum* (Ruiz & Pav.) Garay & Dunst. (= *X.* cf. *truxillense* Rolfe)	P. Viveros, *et al.* 129 (HUQ)	–28.9	E	1100
X. sp.	M. Rincón 402 ((TOLI)/Dendrology sec.)	–31.5	E	100
Subtribe Oncidiinae				
***Aspasia* Lindl. (7; 0/1 = 0%)**				
A. epidendroides Lindl.	E. Rentería, *et al.* 4852 (JAUM)	–30.2	E	10
***Brassia* R.Br. in W.T.Aiton (63; 0/11 = 0%)**				
B. allenii (L.O.Williams ex C.Schweinf.) [= *Ada allenii* (L.O.Williams ex C.Schweinf.) N.H.Williams]	G. M. Urreta 205 (HPUJ)	–30.4	E	523
B. andina (Rchb.f.) M.W.Chase (= *Brachtia andina* Rchb.f.)	B. E. Salgado-Negret 395 (CAUP)	–27.8	T	2900
B. arcuigera Rchb.f (= *B. antherotes* Rchb.f.)	D. A. García-Ramírez 102 (CUVC)	–30.5	E	2580
B. aurantiaca (Lindl.) M.W.Chase (= *Ada aurantiaca* Lindl.)	P. Ortiz-Valdivieso 272 (HPUJ)	–29.2	E	1600
B. aff. *bidens* Lindl.	J. Espina 852 (JBGP)	–27.6	T	130
B. brevis (Kraenzl.) M.W.Chase	M. Rincón 306 (TOLI)	–29.1	E	2600

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
B. euodes Rchb.f. [= *Ada elegantula* (Rchb.f.) N.H.Williams]	D. A. García-Ramírez 94 (CUVC)	–29.9	E	2307
B. euodes Rchb.f. [= *Ada euodes* (Rchb.f.) D.E.Benn. & Christenson]	O. Pérez, *et al.* 1068 (CUVC)	–30.8	E	1800
B. forgetiana Sander	P. Silverstone-Sopkin & N. Paz 8815 (CUVC)	–27.2	E	22
B. glumacea Lindl. [= *Ada glumacea* (Lindl.) N.H.Williams]	D. Bonilla 3 (TOLI)	–28.0	E	1590
B. ocanensis Lindl. [= *Ada ocanensis* (Lindl.) N.H.Williams]	P. Stevenson & C. Prada 3120 (ANDES/P. stevenson Coll.)	–28.9	E	1900
B. verrucosa Bateman	G. I. Alzate, *et al.* 9 (FAUC)	–26.4	E	900
***Caucaea* Schltr. (9; 0/4 = 0%)**				
C. olivacea (Kunth) N.H.Williams & M.W.Chase	M. J. Rodríguez & M. E. Pantoja 40 (CAUP)	–26.0	E	3206
C. olivacea (Kunth) N.H.Williams & M.W.Chase (= *Oncidium cucullatum* Lindl.)	S. Espinal & J. E Ramos 3282 (CUVC)	–23.4	E	3000
C. olivacea (Kunth) N.H.Williams & M.W.Chase (= *Oncidium olivaceum* Kunth)	C. Restrepo & A. Duque 224 (CUVC)	–28.2	E	2900
C. radiata Mansf.	D. Bonilla 41 (TOLI)	–30.0	E	2900
C. sanguinolenta (Lindl.) N.H.Williams & M.W.Chase	M. Rincón 149 (TOLI)	–29.4	E	2600
C. sanguinolenta (Lindl.) N.H.Williams & M.W.Chase [= *C. mimetica* (Stacy) N.H.Williams & M.W.Chase]	V. H. Grande, *et al.* 68 (HUQ)	–26.9	E	2800
C. cf. *sanguinolenta* (Lindl.) N.H.Williams & M.W.Chase (= *Oncidium* cf. *mimeticum* Stacy)	G. Arbeláez, *et al.* 659 (HUQ)	–24.3	E	2750
***Cischweinfia* Dressler & N.H.Williams (10; 0/1 = 0%)**				
C. sp.	J. Cuatrecasas 15049 (VALLE)	–29.8	E	1040
***Comparettia* Poepp. & Endl. (76; 3/3 = 100%)**				
C. falcata Poepp. & Endl.	S. Galán & K. Cárdenas 40 (FMB)	–15.0	E	1878
C. macroplectron Rchb.f. & Triana	P. Rodríguez 3 (HPUJ)	–11.9	E	1650
C. ottonis (Klotzsch) M.W.Chase & N.H.Williams (= *Scelochilus ottonis* Klotzsch)	M. Rincón 287 (TOLI)	–15.5	E	2800
***Cuitlauzina* Lex. (7; 0/1 = 0%)**				
C. sp. (= *Osmoglossum* Schltr.)	Anon. (CAUP)	–29.1		
***Cyrtochiloides* N.H.Williams & M.W.Chase (3; 0/1 = 0%)**				
C. ochmatochila (Rchb.f.) N.H.Williams & M.W.Chase (= *Oncidium ochmatochilum* Rchb.f.)	G. Reina, *et al.* 1557 (CUVC)	–28.4	E	1300
***Cyrtochilum* Kunth (131; 0/31 = 0%)**				
C. cf. *aemulum* Kraenzl.	J. L. Luteyn, *et al.* 12249 (CUVC)	–29.2	T	1750
C. angustatum (Lindl.) Dalström	P. Silverstone-Sopkin, *et al.* 10139 (CUVC) Ecuador	–28.9	E	2990
C. annulare Kraenzl.	T. Hinestroza & A. L. Montoya 438 (JAUM)	–25.3	E	438
C. annulare Kraenzl. (= *C. monachicum* Kraenzl.)	P. Ortiz-Valdivieso 486 (HPUJ)	–27.7	E	2500
C. auropurpureum (Rchb.f.) Dalström (= *Odontoglossum auropurpureum* Rchb.f.)	P. Ortiz-Valdivieso 4037 (HPUJ)	–23.5	T	2975
C. cimiciferum (Rchb.f) Dalström [= *Oncidium cimiciferum* (Rchb.f.) Beer]	P. Ortiz-Valdivieso 168a (HPUJ)	–23.7	E	2450
C. densiflorum Kraenzl.	P. Ortiz-Valdivieso 375 (HPUJ)	–28.5	T	2800
C. diceratum Kraenzl.	P. Ortiz-Valdivieso 475 (HPUJ)	–25.5	T	2800

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
C. cf. *dipterum* Kraenzl. (= *Odontoglossum* cf. *dipterum* Lindl.)	P. Viveros, *et al.* 321 (HUQ)	–27.1	T	2900
C. divaricatum (Lindl.) Dalström	E. Domínguez 668 ((TOLI)/Dendrology sec.)	–24.1	E	2580
C. divaricatum (Lindl.) Dalström [= *Oncidium costatum* (Lindl.) Beer]	P. Ortiz-Valdivieso 165 (HPUJ)	–30.1	E	2300
C. examinans Kraenzl.	D. A. García-Ramírez & J. S. García-Revelo 15 (CUVC)	–30.2	T	2321
C. exasperatum Kraenzl.	Anon. *s.n.* (HPUJ)	–23.9		
C. flexuosum Kunth	H. Silva 299 (HPUJ)	–26.1	E	2000
C. flexuosum Kunth (= *Oncidium trulla* Rchb.f.)	P. Ortiz-Valdivieso 484 (HPUJ)	–28.0	E	2300
C. funis Kraenzl.	P. Ortiz-Valdivieso & L. Ortiz 4193 (HPUJ)	–24.7	T	3200
C. halteratum Kraenzl. (= *C. superbiens* Kraenzl.)	A. J. Negret 2144 (CAUP)	–25.7	E	2300
C. halteratum Kraenzl.	A. Cogollo, *et al.* 11355 (JAUM)	–26.1	E	2555
C. halteratum Kraenzl. (= *C. superbiens* Kraenzl.)	P. Ortiz-Valdivieso 487 (HPUJ)	–26.9	E	2700
C. ioplocon (Rchb.f.) Dalström	J. Farfán, *et al.* 1066 (FMB)	–29.1	T	2850
C. ixioides Lindl. (= *Odontoglossum ixioides* Lindl.	S. Restrepo 100 (HPUJ)	–26.7	T	2675
C. longifolium Kraenzl.	M. Ospina 130 (JAUM)	–26.5	T	2500
C. meirax (Rchb.f.) Dalström	P. Ortiz-Valdivieso *s.n.* (HPUJ)	–28.7	E	1697
C. murinum Kraenzl. (= *Oncidium murinum* Rchb.f.)	S. Restrepo 108 (HPUJ)	–23.9	E	2450
C. myanthum Kraenzl. (= *Odontoglossum myanthum* Lindl. in Benth.)	P. Ortiz-Valdivieso 326 (HPUJ)	–24.6	E	2500
C. orgyale Kraenzl.	J. Farfán & E. Farfán 1123 (FMB)	–27.4	E	2450
C. pardinum Lindl.	E. Rentería 3906 (HUA)	–29.5	E	3372
C. pardinum Lindl. (= *Odontoglossum spathaceum* Lindl.)	P. Ortiz-Valdivieso 612 (HPUJ)	–24.3	T	3483
C. porrigens Kraenzl. (= *Oncidium saltabundum* Rchb.f.)	P. Ortiz-Valdivieso 380 (HPUJ)	–23.8	E	2050
C. ramosissimum (Lindl.) Dalström (= *Odontoglossum ramosissimum* Lindl.)	P. Ortiz-Valdivieso 522 (HPUJ)	–23.8	E	2400
C. revolutum (Lindl.) Dalström	A. Giraldo 7836 (CUVC)	–28.4	T	3300
C. revolutum (Lindl.) Dalström (= *Odontoglossum lindenii* Lindl.)	P. Ortiz-Valdivieso 30 (HPUJ)	–25.7		
C. serratum Kraenzl.	P. Silverstone-Sopkin, *et al.* 9803 (CUVC) Ecuador	–29.2	E	1900
C. tenense Kraenzl.	M. Ospina 163 (JAUM)	–25.9	E	2400
C. tetracopis Kraenzl.	J. Farfán, *et al.* 1090 (FMB)	–27.9	E	2550
C. trifurcatum Kraenzl.	M. I. Guarín 89 (VALLE)	–24.4	E	2724
C. ventilabrum Kraenzl.	J. L. Zarucchi, *et al.* 5701 (HUA)	–28.5	T	2010
C. ventilabrum Kraenzl. (= *Oncidium carderi* Rchb.f.)	G. Hincapié 113 (HPUJ)	–25.3	E	2450
C. weirii (Rchb.f.) Dalström (= *Odontoglossum weirii* Rchb.f.)	A. Fernández-Pérez, *et al.* 30180 (FMB)	–25.3	E	2890
***Erycina* Lindl. (7; 0/4 = 0%)**				
E. crista-galli (Rchb.f.) N.H.Williams & M.W.Chase [= *Psygmorchis crista-galli* (Rchb.f.) Dodson]	R. Callejas, *et al.* 6672 (HUA)	–27.4	E	910
E. glossomystax (Rchb.f.) N.H.Williams & M.W.Chase [= *Psygmorchis glossomystax* (Rchb.f.) Dodson & Dressler]	J. J. Pipoly *s.n.* (FMB)	–21.9	E	215
E. pumilio (Rchb.f.) N.H.Williams & M.W.Chase	L. M. Quiñones, *et al.* 238 (LLANOS)	–23.2	E	1235
E. pusilla (L.) N.H.Williams & M.W.Chase	M. Rodríguez & J. del Águila 40 (COAH)	–24.2	E	99

Table 1. Continued

Taxon	Accession/Voucher details‡	δ13C (‰)	G	Elevation (m)
***Fernandezia* Ruiz & Pav. (51; 0/11 = 0%)**				
F. crystallina (Lindl.) M.W.Chase	V. H. Grande, *et al.* 83 (HUQ)	–31.8	E	2600
F. crystallina (Lindl.) M.W.Chase (= *Pachyphyllum crystallinum* Lindl.)	F. Alzate, *et al.* 3207 (HUA)	–27.8	E	3550
F. cf. distichoides M.W.Chase (= *Pachyphyllum* cf. *distichum* Kunth)	O. Pérez, *et al.* 1038 (CUVC)	–25.8	E	3200
F. hartwegii (Rchb.f.) Garay & Dunst.	R. Londoño, *et al.* 364 (HUA)	–25.7	E	3115
F. hispidula (Rchb.f.) M.W.Chase [= *Pachyphyllum hispidulum* (Rchb.f.) Garay & Dunst. in Dunst. & Garay]	A. L. Montoyam, *et al.* 483 (HUA)	–24.1	E	3000
F. lanceolata (L.O.Williams) Garay & Dunst.	O. Marulanda, *et al.* 444 (HUA)	–26.9	E	2904
F. micrangis (Schltr.) M.W.Chase	M. Rincón 343 (TOLI)	–31.8	E	3000
F. pastii (Rchb.f.) M.W.Chase (= *Pachyphyllum pastii* Rchb.f.)	M. E. Fernández, *et al.* 192 (JAUM)	–23.8	E	3120
F. peperomioides (Kraenzl.) M.W.Chase (= *Pachyphyllum peperomioides* Kraenzl.)	L. Perdomo & S. Díaz 569 (CAUP)	–26.6	E	2990
F. sanguinea (Lindl.) Garay & Dunst.	J. L. Zarucchi & A. E. Brant 5322 (HUA)	–27.7	E	2970
F. squarrosa (Lindl.) M.W.Chase (= *Pachyphyllum squarrosum* Lindl.)	R. Callejas, *et al.* 7621 (HUA)	–32.3	E	3400
F. sp.	C. Barbosa 9436 (146) (FMB)	–26.0	E	
***Ionopsis* Kunth (6; 1/2 = 50%)**				
I. satyrioides Rchb.f.	A. Cogollo 1100 (HUA)	–30.3	E	370
I. utricularioides (Sw.) Lindl.	Ohba, *et al.* 315 (FMB)	–15.8	E	354
***Lockhartia* Hook. (27; 1/5 = 20%)**				
L. acuta Rchb.f.	P. Stevenson 1935 (ANDES/P. stevenson Coll.)	–21.1	E	375
L. amoena Endrés & Rchb.f.	J. F. Restrepo 289 (CAUP)	–28.5	E	1650
L. longifolia Schltr. (= *L. hologlossa* Schltr.)	S. Espinal, *et al.* 3735 (CUVC)	–28.4	E	2100
L. aff. *longifolia* Schltr.	G. Reina, *et al.* 1751 (CUVC)	–30.9	E	2187
L. sp.	L. M. Moreno 497 (FMB)	–14.9	E	10
***Macroclinium* Barb.Rodr. ex Pfitzer (40; 0/1 = 0%)**				
M. sp.	D. Macías, *et al.* 2207 (CAUP)	–26.6	E	737.5
***Miltonia* Lindl. (18; 0/1 = 0%)**				
M. spectabilis Lindl.	J. Home 157 (CUVC)	–28.7	E	1450
***Miltoniopsis* God.-Leb. (5; 0/2 = 0%)**				
M. roezlii (Rchb.f.) God.-Leb.	M. Ospina 368 (JAUM)	–30.5	E	1349
M. vexillaria G.Nicholson	S. Hoyos, *et al.* 2402 (JAUM)	–30.3	E	705
***Notylia* Lindl. (56; 3/3 = 100%)**				
N. albida Klotzsch	MOH 371 (JAUM)	–11.2	E	1349
N. incurva Lindl.	C. Barbosa 4750 (156) (FMB)	–12.8	E	64
N. aff. *pentachne* Rchb.f.	M. Rincón 143 ((TOLI)/Dendrology sec.)	–15.4	E	140
***Oliveriana* Rchb.f. (6; 0/2 = 0%)**				
O. egregia Rchb.f.	MOH 983 (JAUM)	–25.4	T	2500
O. lehmannii Garay	P. A. Silverstone, *et al.* 4637 (CUVC)	–27.9	E	2750
***Oncidium* Sw. (324; 0/40 = 0%)**				
O. abortivum Rchb.f.	MOH 151 (JAUM)	–29.6	E	2722
O. adelaidae Königer	D. A. García-Ramírez 116 (CUVC)	–28.1	E	2050
O. anthocrene Rchb.f.	P. Ortiz-Valdivieso 643 (HPUJ)	–25.9	E	246
O. aristuliferum (Kraenzl.) M.W.Chase & N.H.Williams (= *Sigmatostalix aristulifera* Kraenzl.)	D. A. García-Ramírez 117 (CUVC)	–29.7	E	2150

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
O. baueri Lindl.	H. Mendoza, *et al.* 14430 (FMB)	–29.5	E	1200
O. boothianum Rchb.f.	P. Ortiz-Valdivieso 4303 (HPUJ)	–28.7	E	2183
O. candelabrum Linden [= *Otoglossum coronarium* (Lindl.) Garay & Dunst.]	MOH 62-5 (JAUM)	–27.6	E	2500
*O. chiripeodium**	J. F. Restrepo 383 (CAUP) Costa Rica	–28.4	E	1884
O. chrysomorphum Lindl.	E. Parra & O. Pérez 149 (CUVC)	–25.9	E	1600
O. cirrhosum Beer (= *Odontoglossum cirrhosum* Lindl.)	N. Paz 353 (CUVC)	–29.8	E	1800
O. citrinum Lindl.	P. Ortiz-Valdivieso & R. Cortés 550 (HPUJ)	–29.5	E	800
O. constrictum Beer (= *Odontoglossum constrictum* Lindl.)	D. A. García-Ramírez & J. S. García-Revelo 73 (CUVC)	–32.7	E	2146
O. crinitum (Rchb.f.) M.W.Chase & N.H.Williams	M. Rincón 325 (TOLI)	–26.9	E	2600
O. cristatum Beer (= *Odontoglossum cristatum* Lindl.)	P. Ortiz-Valdivieso 587 (HPUJ)	–23.5	E	2600
O. cuculligerum (Schltr.) M.W.Chase & N.H.Williams [= *Sigmatostalix cuculligera* (Schltr.) Garay]	W. Hincapié & O. Pérez 143 (CUVC)	–29.1	E	1600
O. cultratum Lindl. (= *O. jamesonii* Rchb.f.)	P. Ortiz-Valdivieso & L. J. Ortiz 4206 (HPUJ)	–25.2	T	3000
O. dactyliferum Garay & Dunst.	J. M. MacDougal, *et al.* 4478 (CUVC)	–24.1	E	3385
O. epidendroides Beer (= *Odontoglossum epidendroides* Kunth)	P. Ortiz-Valdivieso 482 (HPUJ)	–30.3	E	2200
O. cf. *fuscatum* Rchb.f.	G. M. Urreta 269d (HPUJ)	–24.7	E	750
O. gloriosum (Linden & Rchb.f.) M.W.Chase & N.H.Williams (= *Odontoglossum gloriosum* Linden & Rchb.f.)	L. V. Sánchez & R. Moreno 65 (HPUJ)	–27.2	E	3000
O. gramineum (Poepp. & Endl.) M.W.Chase & N.H.Williams (= *Sigmatostalix graminea* Rchb.f.)	F. Quevedo & J. V. Ruedas 2183 (FMB)	–25.2	E	2200
O. hapalotyle Schltr.	P. Ortiz-Valdivieso 611 (HPUJ)	–25.5	E	1460
O. harryanum (Rchb.f.) M.W.Chase & N.H.Williams (= *Odontoglossum harryanum* Rchb.f.)	P. Ortiz-Valdivieso 692 (HPUJ)	–24.7	E	1865
O. hastilabium (Lindl.) Beer	MOH 308 (JAUM)	–25.7	E	1691
O. heteranthum Poepp. & Endl.	P. A. Villa & K. Quintero 92 (HUQ)	–27.9	E	1700
O. lehmannii (Rchb.f.) M.W.Chase & N.H.Williams (= *Odontoglossum cristatellum* Rchb.f.)	C. Acevedo, *et al.* 176 (FMB)	–28.8	E	2530
O. luteopurpureum Beer (= *Odontoglossum luteopurpureum* Lindl.)	J. Farfán & E. Farfán 1128 (FMB)	–27.2	E	2450
O. mirandum (Rchb.f.) M.W.Chase & N.H.Williams (= *Odontoglossum mirandum* Rchb.f.)	P. Ortiz-Valdivieso & S. Restrepo 570 (HPUJ)	–25.6	E	2400
O. nebulosum Lindl. (= *O. klotzschianum* Rchb.f.)	H. Mendoza, *et al.* 14430 (JAUM)	–25.0	E	1200
O. obryzatum Rchb.f. & Warsz.	G. M. Urreta 217b (HPUJ)	–26.8	E	0
O. ornithocephalum Lindl.	L. M. Álvarez 4157 (FAUC)	–32.3	E	2737
O. ornithocephalum Lindl.	A. Prieto, *et al.* 1429 (FMB)	–29.4	E	2903
O. ornithorhynchum Kunth (= *O. pyramidale* Lindl.)	O. Pérez, *et al.* 1028 (CUVC)	–25.5	E	3200
O. pictum Kunth	O. Pérez & E. Parra 231 (VALLE)	–28.4	E	1800
O. poikilostalix (Kraenzl.) M.W.Chase & N.H.Williams (= *Sigmatostalix guatemalensis* Schltr.)	J. F. Restrepo 614 (CAUP)	–24.6	E	1884
O. praenitens (Rchb.f.) M.W.Chase & N.H.Williams (= *Odontoglossum praenitens* Rchb.f.)	P. Ortiz-Valdivieso 585 (HPUJ)	–25.6	E	2000

Table 1. Continued

Taxon	Accession/Voucher details‡	δ^{13}C (‰)	G	Elevation (m)
O. roseum Beer (= *Cochlioda rosea* (Lindl.) Benth. & Hook.f.)	J. F. Restrepo 322 (CAUP)	−27.6	E	1884
O. sceptrum (Rchb.f. & Warsz.) M.W.Chase & N.H.Williams (= *Odontoglossum sceptrum* Rchb.f. & Warsz.)	M. Correa & D. Yarce 1630 (JAUM)	−28.1	E	2600
O. sphacelatum Lindl.	C. Ríos, *et al.* 8 (FAUC)	−23.4	E	2300
O. tipuloides Rchb.f.	D. A. García-Ramírez 139 (CUVC)	−27.9	T	1870
O. tripudians (Rchb.f. & Warsz.) M.W.Chase & N.H.Williams (= *Odontoglossum tripudians* Rchb.f. & Warsz.)	P. Ortiz-Valdivieso 604 (HPUJ)	−25.4	E	2600
***Ornithocephalus* Hook. (49; 5/5 = 100%)**				
O. bicornis Lindl.	P. V. Trujillo-Q 6418 (HUA)	−13.2	E	417
O. escobarianus (Garay) Toscano & Dressler	L. A. de Escobar, *et al.* 7986 (HUA)	−13.4	E	1850
O. cf. *gladiatus* Hook.	D. A. Giraldo-Cañas 775 (HUA)	−13.1	E	800
O. urceilabris (P.Ortiz & R.Escobar) Toscano & Dressler	D. M. Munar, *et al.* 1752 (CAUP)	−16.4	E	2457
O. sp.	P. Stevenson, *et al.* 2950 (ANDES/P. stevenson Coll.)	−16.7	E	1900
***Otoglossum* (Schltr.) Garay & Dunst. (14; 0/5 = 0%)**				
O. arminii (Rchb.f.) Garay & Dunst.	J. S. García-Revelo & A. D. García-Ramírez 18 (CUVC)	−29.4	T	2245
O. aff. *chiriquense* (Rchb.f.) Garay & Dunst.	H. Mendoza & H. Gómez 376 (FMB)	−27.3	E	2700
O. globuliferum (Kunth) N.H.Williams & M.W.Chase (= *Oncidium globuliferum* Kunth)	H. C. Villlalobos & A. H. Gentry 2894 (JBGP)	−26.7	E	980
O. globuliferum (Kunth) N.H.Williams & M.W.Chase	H. Esquivel 2210 (TOLI)	−26.8	T	2000
O. scansor (Rchb.f.) Carnevali & I.Ramírez	M. Rincón 23558 (VALLE)	−24.3	E	2280
O. serpens (Lindl.) N.H.Williams & M.W.Chase (= *Oncidium serpens* Lindl.)	E. Carvajalino 128 (HPUJ)	−27.7	E	2200
***Plectrophora* H.Focke (10; 1/1 = 100%)**				
P. alata (Rolfe) Garay	L. Rivas & D. Herrera 24 (HUQ)	−13.4	E	1500
***Psychopsis* Raf. (4; 1/1 = 100%)**				
P. papilio (Lindl.) H.G.Jones	J. Espina & F. García 2446 (CHOCO)	−14.9	E	40
***Pterostemma* Kraenzl. (3; 1/1 = 100%)**				
P. antioquiense F.Lehm. & Kraenzl.	D. M. & P. Estrada 13 (HUA)	−16.9	E	2200
***Rodriguezia* Ruiz & Pav. (48; 3/3 = 100%)**				
R. granadensis Rchb.f.	T. Hinestroza & A. L. Montoya 467 (JAUM)	−12.7	E	1400
R. lanceolata Ruiz & Pav.	C. Barbosa *s.n.* (FMB)	−13.2	E	41
R. lanceolata Ruiz & Pav. (= *R. secunda* Kunth)	E. P. Killip & J. Cuatrecasas 39170 (VALLE)	−11.5	E	400
R. venusta Rchb.f.	L. F. Rojas & C. Rojas 8 (LLANOS)	−13.8	E	384
***Rossioglossum* (Schltr.) Garay & G.C.Kenn. (9; 0/1 = 0%)**				
R. ampliatum (Lindl.) M.W.Chase & N.H.Williams (= *Oncidium ampliatum* Lindl.)	P. Ortiz-Valdivieso 4343 (HPUJ)	−28.4	E	2220
***Solenidium* Lindl. (3; 1/1 = 100%)**				
S. racemosum Lindl.	D. A. García-Ramírez 122 (CUVC)	−17.9	E	1670
***Systeloglossum* Schltr. (5; 0/1 = 0%)**				
S. cf. *ecuadorense* (Garay) Dressler & N.H.Williams	P. Viveros & E. Flórez 320 (HUQ)	−28.7	E	1900
***Telipogon* Kunth (205; 0/5 = 0%)**				
T. hausmannianus Rchb.f.	C. Berrío, *et al.* 67 (HUQ)	−28.9	E	3040

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
T. lehmannii Schltr.	B. E. Salgado-Negret 350 (CAUP)	−25.5	T	2900
T. nervosus Druce	L. Rodríguez & J. Rodríguez 75 (CUVC)	−25.1	E	2950
T. papilio Rchb.f. & Warsz.	B. R. Ramírez & M. S. González I 5276 (CAUP)	−27.7	E	3000
T. pulcher Rchb.f.	J. Cuatrecasas 19506 (VALLE)	−25.6	E	1840
***Trichocentrum* Poepp. & Endl. (72; 3/3 = 100%)**				
T. carthagenense (Jacq.) M.W.Chase & N.H.Williams	M. P. Córdoba, *et al.* 8028 (FMB)	−15.0	E	77
T. carthagenense (Jacq.) M.W.Chase & N.H.Williams (= *Oncidium carthagenense* Sw.)	P. Ortiz-Valdivieso 143 (HPUJ)	−14.3	E	850
T. cebolleta (Jacq.) M.W.Chase & N.H.Williams	J. P. Tobón *s.n.* (JAUM)	−13.8	E	100
T. pulchrum Poepp. & Endl.	J. F. Restrepo 600 (CAUP)	−13.6	E	1700
***Trichopilia* Lindl. (40; 0/4 = 0%)**				
T. fragrans Rchb.f.	B. R. Ramírez & A. L. Jojoa 5823 (CAUP)	−23.9	E	2075
T. hennisiana Kraenzl.	J. F. Restrepo 987 (CAUP)	−27.7	E	1650
T. laxa Rchb.f.	J. F. Restrepo 594 (CAUP)	−30.9	E	1780
T. laxa Rchb.f.	P. A. Viveros, *et al.* 43 (HUQ)	−27.9	E	1650
T. sp.	J. Cuatrecasas 23984 (VALLE)	−30.0	E	1400
***Trizeuxis* Lindl. (1; 1/1 = 100%)**				
T. falcata Lindl.	J. Zarucchi, *et al.* 5116 (HUA)	−13.4	E	1030
***Vitekorchis* Romowicz & Szlach. (4; 0/1 = 0%)**				
V. aurifera (Rchb.f) J.M.H.Shaw (= *Oncidium auriferum* Rchb.f.)	MOH 61-8 (JAUM)	−26.2	E	2500
***Zelenkoa* M.W.Chase & N.H.Williams (1; 0/1 = 0%)**				
Z. onusta (Lindl.) M.W.Chase & N.H.Williams (= *Oncidium onustum* Lindl.)	W. F. Higuera 14 (HPUJ)	−28.2	T	3250
Subtribe Stanhopeinae				
***Acineta* Lindl. (17; 0/4 = 0%)**				
A. antioquiae Schltr.	D. Tuberquía, *et al.* 877 (JAUM)	−30.5	T	1883
A. erythroxantha Rchb.f.	P. Ortiz-Valdivieso 304 (HPUJ)	−25.8	E	2000
A. hennisiana Schltr.	P. Ortiz-Valdivieso 4277 (HPUJ)	−25.6	E	3000
A. superba Rchb.f.	A. Niessen & O. De La Roque *s.n.* (CUVC)	−26.2	E	1000
***Braemia* Jenny (1; 0/1 = 0%)**				
B. vittata (Lindl.) Jenny	D. E. Álvarez, *et al.* 3709 (JAUM)	−33.4	E	119
***Coryanthes* Hook. (53; 0/2 = 0%)**				
C. flava G.Gerlach	G. M. Urreta 292b (HPUJ)	−28.2	E	0
C. mastersiana F.Lehm.	J. G. Ramírez & D. Cárdenas 659 (HUA)	−28.4	E	485
***Gongora* Ruiz & Pav. (71; 0/4 = 0%)**				
G. chocoensis Jenny	G. Reina, *et al.* 1843 (CUVC)	−30.3	E	340
G. cf. *gratulabunda* Rchb.f.	O. Pérez & E. Parra 219 (VALLE)	−31.5	E	1600
G. quinquenervis Ruiz & Pav.	J. Espina 600 (JBGP)	−29.5	E	130
G. sp.	H. Mendoza, *et al.* 14402 (FMB)	−35.7	E	1000
***Polycycnis* Rchb.f. (17; 0/2 = 0%)**				
P. lehmannii Rolfe	J. Cuatrecasas 15024 (VALLE)	−25.1	E	1040
P. sp.	H. Mendoza, *et al.* 8890 (CAUP)	−33.4	E	1000
***Schlimia* Regel (8; 0/1 = 0%)**				
S. jasminodora Planch. & Linden	MOH 65-18 (JAUM)	−30.8	E	2167
***Sievekingia* Rchb.f. (16; 0/2 = 0%)**				

Table 1. Continued

Taxon	Accession/Voucher details‡	δ^{13}C (‰)	G	Elevation (m)
S. reichenbachiana Rolfe	A. J. Negret *s.n.* (CAUP)	–30.3	E	639
S. suavis Rchb.f.	Mejía-Rosero & Pino-Andrade 18 (CHOCO)	–31.5	E	45
***Stanhopea* J.Frost ex Hook. (65; 0/6 = 0%)**				
S. jenischiana F.Kramer ex Rchb.f.	J. F. Restrepo 462 (CAUP)	–28.9	E	1884
S. platyceras Rchb.f.	A. Niessen & O. De La Roque *s.n.* (CUVC)	–33.2	E	1100
S. pulla Rchb.f.	G. M. Urreta 203a (HPUJ)	–28.6	E	100
S. reichenbachiana Roezl ex Rchb.f.	P. Ortiz-Valdivieso 305 (HPUJ)	–25.3	E	1600
S. shuttleworthii Rchb.f.	T. Londoño, *et al. s.n.* (FAUC)	–24.4	E	2150
S. tricornis Lindl.	O. Pérez & E. Parra 229 (VALLE)	–25.8	E	1600
Subtribe Zygopetalinae				
***Chaubardiella* Garay (8; 0/1 = 0%)**				
C. sp.	W. Devia, *et al.* 3431 (TULV)	–30.5	E	130
***Chondroscaphe* (Dressler) Senghas & G.Gerlach (16; 0/2 = 0%)**				
C. amabilis (Schltr.) Senghans & G.Gerlach (= *Chondrorhyncha amabilis* Schltr.)	A. Cogollo & J. G. Ramírez 3115 (JAUM)	–32.9	E	1312
C. cf. *chestertonii* (Rchb.f.) Senghas & G.Gerlach (= *Chondrorhyncha* cf. *chestertonii* Rchb.f.)	A. Cogollo, *et al.* 6948 (JAUM)	–34.1	E	1450
***Dichaea* Lindl. (119; 0/14 = 0%)**				
D. brachypoda Rchb.f.	J. E. Ramos 1938 (CUVC)	–30.8	E	1990
D. camaridioides Schltr.	L. A. de Escobar, *et al.* 4912 (HUA)	–31.2	E	1850
D. humilis Cogn.	G. M. Urreta 180 (HUA)	–31.0	E	50
D. hystricina Rchb.f.	J. F. Negret 317 (CAUP)	–23.2	E	1650
D. latifolia Lindl.	O. Pérez, *et al.* 638 (CUVC)	–30.6	E	1800
D. morrisii Fawc. & Rendle	P. Stevenson, *et al.* 2934 (ANDES/P. stevenson Coll.)	–34.1	E	1900
D. muricata Lindl.	E. Barrera 37 (FMB)	–27.4	E	1207
D. muricata Lindl. (= *D. moritzii* Rchb.f.)	M. Ospina 583 (JAUM)	–28.4	E	2262
D. panamensis Lindl.	G. M. Urreta 177 (HUA)	–28.7	E	50
D. cf. *pendula* (Aubl.) Cogn.	O. Pérez & E. Parra 180 (CUVC)	–31.4	E	1600
D. powellii Schltr.	A. Cogollo, *et al.* 2525 (JAUM)	–28.5	E	1355
D. rendlei Gleason	A. V. Gutiérrez 304 (HUA)	–24.1	E	200
D. richii Dodson	R. Fonnegra, *et al.* 369a (HUA)	–29.7	E	450
D. splitgerberi Rchb.f.	Anon. *s.n.* (COAH)	–34.5		
D. tenuifolia Schltr. (= *D. undulifolia* Dodson)	A. Cogollo, *et al.* 4119 (JAUM)	–34.7	E	1355
D. tenuifolia Schltr. (= *D. undulifolia* Dodson)	J. S. García-Revelo & A. D. García-Ramírez 41 (CUVC)	–28.0	E	2241
***Huntleya* Bateman ex Lindl. (14; 0/2 = 0%)**				
H. meleagris Lindl.	J. Cuatrecasas 19626 (VALLE)	–28.4	E	981
H. sp.	A. Juncosa & A. H. Gentry 716 (JAUM)	–30.3	E	350
***Kefersteinia* Rchb.f. (68; 0/2 = 0%)**				
K. graminea Rchb.f.	M. de Fraume & Álvarez y Gallego 179 (HUQ)	–29.2	E	2250
K. tolimensis Schltr.	M. Rincón 300 (TOLI)	–28.1	E	3000
***Koellensteinia* Rchb. f. (17; 0/1 = 0%)**				
K. graminea (Lindl.) Rchb.f.	D. Cárdenas, *et al.* 22392 (COAH)	–33.4	E	150
***Otostylis* Schltr. (4; 0/1 = 0%)**				
O. brachystalix Schltr.	J. Duivenvoorden, *et al.* 1345 (COAH)	–30.9	T	164
***Pescatoria* Rchb.f. (25; 0/3 = 0%)**				

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
P. coelestis (Rchb.f.) Dressler (= *Bollea coelestis* Rchb.f.)	O. Pérez & E. Parra 0798-2 (CUVC)	–31.3	E	1900
P. dayana Rchb.f.	P. Silverstone & N. Paz 7333 (CUVC)	–30.2	E	1100
P. klabochorum Rchb.f.	S. Arias-Guerrero, *et al.* 146 (CUVC)	–34.3	E	1310
***Warreopsis* Garay (4; 0/1 = 0%)**				
***Warczewiczella* Rchb.f. (11; 0/1 = 0%)**				
W. purpurea P.Ortiz	B. E. Salgado-Negret 344 (CAUP)	–29.9	T	2900
W. marginata Rchb.f.	W. Devia, *et al.* 4265 (TULV)	–33.7	E	100
Tribe Epidendreae Lindl.				
Subtribe Bletiinae				
***Bletia* Ruiz & Pav. (39; 0/1 = 0%)**				
B. purpurea (Lam.) DC.	M. Ospina 62-1 (JAUM)	–28.3	T	1700
***Chysis* Lindl. (10; 0/1 = 0%)**				
C. sp.	P. A. Silverstone-Sopkin, *et al.* 4350 (CHOCO)	–24.1	E	2525
Subtribe Calypsoinae				
***Govenia* Lindl. (24; 0/3 = 0%)**				
G. fasciata Lindl.	V. H. Grande, *et al.* 97 (HUQ)	–26.7	T	2600
G. fasciata Lindl.	D. A. García-Ramírez 114 (CUVC)	–27.9	T	1900
G. sodiroi Schltr.	G. Reina, *et al.* 1750 (CUVC)	–29.9	T	2187
G. superba (La Llave & Lex.) Lindl. (= *Maxillaria* aff. *superba* Lex.)	J. Cuatrecasas 23642 (VALLE)	–26.0	T	2450
Subtribe Coeliinae				
***Coelia* Lindl. (5; 0/1 = 0%)**				
C. macrostachya Lindl.	M. Ospina 599 (JAUM)	–27.6	T	2038
Subtribe Laeliinae				
***Arpophyllum* Lex. (4; 0/1 = 0%)**				
A. giganteum Hartw. ex Lindl.	P. Ortiz-Valdivieso 896 (HPUJ)	–25.9	E	1702
***Brassavola* R.Br. (21; 1/1 = 100%)**				
B. nodosa Lindl.	M. Códoba & N. Chávez 8100 (FMB)	–13.9	E	78
***Cattleya* Lindl. (151; 6/7 = 85.7%)**				
C. dowiana var. *aurea* (Linden) B.S.Williams & T.Moore (= *C. aurea* Linden)	G. M. Urreta 22b (HPUJ)	–12.9	E	20
C. mendelii Dombrain	E. Carvajalino 134 (HPUJ)	–12.8	E	1600
C. quadricolor Lindl.	E. Aldana 18 (TOLI)	–14.6	E	1049
C. schroederae Rchb.f.	G. Reina, *et al.* 1484 (CUVC)	–33.9	E	635
C. trianae Linden & Rchb.f.	C. Ortíz 145 (HPUJ)	–13.6	E	1400
C. violacea (Kunth) Rolfe	M. P. Galeano, *et al.* 1885 (HPUJ)	–16.0	E	272
C. warscewiczii Rchb.f.	A. Cogollo & J. Alzate 2296 (JAUM)	–12.8	E	1243
***Dimerandra* Schltr. (8; 0/4 = 0%)**				
D. elegans (H.Focke) Siegerist	D. Sanín & N. Castaño 1565 (JAUM)	–27.2	E	213
D. stenopetala Schltr.	N. López & F. Solano-Manco 4695 (JAUM)	–28.0	E	86
D. emarginata (G.Mey.) Hoehne	A. Dueñas, *et al.* 3264 (FMB)	–27.7	E	371
D. latipetala Siegerist	G. Tadri-Zocher 232 (CUVC)	–29.1	E	58
***Dinema* Lindl. (1; 0/1 = 0%)**				
D. polybulbon Lindl.	W. D. Stevens & A. Grijalva 15801 (HUA)	–27.6	E	1372
***Encyclia* Hook. (165; 5/5 = 100%)**				
E. aspera Schltr.	N. H. Opsina 293 (CUVC)	–13.4	E	1627
E. betancourtiana Carnevali & I.Ramírez	A. Castaño 49 (TULV)	–16.2	E	1085
E. ceratistes Schltr.	P. Silverstone-Sopkin & N. Paz 6938 (CUVC)	–15.2	E	1140
E. leucantha Schltr.	F. Mijares, *et al.* 614 (FMB)	–14.8	E	129

Table 1. Continued

Taxon	Accession/Voucher details‡	δ^{13}C (‰)	G	Elevation (m)
E. profusa (Rolfe) Dressler & G.E.Pollard	D. Cabrera, *et al.* 1778 (FMB)	–15.7	E	762
***Epidendrum* L. (1435; 33/191 = 17.3%)**				
E. acuminatum Ruiz & Pav.	R. Bernal, *et al.* 1939 (HUQ)	–28.2	E	2796
E. aff. *aenigmaticum* Hágsater & Dodson	D. Gamba & T. Cano 100 (CUVC)	–31.5	E	2450
E. agathosmicum Rchb.f. (= *E. calothyrsus* Schltr.)	G. Reina & C. Lopera 1738 (CUVC)	–29.2	E	1402
E. aggregatum Lindl.	M. I. Guarín 70 (VALLE)	–26.8	E	1985
E. alexii Hágsater & Dodson	B. R. Ramírez & J. A Cuayal M 4509 (CAUP)	–29.6	T	3100
E. alpicola Rchb.f.	V. H. Grande, *et al.* 94 (HUQ)	–21.2	E	2800
E. alpicola Rchb.f.	M. Ospina 218 (JAUM)	–26.0	E	2412
E. cf. *alpicola* Rchb.f.	M. Rincón 51 (TOLI)	–31.1	E	2600
E. alsum Ridl.	C. Acevedo, *et al.* 8685 (FMB)	–28.6	T	1500
E. ampelomelanoxeros Hágsater, E.Santiago & E.Parra	C. López 75 (TULV)	–20.6	T	3400
E. aff. *ampelospathum* Hágsater & Dodson	S. Sarria, *et al.* 268 (CUVC)	–22.8	E	3350
E. amplexirisaraldense Hágsater & E.Santiago	A. F. Bohórquez, *et al*. 507 (FAUC)	–28.9	E	3126
E. anceps Jacq.	F. Silverstone-Sopkin, *et al.* 5195 (CUVC)	–18.3	E	940
E. anchicayanum Hágsater & Dodson	N. Paz, *et al.* 602 (CUVC)	–13.4	T	700
E. angustatum (T.Hashim.) Dodson	M. Rincón 93 (TOLI)	–21.5	E	1800
E. angustilobum Fawc. & Rendle [= *E. latifolium* (Lindl.) Garay & H.R.Sweet]	Mejía-Rosero & Pino-Andrade 6 (CHOCO)	–27.2	E	44
E. angustissimum Lindl.	S. Sarria, *et al.* 285 (CUVC)	–24.6	E	3350
E. apaganum Mansf.	Anon. 5626 (CHOCO)	–24.8	E	245
E. arachnoglossum Rchb.f. ex André	J. Cuatrecasas & R. Echeverry 27626 (TOLI)	–20.6	T	2420
E. arevaloi (Schltr.) Hágsater	M. Correa, *et al.* 1313 (JAUM)	–27.5	T	2730
E. arnoldii Schltr.	C. López 73 (TULV)	–30.7	T	3400
E. aura-usecheae Hágsater, Rinc.-Useche & O.Pérez	O. Pérez & E. Parra 1162 (CUVC)	–17.3	L	2600
E. avicula Lindl.	L. E. Urrego, *et al.* 274 (HUA)	–20.7	E	122
E. cf. *avicula* Lindl. (= *Lanium avicula* Lindl. ex Benth.)	J. Espina & M. Mosquera 2363 (CHOCO)	–23.1	E	126
E. aylacotoglossum Hágsater	M. Rincón 277 (TOLI)	–27.7	E	2600
E. bangii Rolfe (= *E. macrostachyum* Lindl.)	C. Chaparro 119 (FMB)	–29.8	T	2000
E. barbeyanum Kraenzl.	J. Farfán, *et al.* 1168 (FMB)	–20.9	E	2180
E. bispathulatum Hágsater, O.Pérez & E.Santiago	O. Pérez & E. Parra 164 (CUVC)	–13.7	E	1600
E. blepharistes Barker ex Lindl.	M. Rincón 299 (TOLI)	–26.0	E	2500
E. aff. *blepharistes* Barker ex Lindl. (= *E.* aff. *funkii* Rchb.f.)	H. Vargas 17 (HUA)	–28.2	E	2300
E. cf. *bogotense* Schltr.	M. Rincón 156 (TOLI)	–24.3	T	3500
E. braccigerum Rchb.f.	B. R. Ramírez 12037 (CAUP)	–21.6	T	2900
E. bracteolatum C.Presl	L. A. de Escobar 897 (HUA) Ecuador	–17.0	E	30
E. brevicernuum Hágsater & Dodson	T. Hinestroza & A. L. Montoya 414 (JAUM)	–27.2	E	2500
E. buenaventurae F.Lehm. & Kraenzl.	A. Cogollo, *et al.* 4160 (JAUM)	–27.2	E	1300
E. calanthum Rchb.f. & Warsz.	J. Chuiquillo, *et al.* 5 (LLANOS)	–16.5	E	627
E. calyptratum F.Lehm. & Kraenzl.	D. Bonilla 57 (TOLI)	–32.4	E	1596
E. campyloglossum P.Ortiz & Hágsater	B. Villanueva & F. Fernández 1167 (TOLI)	–28.1	E	67
E. cf. *caquetanum* Schltr.	J. E. Ramos, *et al.* 2509 (CUVC)	–19.2	T	1100
E. carchiense Hágsater & Dodson	O. Pérez, *et al.* 1079 (CUVC)	–25.1	E	1800
E. carmelense Hágsater & Dodson	H. Sánchez & F. Lehmann 368 (CUVC)	–28.0	E	3300
E. cf. *catillus* Rchb.f. & Warsz.	S. Garzón 10 (CUVC)	–16.9	E	1800

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
E. cernuum Kunth	O. Pérez, *et al.* 439 (CUVC)	–25.8	T	3800
E. chioneum Lindl.	E. Rentería, *et al.* 5322 (HUA)	–27.0	T	3009
E. chioneum Lindl.	H. Bernal & A. Hernández 1303 (FMB)	–23.1	T	3300
E. chlorops Rchb.f.	A. F. Bohórquez, *et al.* 135 (FAUC)	–28.1	E	3224
E. chortophyllum Schltr.	J. Cuatrecasas 20037 (VALLE)	–22.0	E	3640
E. chortophyllum Schltr.	D. Bonilla 1 (TOLI)	–29.3	E	3000
E. cf. *ciliare* L.	N. López & F. Solano-Manco 4701 (JAUM)	–24.1	E	86
E. cimanum Dodson	V. Zak 941 (JAUM) Ecuador	–28.7	T	3180
E. cirrhochilum F.Lehm. & Kraenzl.	A. Cogollo, *et al.* 3368 (FMB)	–25.7	E	900
E. cf. *cleistocoleum* Hágsater & E.Santiago	C. Barbosa 5979 (HUA)	–31.2	E	1385
E. aff. *coriifolium* Lindl.	O. Pérez & E. Sánchez 259 (VALLE)	–30.1	T	1600
E. coronatum Ruiz & Pav.	J. G. Ramírez & D. Cárdenas 662 (JAUM)	–19.2	E	485
E. coryophorum (Kunth) Rchb.f.	M. Rincón 264 (TOLI)	–24.3	E	2600
E. cottoniiflorum (Rchb.f.) Hágsater	J. Cuatrecasas 18160 (VALLE)	–26.6	E	2295
E. cristatum Ruiz & Pav.	López-Figueiras 8098 (VALLE)	–18.2	E	1072
E. cuatrecasasii Garay	O. Pérez & M. Kolanowska 1049 (CUVC)	–27.8	E	100
E. cylindraceum Lindl.	J. Farfán, *et al.* 1141 (FMB)	–30.5	E	3250
E. cylindrostachys Rchb.f. & Warsz.	M. Rincón 268 (TOLI)	–26.8	E	2600
E. cylindrostachys Rchb.f. & Warsz.	D. Benítez & F. J Toro 967 (JAUM)	–27.6	E	2600
E. decurviflorum Schltr.	J. Farfán, *et al.* 1071 (FMB)	–27.7	T	2800
E. dendrobii Rchb.f. (= *E. pileatum* Rchb.f.)	O. Pérez & M. Kolanowska 1053 (CUVC)	–26.2	T	1500
E. densiflorum Hook.	N. H. Ospina-Calderón 294 (CUVC)	–28.2	T	1500
E. aff. *difforme* Jacq.	MOH 286 (JAUM)	–17.8	E	72
E. diothonaeoides Schltr.	V. H. Grande, *et al.* 101 (HUQ)	–24.7	E	2850
E. cf. *dolichorhachis* Hágsater & Dodson	L. M Álvarez-Mejía & A. F. Bohórquez 3905 (FAUC)	–30.5	E	3688
E. elleanthoides Schltr.	J. S. García-Revelo & A. D. García-Ramírez 29 (CUVC)	–31.7	E	2169
E. embreei Dodson	J. F. Restrepo 369 (CAUP)	–25.0	E	1884
E. envigadoense Hágsater	V. H. Grande, *et al.* 95 (HUQ)	–30.5	E	2800
E. erosum Ames & C.Schweinf.	C. Barbosa 1523 (FMB)	–24.9	E	3079
E. escobarianum Garay	O. Pérez & M. Kolanowska 1016 (VALLE)	–29.4	E	1800
E. eugenii Schltr.	S. Sarria 528 (CUVC)	–27.9	E	3350
E. excisum Lindl.	A. Idárraga, *et al.* 3740 (HUA)	–29.0	E	2595
E. excisum Lindl.	B. R. Ramírez, *et al.* 12489 (FMB)	–28.2	E	2400
E. cf. *ferrugineum* Ruiz & Pav.	G. McPherson, *et al.* 12928 (HUA)	–24.2	E	2150
E. fimbriatum Kunth	B. Sánchez & J. Hernández 715 (FMB)	–29.8	T	2550
E. fimbriatum Kunth	P. Stevenson, *et al.* 2987 (ANDES/P. stevenson Coll.)	–32.6	L	1900
E. flexuosum G.Mey. (= *E. imatophyllum* Lindl.)	I. Borsic 77 (HUQ)	–14.6	E	1100
E. flexuosum G.Mey.	E. Rentería, *et al.* 1898 (HUA)	–15.4	E	700
E. frigidum Linden ex Lindl.	M. Schneider 134 (HUA)	–25.6	T	3062
E. frutex Rchb.f.	Anon. 1280 (FMB)	–23.5	T	3108
E. fruticosum Pav. ex Lindl. (= *E. fastigiatum* Lindl.)	P. Silverstone-Sopkin 962 (CUVC)	–23.6	E	2200
E. fruticulum Schltr.	B. R. Ramírez 170 (CAUP)	–29.7	E	2901

Table 1. Continued

Taxon	Accession/Voucher details‡	δ¹³C (‰)	G	Elevation (m)
E. aff. *fusagasugaënse* E.Parra, Hágsater & L.Sánchez	M. Rincón 260 (TOLI)	–21.5	E	1800
E. gaertelmaniae Hágsater & O.Pérez	O. Pérez, *et al.* 1034 (CUVC)	–27.6	T	3200
E. aff. *garayi* Løjtnant	J. E. Ramos, *et al.* 1568 (CUVC)	–34.1	T	1760
E. gastropodium Rchb.f.	C. Luer & R. Escobar 8414 (JAUM)	–25.2	E	2850
E. geminiflorum Kunth	C. Acevedo, *et al.* 324 (FMB)	–23.5	T	2000
E. gentryi Dodson	G. Galeano, *et al.* 4586 (CHOCO)	–35.1	E	200
E. globiflorum F.Lehm. & Kraenzl.	M. Ospina 40 (JAUM)	–29.1	E	3300
E. globiflorum F.Lehm. & Kraenzl. (= *E. restrepoanum* A.D.Hawkes)	M. Rincón 74 (TOLI)	–25.5	E	3400
E. goodspeedianum A.D.Hawkes	J. Cuatrecasas 22444 (VALLE)	–26.4	T	2225
E. gratissimum (Rchb.f.) Hágsater & Dodson	H. Mendoza, *et al.* 14775 (FMB)	–26.7	E	2050
E. gratissimum (Rchb.f.) Hágsater & Dodson (= *Diothonea gratissima* Rchb.f.)	P. Gómez, *et al.* 9 (HUQ)	–25.2		1800
E. hesperium Hágsater & E.Santiago	D. A. García-Ramírez & O. Pérez-Escobar 106 (CUVC)	–31.8	T	1730
E. aff. *hymenodes* Lindl.	W. Devia, *et al.* 10795 (TULV)	–36.0	T	1840
E. ibaguense Kunth	L. P. Romero, *et al.* 64 (FMB)	–17.6	T	1455
E. igneum Hágsater	D. A. García-Ramírez 130A (CUVC)	–19.4	E	1870
E. ionodesme Schltr.	D. Benítez, *et al.* 869 (JAUM)	–31.9	T	2400
E. ionophyllum P.Ortiz	O. Pérez & E. Parra 174 (VALLE)	–27.3	E	1600
E. jamiesonis Rchb.f. (= *E. evectum* Hook.f.)	V. Zak & J. Jaramillo 2056 (JBGP) Ecuador	–13.5	T	2850
E. jamiesonis Rchb.f.	M. Hermann & R. Castillo 429 (CUVC) Ecuador	–13.8	E	2850
E. jejunum Rchb.f.	J. Betancur & A. Gil 7942 (CHOCO)	–30.9	E	0
E. jejunum Rchb.f. (= *E. dentiferum* Ames & C.Schweinf.)	A. Cogollo, *et al.* 2897 (JAUM)	–28.5	E	890
E. jejunum Rchb.f. (= *E. dentiferum* Ames & C.Schweinf.)	O. Pérez 144 (CUVC)	–28.9	E	1600
E. kerryae Hágsater & L.Sánchez	M. Ospina 154 (JAUM)	–20.3	E	27
E. klotzscheanum Rchb.f.	J. Farfán & E. Buitrago 1097 (FMB)	–29.7	T	2900
E. lacustre Lindl.	O. Pérez, *et al.* 1066 (CUVC)	–31.3	E	1800
E. lagenomorphum Hágsater & Dodson	A. Cogollo, *et al.* 2993 (JAUM)	–31.8	E	800
E. lanipes Lindl.	J. L. Zarucchi, *et al.* 7031 (HUA)	–27.8	E	1200
E. leeanum (Rchb.f.) Hágsater	M. A. Rebolledo 13 (FMB)	–30.2	E	350
E. leucochilum Link, Klotzsch & Otto	J. C. Bermúdez 24 (CUVC)	–26.5	E	1984
E. leucochilum Link, Klotzsch & Otto	A. Rudas, *et al.* 2164 (FMB)	–29.9	E	100
E. leucochilum Link, Klotzsch & Otto (= *E. longiflorum* Kunth)	D. Hartman 484 (CUVC)	–22.9	E	2000
E. lima Lindl.	J. Cuatrecasas 14794 (VALLE)	–22.9	T	2800
E. lindae Hágsater & Dodson	J. S. García-Revelo & A. D. García-Ramírez 36 (CUVC)	–29.4	E	2160
E. littorale Hágsater & Dodson	J. Cuatrecasas 21570 (VALLE)	–19.8	E	5
E. longicolle Lindl.	M. Sánchez & P. Miraña 537 (COAH)	–30.3	E	108
E. luckei I.Bock	J. Zarucchi, *et al.* 5029 (HUA)	–17.8	E	140
E. macrocarpum Rich.	C. Guerrero 7 (COAH)	–20.0	E	638
E. macrogastrium Kraenzl.	J. Cuatrecasas 20874 (VALLE)	–19.3	T	2900
E. cf. *mancum* Lindl.	J. Farfán, *et al.* 1139 (FMB)	–29.5	E	3300
E. megagastrium Lindl.	J. Cuatrecasas 19252 (VALLE)	–23.1	T	3050
E. megalospathum (Rchb.f.) (= *E. rhodochilum* (Schltr.) Hágsater & Dodson)	M. Rincón 110 (TOLI)	–31.2	E	2500
E. cf. *megalospathum* Rchb.f.	C. Barbosa 1394 (FMB)	–26.4	E	2811
E. melinanthum Schltr.	T. A. Medina 1394 (TOLI)	–18.2	T	2021

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
E. microphyllum Lindl.	P. Stevenson 474 (ANDES/P. stevenson Coll.)	–20.5	E	300
E. microphyllum Lindl. (= *Lanium microphyllum* Lindl. ex Benth.)	F. Alonso, *et al.* 9280 (HUA)	–24.4	E	515
E. misasii Hágsater (= *Oerstedella viridiflora* Hágsater)	P. Ortiz-Valdivieso 739 (HPUJ)	–26.1	E	1104
E. muricatoides Hágsater & Dodson	G. Reina, *et al.* 1589 (CUVC)	–30.5	T	1378
E. mutisii Hágsater	J. J. Hernández, *et al.* 275 (HUA)	–19.5	E	670
E. nocturnum Jacq.	A. Rudas, *et al.* 2190 (FMB)	–27.8	E	100
E. nora-mesae Hágsater & O.Pérez	P. Silverstone-Sopkin, *et al.* 2987 (CUVC)	–32.2	E	2260
E. cf. *oreogena* Schltr.	L. Cortés 50 (CUVC)	–24.3	T	3257
E. oxycalyx Hágsater & Dodson	J. S. García-Revelo & A. D. García-Ramírez 30 (CUVC)	–28.2	E	2157
E. pachycoleum Hágsater, O.Pérez & E.Santiago	M. Rincón 154 (TOLI)	–26.4	E	3500
E. palaciosii Hágsater & Dodson	MOH 776 (JAUM)	–30.4	T	2501
E. paniculatum Ruiz & Pav.	J. Betancur, *et al.* 9850 (FMB)	–28.9	T	2800
E. paniculatum Ruiz & Pav. (= *E. laeve* Lindl.)	M. Rincón 281 (TOLI)	–29.0	E	2600
E. paniculatum Ruiz & Pav. (= *E. laeve* Lindl.)	V. H. Grande, *et al.* 80 (HUQ)	–32.7	E	2600
E. paranthicum Rchb.f.	L. A. de Escobar, *et al.* 8075 (HUA)	–28.5	E	1850
E. pastoense Schltr.	L. Cortés 0 (CUVC)	–23.8	T	3450
*E. paternale**	O. Pérez & E. Parra 1105 (VALLE)	–19.0	T	2600
E. pazii Hágsater	D. A. García-Ramírez & J. S. García-Revelo 68 (CUVC)	–27.1	T	2121
E. peperomia Rchb.f.	H. Cuadros 663 (TULV)	–15.6	E	1200
E. peperomia Rchb.f (= *E. porpax* Rchb.f.)	J. Cuatrecasas 19497 (VALLE)	–17.2	E	1840
E. peperomia Rchb.f. (= *E. lambeauanum* De Wild.)	G. Reina, *et al.* 1127 (CUVC)	–15.7	E	1841
E. aff. *peraltum* Schltr.	D. Hartman 529 (CUVC)	–32.9	E	2600
E. piliferum Rchb.f.	P. A. Viveros, *et al.* 20 (HUQ)	–29.9	E	1650
E. pittieri Ames	L. Cortés 30A (CUVC)	–24.1	T	3375
E. platychilum Schltr.	A.H. Gentry, *et al.* 47990 (CUVC)	–26.1	E	19
E. polyanthostachyum Hágsater, E.Santiago & García-Ram.	D. A. García-Ramírez 180 (CUVC)	–28.6	E	2033
E. porphyreum Lindl.	J. Farfán 873 (FMB)	–30.9	T	2900
E. porphyreum Lindl. (= *E.* cf. *spathatum* Schltr.)	N. F. Alzate 716 (FAUC)	–25.7	E	2276
E. porquerense F.Lehm. & Kraenzl.	G. Reina & C. Lopera 1737 (CUVC)	–20.9	E	1402
E. cf. *praetervisum* Rchb.f.	Anon. *s.n.* (CAUP)	–26.5	E	1698
E. prostratum (Lindl.) Cogn.	A. Cogollo & R. Borja 1609 (JAUM)	–18.7	E	376
E. pseudonocturnum Hágsater & Dodson	T. B. Croat & D. Bay 75652 (CUVC)	–26.9	E	45
E. ptochicum Hágsater	J. Cuatrecasas 18144 (VALLE)	–13.0	E	2295
E. purpurascens H.Focke	D. Cárdenas, *et al.* 21188 (COAH)	–23.4	T	400
E. radicans Pav. ex Lindl.	R. González, *et al.* 2108 (FMB)	–15.7	T	828
E. ramosum Jacq.	O. Pérez & E. Parra 168 (CUVC)	–26.9	E	1600
E. renzii Garay & Dunst.	C. E. Ceballos & V. Lasso 230 (CAUP)	–30.4	E	1800
E. repens Cogn.	P. Silverstone-Sopkin, *et al.* 9944 (CUVC) Ecuador	–27.7	E	1725
E. cf. *rhizomaniacum* Rchb.f.	C. E. Ceballos & V. Lasso 3556 (CAUP)	–31.6	T	2100
E. rhodovandoides Hágsater	P. A. Morales, *et al.* 627 (HUA)	–28.8	E	2456
E. rhombochilum L.O.Williams	J. Cuatrecasas 18950 (VALLE)	–23.7	T	3425
E. rigidiflorum Schltr.	J. Cuatrecasas 18949 (VALLE)	–25.0	T	3425
E. rocalderianum P.Ortiz & Hágsater	J. Cuatrecasas 16471 (VALLE)	–24.9	E	28
E. rostrigerum Rchb.f.	J. Cuatrecasas 14797 (VALLE)	–22.6	E	2800
E. rugulosum Schltr.	G. McPherson & F. J. Roldán 13267 (HUA)	–29.7	E	1900

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
E. ruizianum Steud.	G. Reina, *et al.* 1543 (CUVC)	–15.5	E	1107
E. aff. *santaclarense* Ames	D. Hartman 3 (CUVC)	–23.7	E	1500
E. saxatile Lindl. (= *E. fractiflexum* Barb.Rodr.)	D. A. García-Ramírez 125 (CUVC)	–31.1	T	2100
E. scabrum Ruiz & Pav.	M. Schneider 322 (HUA)	–27.0	T	3200
E. aff. *scharfii* Hágsater & Dodson	P. Silverstone 676 (TULV)	–21.5	E	2000
E. schistochilum Schltr.	D. Gamba 66 (CUVC)	–16.7	E	2700
E. schlimii Rchb.f.	P. A. Morales, *et al.* 619 (HUA)	–26.9	E	2417
E. schneideri Hágsater	A. M. Benavides, *et al.* 4027 (HUA)	–31.5	E	2436
E. scutella Lindl.	J. Farfán, *et al.* 1077 (FMB)	–26.4	E	3195
E. aff. *scytocladium* Schltr.	P. Stevenson, *et al.* 3279 (ANDES/P. stevenson Coll.)	–33.8	E	1900
E. secundum Jacq. (= *E. dolichopus* Schltr.)	L. M. Álvarez, *et al.* 38 (CUVC)	–18.0	T	2000
E. secundum Jacq. (= *E. elongatum* Jacq.)	G. M. Rodríguez, *et al.* 1293 (FMB)	–18.2	T	2695
E. cf. *secundum* Jacq. (= *E.* cf. *coroicoense* Schltr.)	M. Hermann 304 (CUVC) Bolivia	–17.5	E	2330
E. cf. *secundum* Jacq. (= *E.* cf. *brachyphyllum* Lindl.)	M. Hermann 318 (CUVC) Bolivia	–17.1	T	1300
E. silverstonei Hágsater	D. A. García-Ramírez & J. S. García-Revelo 23 (CUVC)	–31.4	E	1604
E. sinuosum Lindl.	C. Acevedo, *et al.* 2920 (FMB)	–32.1	E	2600
E. siphonosepalum Garay & Dunst.	D. Hartman 2 (CUVC)	–21.1	E	1500
E. sisgaense Hágsater	J. Farfán, *et al.* 1151 (FMB)	–31.9	E	3214
E. smaragdinum Lindl.	Anon. 609 (FAUC)	–22.5	E	1341
E. sophronitoides F.Lehm. & Kraenzl.	O. Duque 391 (JAUM)	–30.4	E	2500
E. stellidifforme Hágsater & Dodson	M. Rincón 305 (TOLI)	–22.6	E	2500
E. cf. *sterroanthum* Schltr.	P. A. Silverstone, *et al*. 4504 (CUVC)	–26.1	E	3050
E. aff. *stramineum* Lindl.	C. Luer, *et al.* 7540 (JAUM)	–30.0	E	3150
E. strobiliferum Rchb.f.	J. E. Ramos, *et al*. 2520 (CUVC)	–17.3	E	500
E. subpurum Rchb.f.	L. A. de Escobar, *et al.* 4199 (HUQ)	–27.8	E	2000
E. summerhayesii Hágsater	O. Pérez & E. Parra 142 (VALLE)	–22.7	E	1600
E. sympetalostele Hágsater & L.Sánchez	N. Pino, *et al.* 68 (CHOCO)	–26.5	E	49
E. tipuloideum Lindl.	N. F. Alzate 585 (FAUC)	–27.2	E	1480
E. tolimense Lindl.	M. Rincón 348 (TOLI)	–32.7	E	3400
E. torquatum Lindl.	M. L. Delgado & A. Quenguan 54 (FMB)	–26.6	E	3402
E. tulcanense Hágsater & Dodson	L. Cortés 70 (CUVC)	–18.5	T	3100
E. cf. *umbelliferum* J.F.Gmel (= *E.* cf. *chlorocorymbos* Schltr.)	D. Cárdenas, 1379 (JAUM)	–27.4	E	267
E. unguiculatum (C.Schweinf.) Garay & Dunst.	A. H. Gentry, *et al.* 59509 (CUVC)	–26.1	E	1700
E. vesicicaule L.O.Williams	M. Rincón 64 (TOLI)	–33.2	E	3600
E. vincentinum Lindl.	O. Pérez & E. Parra 523 (VALLE)	–29.6	E	1860
E. cf. *vulcanicola* A.H.Heller	J. Cuatrecasas 18211 (VALLE)	–25.9	E	2160
E. wallisii Rchb.f.	G. Reina, *et al.* 1138 (CUVC)	–28.9	E	1697
E. wallisii Rchb.f. (= *Oerstedella wallisii* (Rchb.f.) Hágsater)	P. Ortiz-Valdivieso 214 (HPUJ)	–28.1	E	337
E. weerakitianum Hágsater, O.Pérez & E.Santiago	D. A. García-Ramírez 121 (CUVC)	–26.6	E	2176
E. xanthinum Lindl.	Anon. *s.n.* (TOLI)	–15.2	T	810
E. xylostachyum Lindl.	C. Acevedo, *et al.* 6957 (FMB)	–30.3	T	2570
E. yumboënse Hágsater, O.Pérez & E.Santiago	J. S. García-Revelo & A. D. García-Ramírez 13 (CUVC)	–26.9	E	2169
E. zipaquiranum Schltr.	H. Sánchez & J. Hernández 588 (FMB)	–28.8	E	3120
***Homalopetalum* Rolfe (7; 0/1 = 0%)**				
H. sp.	Anon. 84 (HUQ)	–32.2	E	1650
***Jacquiniella* Schltr. (12; 1/2 = 50%)**				
J. globosa (Jacq.) Schltr.	D. A. Giraldo-Cañas 406 (HUA)	–27.0	E	1000

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
J. teretifolia (Sw.) Britton	J. Cuatrecasas 17813 (VALLE)	–17.9	E	630
***Laelia* Lindl. (23; 3/3 = 100%)**				
L. lueddemanii (Prill.) L.O.Williams in Woodson & Schery	Orquídeas del Valle 10 (CUVC)	–13.9	E	1016
L. marginata (Lindl.) L.O.Williams	A. Van Dulmen 303 (COAH)	–17.2	E	200
L. undulata (Lindl.) L.O.Williams	G. Reina, *et al.* 1485 (CUVC)	–15.4	E	310
***Meiracyllium* Rchb.f. (2; 1/1 = 100%)**				
M. trinasutum Rchb.f.	F. Hamer 63 (JAUM) El Salvador	–13.1	E	700
***Nidema* Britton & Millsp. (2; 0/1 = 0%)**				
N. ottonis Britton & Millsp.	J. G. Ramírez & D. Cárdenas 140 (HUA)	–25.0	E	600
***Prosthechea* Knowles & Westc. (119; 0/14 = 0%)**				
P. aemula (Lindl.) W.E.Higgins	R. López C & O. J. Rodríguez 2445 (COAH)	–28.0	E	191
P. chacaoensis (Rchb.f.) W.E.Higgins	L. Rodríguez 68 (CUVC)	–30.9	E	700
P. crassilabia (Poepp. & Endl.) Carnevali & I.Ramírez	R. Arévalo 198 (COAH)	–22.8	E	500
P. crassilabia (Poepp. & Endl.) Carnevali & I.Ramírez (= *P. longipes* (Rchb.f.) Chiron)	J. Cuatrecasas 21941 (VALLE)	–28.3	E	2691
P. fragrans (Sw.) W.E.Higgins	J. Rubiano 27 (FMB)	–26.5	E	1200
P. fragrans (Sw.) W.E.Higgins (= *Encyclia fragrans* (Sw.) Dressler)	Anon. *s.n.* (FAUC)	–22.9		
P. gilbertoi (Garay) W.E.Higgins	MOH 703 (JAUM)	–25.2	E	1940
P. grammatoglossa (Rchb.f.) W.E.Higgins	O. Pérez & E. Parra 658 (CUVC)	–27.6	E	1800
P. livida (Lindl.) W.E.Higgins	G. Reina & C. Lopera 1745 (CUVC)	–24.4	E	1402
P. livida (Lindl.) W.E.Higgins (= *Encyclia livida* (Lindl.) Dressler)	J. F. Restrepo 349 (CAUP)	–26.3	E	1000
P. megahybos (Schltr.) Dodson & Hágsater [= *P. squamata* (Porto & Brade) W.E.Higgins ex Withner]	P. A. Villa & K. Quintero 45 (HUQ)	–32.2	E	1700
P. mejia (Withner & P.A.Harding) W.E.Higgins	D. A. García-Ramírez 120 (CUVC)	–25.0	E	1850
P. pygmaea (Hook.) W.E.Higgins	J. G. Ramírez & D. Cárdenas 1829 (HUA)	–29.7	E	685
P. sceptra (Lindl.) W.E.Higgins (= *Epidendrum sceptrum* Lindl.)	P. Stevenson 961 (ANDES/P. stevenson Coll.)	–26.6	E	350
P. sceptra (Lindl.) W.E.Higgins	A. J. Negret 349 (CAUP)	–26.2	E	1700
P. cf. *tigrina* (Lindl.) W.E.Higgins	E. L. Velásquez, & T. Hinestroza 12 (JAUM)	–26.5	E	2400
P. vespa (Vell.) W.E.Higgins	A. Prieto, *et al.* 1106 (FMB)	–30.8	E	2200
P. sp. (= *Anacheilium* sp. Hoffmanns.)	J. L. Fernández 12277 (FMB)	–23.6	E	2300
***Scaphyglottis* Poepp. & Endl. (68; 0/16 = 0%)**				
S. aurea (Rchb.f.) Foldats	D. Hartman 631 (CUVC)	–30.4	T	2500
S. bidentata (Lindl.) Dressler	L. F. Rojas & C. Rojas 4 (LLANOS)	–30.5	E	537
S. bidentata (Lindl.) Dressler (= *Hexisea bidentata* Lindl.)	P. Stevenson 1343 (ANDES/P. stevenson Coll.)	–30.3	E	350
S. bilineata Schltr.	B. Villanueva 1117 (TOLI)	–33.4	E	70
S. dunstervillei (Garay) Foldats	MOH 753 (JAUM)	–28.2	E	2023
S. gentryi Dodson & Monsalve	A. H. Gentry, *et al.* 59593 (CUVC)	–29.9	E	50
S. graminifolia Poepp. & Endl.	J. Brand & M. Escobar 778 (JAUM)	–28.6	E	11
S. leucantha Rchb.f. (= *S. esuriens* Schltr.)	O. Pérez, *et al.* 635 (CUVC)	–33.4	E	100
S. longicaulis S.Watson	MOH 277 (JAUM)	–28.3	E	22
S. minutiflora Ames & Correll	E. P. Killip & J. Cuatrecasas 38949 (VALLE)	–29.4	E	0

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
S. prolifera Cogn. (= *S. cuneata* Schltr.)	E. Forero & R. Jaramillo 5299 (CHOCO)	–28.4	E	125
S. aff. *prolifera* Cogn.	C. L. Orozco, *et al.* 865 (HUA)	–29.7	E	1100
S. propinqua C.Schweinf.	A. H. Gentry, *et al.* 53653 (CUVC)	–33.5	E	500
S. punctulata (Rchb.f.) C.Schweinf.	M. Ospina 18 (JAUM)	–25.0	E	2500
S. sickii Pabst	Mejía-Rosero & Pino-Andrade 23 (CHOCO)	–25.9	E	44
S. sickii Pabst (= *S. signata* I.Bock)	J. F. Restrepo 608 (CAUP)	–27.6	E	1884
S. stellata Lodd. ex Lindl.	R. López, *et al.* 808 (COAH)	–28.0	E	290
S. triloba B.R.Adams	J. F. Restrepo 340 (CAUP)	–27.4	E	1000
Subtribe Pleurothallidinae				
***Acianthera* Scheidw. (201; 5/11 = 45.5%)**				
A. adeodata P.Ortíz, O.Pérez & E.Parra	O. Pérez & E. Parra 802 (CUVC)	–14.6	E	1900
A. agathophylla (Rchb.f.) Pridgeon & M.W.Chase (= *Pleurothallis agathophylla* Rchb.f.)	Mejía-Rosero & Pino-Andrade 12 (CHOCO)	–17.2	E	44
A. boliviana (Rchb.f.) Pridgeon & M.W.Chase (= *Pleurothallis boliviana* Rchb.f.)	M. Lewis 882091 (JAUM) Bolivia	–14.6	E	2450
A. capillaris (Lindl.) Pridgeon & M.W.Chase [= *Pleurothallis floribunda* (Lindl.) Lindl.]	O. Duque & J. Serna 2345 (JAUM)	–31.5	E	1900
A. casapensis (Lindl.) Pridgeon & M.W.Chase	J. Cuatrecasas 20513 (VALLE)	–18.1	E	1680
A. casapensis (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis casapensis* Lindl.)	M. A. Correa & F. Cardona 1087 (JAUM)	–23.2	E	2472
A. casapensis (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis chamensis* Lindl.)	NA 18 (FMB)	–27.9	E	2400
A. decurrens (Poepp. & Endl.) Pridgeon & M.W.Chase (= *Pleurothallis decurrens* Poepp. & Endl.)	J. L. Zarucchi, *et al.* 5665 (CHOCO)	–29.4	E	1870
A. miqueliana (H.Focke) Pridgeon & M.W.Chase (= *Pleurothallis miqueliana* Lindl.)	A. Van Dulmen 292 (COAH)	–16.1	E	200
A. ramosa (Barb.Rodr.) F.Barros (= *Pleurothallis ramosa* Barb.Rodr.)	S. Espinal & J. E Ramos 3138 (CUVC)	–26.6	E	2150
A. rodrigoi (Luer) Luer	T. Hinestroza & A. L. Montoya P 425 (JAUM)	–27.2	E	2300
A. sicaria (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis sicaria* Lindl.)	J. S. García-Revelo & D. A. García-Ramírez 59 (CUVC)	–27.9	E	1982
A. wageneriana (Klotzsch) Pridgeon & M.W.Chase (= *Pleurothallis wageneriana* Klotzsch)	M. de Fraume & Álvarez y Gallego 487 (FAUC)	–27.6	E	2250
***Anathallis* Barb.Rodr. (147; 0/3 = 0%)**				
A. acuminata (Kunth) Pridgeon & M.W.Chase	N. F. Alzate 684 (FAUC)	–23.6	E	3370
A. acuminata (Kunth) Pridgeon & M.W.Chase (= *Pleurothallis acuminata* (Kunth) Lindl.)	D. Hartman 617 (CUVC)	–32.3		3100
A. ramulosa (Lindl.) Pridgeon & M.W.Chase	A. J. Negret 146 (CAUP)	–28.5	E	2000
A. sclerophylla (Lindl.) Pridgeon & M.W.Chase	I. et Pinto 2185 (COAH)	–27.4	E	780
A. sclerophylla (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis listrostachys* Rchb.f.)	C. Alcázar-Caicedo 507 (CAUP)	–28.7	E	1870
***Barbosella* Schltr. (19; 0/1 = 0%)**				
B. cucullata (Lindl.) Schltr.	C. Luer & R. Escobar 8432 (JAUM)	–28.6	E	3150
***Brachionidium* Lindl. (73; 0/3 = 0%)**				
B. imperiale Luer & R.Escobar	P. Silvertone-Sopkin, *et al.* 1662 (CUVC)	–30.6	T	1970
B. parvifolium Lindl.	D. M. Bonilla 2 (TOLI)	–32.3	E	3000
B. tuberculatum Lindl.	S. L. Díaz-Ibarra 2025 (CAUP)	–26.9	E	3330
***Crocodeilanthe* Rchb.f. & Warsz. (Unresolved; 0/2 = 0%)**				
C. elegans (Kunth) Luer	M. Schneider 626 (HUA)	–24.3	E	2300

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
C. sp.	H. Mendoza, *et al.* 14445 (FMB)	–25.3	E	1000
***Draconanthes* (Luer) Luer (11; 0/1 = 0%)**				
D. aberrans (Schltr.) Luer	C. Luer & R. Escobar 8388 (JAUM)	–27.6	T	3200
***Dracula* Luer (125; 0/13 = 0%)**				
D. alcithoe Luer & R.Escobar	P. Stevenson & F. Henao 3374 (ANDES/P. stevenson Coll.)	–33.5	E	1900
D. andreettae (Luer) Luer	F. A. Silverstone-Sopkin 3010 (CUVC)	–28.9	E	2175
D. benedictii (Rchb.f.) Luer	N. Peláez & E. Buitrago 307 (JAUM)	–29.6	E	2450
D. chimaera (Rchb.f.) Luer	P. A. Silverstone, *et al.* 5119 (CUVC)	–29.9	E	1999
D. chiroptera Luer & Malo	J. F. Restrepo 373 (CAUP)	–32.7	E	1884
D. cutis-bufonis Luer & R.Escobar	L. Posada 151 (HUA)	–33.3	E	2200
D. diana Luer & R.Escobar	P. Silverstone-Sopkin, *et al.* 11149 (CUVC)	–28.9	E	1783
D. houtteana (Rchb.f.) Luer	M. Rincón 374 ((TOLI)/Dendrology sec.)	–33.8	E	2580
D. inaequalis (Rchb.f.) Luer & R.Escobar	J. F. Restrepo 459 (CAUP)	–26.2	E	1884
D. platycrater (Rchb.f.) Luer	A. Cogollo & J. G. Ramírez 3230 (JAUM)	–33.5	E	880
D. venefica Luer & R.Escobar	J. F. Restrepo 597 (CAUP)	–29.6	E	1884
D. vinacea Luer & R.Escobar	J. F. Restrepo 484 (CAUP)	–28.5	E	1884
D. xenos Luer & R.Escobar	J. F. Restrepo 596 (CAUP)	–30.4	E	1884
***Dryadella* Luer (53; 0/1 = 0%)**				
D. simula (Rchb.f.) Luer	S. Hoyos, *et al.* 1699 (JAUM)	–28.5	E	2022
***Frondaria* Luer (1; 0/1 = 0%)**				
F. caulescens (Lindl.) Luer	S. Sarria, *et al.* 1119 (CUVC)	–27.5	E	3180
***Kraenzlinella* Kuntze (9; 0/1 = 0%)**				
K. anfracta (Luer) Luer (= *Pleurothallis anfracta* Luer)	J. F. Restrepo 471 (CAUP)	–32.1	E	1884
***Lepanthes* Sw. (1092; 0/36 = 0%)**				
L. aduncata Luer & R.Escobar	C. Berrío, *et al.* 58 (HUQ)	–29.9	E	2800
L. agglutinata Luer	N. L. Vela 272 (FMB)	–32.7	E	3503
L. arbuscula Luer & R.Escobar	M. J. Rodríguez & M. E. Pantoja 22 (CAUP)	–33.8	E	3327
L. auriculata Luer	P. Silverstone-Sopkin, *et al.* 3786 (CUVC)	–31.4	T	2250
L. carunculigera Rchb.f.	Y. Rueda-Valoyes & J. García-Arias 8 (CHOCO)	–30.1	E	86.9
L. caudatisepala C.Schweinf.	M. J. Rodríguez & M. E. Pantoja 12 (CAUP)	–33.5	E	3327
L. caudatisepala C.Schweinf. (= *L. profusa* Luer & Hirtz)	M. Rincón 165 (TOLI)	–28.1	E	3300
L. cornualis Luer & R.Escobar	P. Silverstone, *et al.* 6541 (CUVC)	–30.1	E	3450
L. dunstervilleorum Foldats	M. Rincón 183 (TOLI)	–20.6	E	3300
L. dunstervilleorum Foldats	C. Luer, *et al.* 7503 (JAUM)	–30.1	E	2930
L. effusa Schltr.	R. Callejas, *et al.* 7795 (HUA)	–26.1	E	3120
L. elata Rchb.f.	O. Pérez & E. Parra 1129 (CUVC)	–34.9	E	1800
L. elata Rchb.f.	C. Luer, *et al.* 7674 (JAUM)	–31.1	E	2300
L. elephantina Luer & R.Escobar	M. L. Delgado & A. Quenguan 76 (FMB)	–32.7	E	3428
L. escifera Luer & R.Escobar	R. Callejas, *et al.* 10051 (HUA)	–34.9	E	2080
L. felis Luer & R.Escobar	P. A. Silverstone, *et al.* 2949 (CUVC)	–29.5	E	2260
L. cf. *fonnegrae* Luer & R.Escobar	P. Stevenson & C. Prada 3192 (ANDES/P. stevenson Coll.)	–33.7	E	1900
L. gargantua Rchb.f.	J. L. Zarucchi & A. E. Brant 5326 (HUA)	–25.3	T	2970

Table 1. Continued

Taxon	Accession/Voucher details‡	δ13C (‰)	G	Elevation (m)
L. cf. *helgae* Luer & R.Escobar (= **Epidendrum* cf. *helgae)*	N. F. Alzate 619 (FAUC)	–31.7	E	3745
L. hirpex Luer & R.Escobar	E. Domínguez & E. Durango 38 (JAUM)	–32.6	E	2500
L. manabina Dodson	C. Berrior, *et al.* 5 (HUQ)	–29.5	E	3020
L. marthae Luer & R.Escobar	C. Berrior, *et al.* 26 (HUQ)	–26.4	E	3300
L. medusa Luer & R.Escobar	M. Rincón 370 ((TOLI)/Dendrology sec.)	–37.4	E	2580
L. monoptera Lindl. (= *L. dolichopus* Schltr.)	M. J. Rodríguez & M. E. Pantoja 63 (CAUP)	–32.7	E	3206
L. nummularia Rchb.f. [= *Neooreophilus nummularius* (Rchb.f.) Archila]	E. Domínguez, *et al.* 39 (JAUM)	–28.7	E	3001
L. ollaris Luer & R.Escobar	J. S. García-Revelo & A. D. García-Ramírez 14 (CUVC)	–32.1	E	2169
L. papyrophylla Rchb.f.	B. R. Ramírez & K. Ocampo 21313 (CAUP)	–32.5	E	3360
L. pastoensis Schltr.	A. H. Gentry, *et al.* 53974 (CUVC)	–29.4	E	2300
L. pendens Garay [= *Neooreophilus pendens* (Garay) Archila]	C. Luer, *et al.* 7541 (JAUM)	–30.2	E	2500
L. pilosella Rchb.f.	C. Berrior, *et al.* 11 (HUQ)	–27.7	E	3020
L. platysepala Luer & R.Escobar [= *Brachycladium platysepalum* (Luer & R.Escobar) Luer]	J. Farfán, *et al.* 1179 (FMB)	–27.7	E	2688
L. cf. *platysepala* Luer & R.Escobar [= *Neooreophilus* cf. *platysepalus* (Luer & R.Escobar) Archila]	J. Betancur, *et al.* 980 (HUA)	–25.8	E	2380
L. scalaris Luer	S. M. Pasmiño & M. R. Posso 26 (CAUP)	–26.8	E	3240
L. setifera Luer & R.Escobar	J. S. García-Revelo & A. D. García-Ramírez 5 (CUVC)	–29.6	E	2107
L. smaragdina Luer & R.Escobar	L. Rodríguez & C. Rincón-Useche 52 (VALLE)	–30.8	E	1900
L. tibouchinicola Luer & R.Escobar	A. Idárraga, *et al.* 4083 (HUA)	–31.9	E	3147
L. tricuspis Schltr.	J. Cuatrecasas 18867 (VALLE)	–29.4	E	3325
L. wageneri Rchb.	J. E. Calle, *et al.* 165 (HUA)	–29.7	E	2325
L. sp.	M. Rincón 128 ((TOLI)/Dendrology sec.)	–31.8	E	100
***Lepanthopsis* Ames (42; 0/2 = 0%)**				
L. acuminata Ames	R. Callejas & R. Fonnegra 10746 (HUA)	–31.7	E	1600
L. floripecten Ames	P. Viveros, *et al.* 752 (HUQ)	–27.4	E	1730
***Masdevallia* Ruiz & Pav. (586; 0/42 = 0%)**				
M. aenigma Luer & R.Escobar	C. Luer, *et al.* 7571A (JAUM)	–30.2	E	2500
M. amanda Rchb.f. & Warsz.	R. Callejas, *et al.* 6404 (HUA)	–29.3	E	3000
M. angulata Rchb.f.	M. Tsubota 12 (FAUC)	–28.5	E	1500
M. arangoi Luer & R.Escobar	R. Escobar & L. Agudelo *s.n.* (JAUM)	–23.3	E	1850
M. assurgens Luer & R.Escobar	C. Barbosa 9565 (275) (FMB)	–27.4	T	3000
M. bicolor Poepp. & Endl.	J. Home, *et al.* 118 (CUVC)	–33.2	E	1807
M. bulbophyllopsis Kraenzl.	M. Tsubota 9 (FAUC) Ecuador	–25.9	E	2650
M. caudivolvula Kraenzl.	R. Escobar, *et al. s.n.* (JAUM)	–24.9	E	2400
M. chaetostoma Luer	D. Portillo, *et al. s.n.* (JAUM) Ecuador	–29.2	E	2450
M. civilis Rchb.f. & Warsz. [= *Byrsella fragrans* (Woolward) Luer]	C. Luer, *et al.* 7644 (JAUM)	–30.2	E	3150
M. coccinea Linden ex Lindl.	C. Luer, *et al.* 7804 (JAUM)	–30.6	T	2500
M. coriacea Lindl.	C. Luer, *et al.* 7985 (JAUM)	–24.8	T	3550

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
M. corniculata Rchb.f.	P. Viveros, *et al.* 230 (HUQ)	−31.7	T	3297
M. cucullata Lindl.	A. Cogollo, *et al.* 11565 (JAUM)	−30.1	E	2650
M. falcago Rchb.f.	C. Luer, *et al.* 7733 (JAUM)	−29.2	E	2400
M. fasciata Rchb.f.	W. Buitrago, *et al.* 226 (JAUM)	−32.5	T	2480
M. filaria Luer & R.Escobar	C. Alexandra, *et al.* 235 (VALLE)	−36.2	E	1800
M. guttulata Rchb.f.	R. Escobar 1386 (JAUM) Ecuador	−27.8	E	1600
M. herradurae F.Lehm. & Kraenzl.	J. F. Restrepo 393 (CAUP)	−27.4	E	1884
M. hians Linden & Rchb.f.	C. Luer & R. Escobar 7869 (JAUM)	−29.9	E	2850
M. ignea Rchb.f.	C. Luer, *et al.* 7672 (JAUM)	−30.7	T	2750
M. impostor Luer & R.Escobar	E. Domínguez & D. Vargas 42 (JAUM)	−32.5	E	2300
M. laevis Lindl.	A. Prieto, *et al.* 1141 (FMB)	−32.2	E	3020
M. laevis Lindl. (= *M. lepida* Rchb.f.)	C. Luer & R. Escobar 7799 (JAUM)	−28.5	E	2600
M. laevis Lindl. (= *M. pantherina* F.Lehm. & Kraenzl.)	C. Luer & R. Escobar 8481 (JAUM)	−28.4	E	3380
M. laevis Lindl. (= *M. pantherina* F.Lehm. & Kraenzl.)	J. Cuatrecasas 20214 (VALLE)	−23.6	T	3500
M. macroglossa Rchb.f.	C. Luer, *et al.* 7608 (JAUM)	−28.2	E	3150
M. mandarina (Luer & R.Escobar) Luer	E. Domínguez & N. Urán 7 (JAUM)	−32.1	E	2600
M. mastodon Rchb.f.	C. Luer, *et al.* 7763 (JAUM)	−28.4	E	2750
M. nidifica Rchb.f.	Anon. *s.n.* (JAUM)	−28.5	E	1355
M. pardina Rchb.f.	W. Devia, *et al.* 8542 (JAUM)	−28.4	E	2850
M. peristeria Rchb.f.	C. Luer, *et al.* 8863 (JAUM)	−29.2	E	2150
M. picturata Rchb.f.	P. A. Morales, *et al.* 642 (HUA)	−27.6	T	2562
M. pteroglossa Schltr.	J. F. Restrepo 329 (CAUP)	−28.2	E	1884
M. pteroglossa Schltr.	E. Domínguez, *et al.* 69 (JAUM)	−31.8	E	2000
M. racemosa Lindl.	C. Luer & R. Escobar 8416 (JAUM)	−25.9	T	2850
M. sceptrum Rchb.f.	A. Hernández & S. Medina 63 (FMB)	−26.8	E	2700
M. strumifera Rchb.f.	D. Hartman 721 (CUVC)	−29.6	E	2800
M. tovarensis Rchb.f.	J. F. Restrepo 607 (CAUP)	−28.1	E	1884
M. trochilus Linden & André	M. Tsubota 14 (FAUC)	−26.6	E	2000
M. tubulosa Lindl.	C. Luer & R. Escobar 7797 (JAUM)	−29.9	E	2500
M. uncifera Rchb.f.	C. Luer & R. Escobar 8337 (JAUM)	−27.5	E	3000
M. urceolaris Kraenzl.	C. Luer, *et al.* 7657 (JAUM)	−29.1	E	2570
M. ventricularia Rchb.f.	MOH 759 (JAUM)	−27.6	E	2098
M. wendlandiana Rchb.f.	J. F. Restrepo 325 (CAUP)	−26.9	E	1884
M. xanthina Rchb.f.	C. Luer & R. Escobar 7856 (JAUM)	−27.8	E	2850
***Myoxanthus* Poepp. & Endl. (46; 0/5 = 0%)**				
*M. chloroleuca**	M. S. González & B. R. Ramírez 1598 (CAUP)	−32.8	E	750
M. exasperatus (Lindl.) Luer	B. R. Ramírez 5039 (CAUP)	−29.9	T	1650
M. melittanthus (Schltr.) Luer	M. S. González, *et al.* 1908 (CAUP)	−27.5	E	2800
M. reymondii (H.Karst.) Luer	B. R. Ramírez 14587 (CAUP)	−27.4	E	1850
M. sp.	M. Ospina 81 (JAUM)	−25.0	T	1900
***Octomeria* R.Br. (151; 0/3 = 0%)**				
O. erosilabia C.Schweinf.	M. V. Arbeláez, *et al.* 679 (COAH)	−22.7	E	112
O. grandiflora Lindl. (= *O. surinamensis* H.Focke)	G. M. Urreta 82 (JAUM)	−28.0	E	50
O. scirpoidea Rchb.f.	D. Cárdenas, *et al.* 43754 (COAH)	−28.8	E	290
***Pabstiella* Brieger & Senghas (29; 1/1 = 100%)**				
P. aryter (Luer) F.Barros (= *Pleurothallis aryter* Luer)	G. Reina 1337 (CUVC)	−14.7	E	1076
***Phloeophila* Hoehne & Schltr. (11; 0/2 = 0%)**				
P. pleurothallopsis (Kraenzl.) Pridgeon & M.W.Chase (= *Ophidion pleurothallopsis* (Kraenzl.) Luer)	G. M. Urreta 66c (HPUJ)	−29.0	E	75

Table 1. Continued

Taxon	Accession/Voucher details‡	δ[13]C (‰)	G	Elevation (m)
P. cf. *pleurothallopsis* (Kraenzl.) Pridgeon & M.W.Chase (= *Ophidion* cf. *pleurothallopsis* (Kraenzl.) Luer)	R. Fonnegra, *et al.* 3768 (HUA)	–29.6	E	3000
***Platystele* Schltr. (95; 0/10 = 0%)**				
P. cf. *alucitae* Luer	MOH 630 (JAUM)	–29.7	E	2328
P. compacta Ames	R. Escobar & R. Moran 3110 (JAUM) Costa Rica	–28.5	E	1950
P. consobrina Luer	A. Juncosa & G. Misas 1012 (JAUM)	–31.2	E	2560
*P. intronsa**	J. F. Restrepo 296 (CAUP)	–27.8	E	1884
P. misera (Lindl.) Garay	J. L. Zarucchi, *et al.* 7009 (HUA)	–30.6	E	2110
P. orectoglossa P.Ortiz	J. Betancur, *et al*. 977 (HUA)	–28.7	E	2380
P. cf. *oxyglossa* (Schltr.) Garay	P. A. Morales, *et al.* 662 (HUA)	–27.7	E	2573
P. stenostachya (Rchb.f.) Garay	G. M. Urreta 88 (HUA)	–31.0	E	75
P. stonyx Luer	M. S. González, *et al.* 2840 (CAUP)	–27.2	E	2800
P. sp.	P. Stevenson & C. Prada 3239 (ANDES/P. stevenson Coll.)	–35.7	E	1900
***Pleurothallis* R.Br. (557; 1/78 = 1.3%)**				
P. alvaroi Luer & R.Escobar	N. F. Alzate 644 (FAUC)	–24.7	E	2203
P. amphigya Luer & R.Escobar	P. A. Silverstone, *et al.* 2747 (CUVC)	–31.6	E	2425
P. antennifera Lindl.	O. Duque 2242 (JAUM)	–28.2	E	800
P. antennifera Lindl. (= *P. cyclochila* Lindl.)	A. Fernández-Pérez, *et al.* 30145 (FMB)	–28.3	E	3247
P. cf. *anthrax* Luer & R.Escobar	P. Stevenson & C. Prada 3081 (ANDES/P. stevenson Coll.)	–34.0	E	1900
P. aff. *baudoensis* Luer & R.Escobar	M. Rincón 392 ((TOLI)/Dendrology sec.)	–32.2	E	140
P. bicochlearis Luer	P. A. Silverstone, *et al.* 1628 (CUVC)	–29.8	E	1929
P. bicornis Lindl.	J. M. Duque J 1180 (FAUC)	–24.1		
P. bivalvis Lindl. (= *Acronia bivalvis* (Lindl.) Luer)	A. Campuzano & C. Sánchez 50 (HUA)	–31.3	E	2300
P. bivalvis Lindl. (= *P. cardium* Rchb.f.)	J. Cuatrecasas 19148 (VALLE)	–26.1	E	2750
P. brachiata Luer	O. Pérez & V. Bub 1075 (CUVC)	–27.2	E	1800
P. calolalax Luer & R.Escobar [= *Acronia calolalax* (Luer & R.Escobar) Luer]	K. Quintero & P.A. Villa 43 (HUQ)	–29.9	E	1700
P. canaliculata Rchb.f.	E. R. Echeverry 3216 (HUA)	–25.5		2000
P. canaligera Rchb.f.	V. H. Grande, *et al.* 111 (HUQ)	–33.1	E	2600
P. cardiostola Rchb.f. [= *Acronia cardiostola* (Rchb.f.) Luer]	A. Juncosa 2037 (CUVC)	–30.5	E	580
P. cernua Luer	P. A. Silverstone, *et al.* 1678 (CUVC)	–33.2	T	1970
P. chloroleuca Lindl. (= *P. wendlandiana* Rchb.f.)	M. I. Valencia 4 (FAUC)	–31.0	E	2250
P. circinata Luer	J. L. Luteyn, *et al.* 12361 (CUVC)	–32.8	E	2100
P. colossus Kerch.	P. A. Silverstone, *et al.* 2797 (CUVC)	–31.2	E	2413
P. cordata Lindl.	B. Villanueva, *et al.* 1224 (TOLI)	–28.4	T	1801
P. cordata Lindl. (= *P. cardiophylla* Schltr.)	P. Silverstone-Sopkin, *et al.* 3843 (CUVC)	–27.0	T	2070
P. cordifolia Rchb.f. & Wagener [= *Acronia cordifolia* (Rchb.f. & Wagener) Luer]	M. Ospina 128 (JAUM)	–27.4	T	2700
P. coriacardia Rchb.f.	J. L. Zarucchi & F. J. Roldán 6859 (HUA)	–28.5	T	3020
P. crocodiliceps Rchb.f. [= *Ancipitia crocodiliceps* (Rchb.f.) Luer]	F. Silverstone-Sopkin, *et al.* 11319 (CUVC)	–32.2	E	1980
P. crocodiliceps Rchb.f.	J. Home 166 (CUVC)	–32.3	E	1450
P. cunabularis Luer	J. S. García-Revelo & A. D. García-Ramírez 15 (CUVC)	–30.4	T	2205
P. cf. *diabolica* Luer & R.Escobar [= *Acronia diabolica* (Luer & R.Escobar) Luer]	C. Luer, *et al*. 6693 (JAUM)	–25.1	E	2775

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
P. divaricans Schltr.	P. A. Morales, *et al.* 667 (JAUM)	–28.2	T	2454
P. dorotheae Luer	Anon. *s.n.* (JAUM)	–26.8		
P. dunstervillei Foldats [= *Ancipitia dunstervillei* (Foldats) Luer]	J. Ramos, *et al.* 6348 (CUVC) Ecuador	–29.2	E	2098
P. elegans (Kunth) Lindl.	C. Berrío & G. Gómez 39 (HUQ)	–26.2	T	3040
P. garayana (Ospina) Luer (= *Colombiana garayana* Ospina)	M. Ospina 905 (JAUM)	–31.2	E	1700
P. giraldoi Luer [= *Acronia giraldoi* (Luer) Luer]	F. Silverstone-Sopkin, *et al.* 2122 (CUVC)	–32.9	E	2068
P. glossopogon Rchb.f.	C. Luer, *et al.* 7603 (JAUM)	–26.4	E	3200
P. glossopogon Rchb.f. (= *P. biserrula* Rchb.f.)	P. Silverstone & J. Giraldo 6383 (CUVC)	–24.1	E	2300
P. gracilipedunculata Foldats	C. Luer, *et al.* 7581 (JAUM)	–29.1	E	2800
P. grandiflora Lindl. [= *Acronia grandiflora* (Lindl.) Luer]	J. Ramos, *et al.* 6132 (CUVC) Ecuador	–30.2	E	2772
P. guttulata Cogn.	V. H. Grande, *et al.* 99 (HUQ)	–32.6	E	2900
P. homalantha Schltr.	S. Arango 54 (FAUC)	–27.3	E	2150
P. imbaburae Luer & Hirtz	P. A. Silverstone, *et al.* 1606 (CUVC)	–33.0	E	1905
P. imber-florum Luer & R.Escobar	P. A. Silverstone, *et al.* 2906 (CUVC)	–32.2	E	2280
P. lacera Luer [= *Acronia lacera* (Luer) Luer]	J. Ramos, *et al.* 6872 (CUVC) Ecuador	–29.5	E	2600
P. lamellaris Lindl.	J. S. García-Revelo & A. D. García-Ramírez 43 (CUVC)	–28.0	E	2085
P. lilijae Foldats	W. Devia, *et al.* 7841 (JAUM)	–30.3	E	2940
P. lindenii Lindl.	F. Giraldo, *et al.* 1641 (JAUM)	–28.7	E	2365
P. lindenii Lindl. (= *P. andrei* Luer & R.Escobar)	D. Hartman 615 (CUVC)	–25.8	E	2900
P. litotes Luer	M. J. Rodríguez & M. E. Pantoja 43 (CAUP)	–24.9	E	3350
P. loranthophylla Rchb.f.	J. F. Restrepo & N. Erazo 241 (CAUP)	–28.8	E	1750
*P. lunatus** Kunth	P. Silverstone, *et al.* 1605 (TULV)	–31.3	E	1905
P. macra Lindl. [= *Acronia macra* (Lindl.) Luer]	J. Ramos, *et al.* 5817 (CUVC) Ecuador	–25.4	E	2614
P. manicosa Luer & R.Escobar	P. A. Silverstone, *et al.* 2918 (CUVC)	–31.5	T	2280
P. marthae Luer & R.Escobar	N. H. Ospina-Calderón 313 (CUVC)	–28.7	T	1431
P. matudana C.Schweinf.	D. A. García-Ramírez 62 (CUVC)	–32.8	E	2114
P. medusa Luer	M. Rincón 274 (TOLI)	–24.9	E	2600
P. microcardia Rchb.f.	C. Berrío & G. Gómez 32 (HUQ)	–27.1	T	2800
P. mundula Luer & R.Escobar	C. Berrior, *et al.* 14 (HUQ)	–27.6	E	3020
P. notabilis Luer & R.Escobar	P. A. Silverstone, *et al.* 2870 (CUVC)	–28.6	E	2400
P. octavioi Luer & R.Escobar	J. F. Restrepo 217 (CAUP)	–31.3	E	1000
P. odobeniceps Luer [= *Ancipitia odobeniceps* (Luer) Luer]	C. Luer & R. Escobar 6604 (JAUM)	–28.3	E	2840
P. penduliflora Kraenzl.	MOH 750 (JAUM)	–30.5	T	2599
P. perijaensis Dunst. [= *Acronia perijaensis* (Dunst.) Luer]	C. Luer, *et al.* 7778 (JAUM)	–24.1	T	2050
P. aff. *perryi* Luer	O. Pérez & M. Kolanowska 1054 (VALLE)	–29.9	E	1500
P. cf. *phalangifera* Rchb.f.	B. Villanueva, *et al.* 1220 (TOLI)	–30.8	T	1801
P. phratria Luer & Hirtz	D. Hartman 115 (CUVC)	–26.9	E	1500
P. pileata Luer & R.Escobar	F. A. Silverstone-Sopkin, *et al.* 2917 (CUVC)	–31.4	E	2280
P. platysepala Schltr.	O. Pérez, *et al.* 211 (VALLE)	–31.8	E	2000
P. possoae Luer	B. R. Ramírez 11567 (CAUP)	–27.9	T	3350
P. cf. *pulvinaris* Luer & R.Escobar	O. Marulanda, *et al.* 124 (CHOCO)	–28.3	T	2330
P. ramificans Luer	D. Hartman 314 (CUVC)	–25.0	E	3000
P. ruberrima Lindl.	O. de Benavides 8915 (CAUP)	–26.3	E	1800

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
P. ruscifolia (Jacq.) R.Br. in W.T.Aiton	G. M. Urreta 277 (HUA)	–26.5	E	50
P. scabrilinguis Lindl. in Hook [= *Acronia scabrilinguis* (Lindl.) Luer]	J. L. Zarucchi & J. Betancur 6373 (HUA)	–25.5	E	2705
P. secunda Poepp. & Endl.	W. Rodríguez, *et al.* 7145 (HUA)	–31.7	E	2502
P. silverstonei Luer (= *Colombiana silverstonei* Luer)	P. Silverstone-Sopkin, *et al.* 3949 (CUVC)	–29.1	E	2399
P. somnolenta Luer	P. A. Silverstone, *et al.* 4389 (CUVC)	–31.1	E	2525
P. cf. *strobilifera* F.Lehm. & Kraenzl.	J. M. MacDougal, *et al.* 4378 (HUA)	–28.5	T	3435
P. aff. *suspensa* Luer	O. Pérez, *et al.* 404 (VALLE)	–22.4	E	3800
P. talpinaria Rchb.f.	J. Farfán, *et al.* 1051 (FMB)	–26.3	E	2450
P. aff. *testifolia* (Sw.) Lindl.	D. Bonilla 46 (TOLI)	–17.8	E	3300
P. tetragona Luer & R.Escobar	C. Berrío, *et al.* 59 (HUQ)	–29.2	E	2800
P. tetroxys Luer	B. R. Ramírez, *et al.* 9341 (CAUP)	–28.3	E	1100
P. titan Luer [= *Acronia titan* (Luer) Luer]	N. Paz, *et al.* 643 (CUVC)	–28.5	E	1200
P. torrana Luer	P. A. Silverstone, *et al.* 1605 (CUVC)	–31.6	E	1905
P. variabilis Luer [= *Acronia variabilis* (Luer) Luer]	M. S. González, *et al.* 2993 (CAUP)	–29.7	E	3000
P. velaticaulis Rchb.f.	D. Stancik, *et al.* 988 (FMB)	–25.3	L	2200
***Pleurothallopsis* Porto & Brade (18; 0/3 = 0%)**				
P. microptera (Schltr.) Pridgeon & M.W.Chase [= *Restrepiopsis microptera* (Schltr.) Luer]	N. H. Ospina-Calderón 318 (CUVC)	–28.6	E	1431
P. striata (Luer & R.Escobar) Pridgeon & M.W.Chase (= *Restrepiopsis striata* Luer & R.Escobar)	N. F. Alzate 751 (FAUC)	–24.1	E	2530
P. tubulosa (Lindl.) Pridgeon & M.W.Chase [= *Pleurothallis viridula* (Lindl.) Kuntze]	M. I. Valencia 5 (FAUC)	–30.5	E	2250
P. tubulosa (Lindl.) Pridgeon & M.W.Chase [= *Restrepiopsis tubulosa* (Lindl.) Luer]	MOH 25 (JAUM)	–25.1	T	2500
***Porroglossum* Schltr. (38; 0/2 = 0%)**				
P. echidna (Rchb.f.) Garay	C. Luer, *et al.* 7607 (JAUM)	–26.7	E	3200
P. eduardi (Rchb.f.) H.R.Sweet	P. A. Silverstone, *et al.* 4613 (CUVC)	–29.1	T	2750
***Restrepia* Kunth (52; 0/9 = 0%)**				
R. antennifera Kunth	C. Luer 8349 (JAUM)	–27.5	E	1800
R. aristulifera Garay & Dunst.	C. Luer, *et al.* 7966 (JAUM)	–27.9	E	2440
R. brachypus Rchb.f.	A. E. Brant & J. Betancur 1625 (HUA)	–25.2	E	2060
R. contorta (Ruiz & Pav.) Luer (= *R. maculata* Lindl.)	J. Cuatrecasas 22288 (VALLE)	–28.0	E	2000
R. elegans H.Karst. (= *R. erythroxantha* Rchb.f.)	J. F. Restrepo 312 (CAUP)	–24.1	E	1884
R. cf. *elegans* H.Karst.	N. F. Alzate 762 (FAUC)	–32.5	E	2530
R. fritillina Luer & V.N.M.Rao	O. Pérez 1074 (CUVC)	–28.6	E	1800
R. trichoglossa Sander	J. F. Restrepo 313 (CAUP)	–27.2	E	1884
R. sp.	D. Bonilla 55 (TOLI)	–26.2	E	3100
***Restrepiella* Garay & Dunst. (2; 0/1 = 0%)**				
R. sp.	J. Castro, E. L. Velásquez 452 (JAUM)	–31.0	E	2303
***Scaphosepalum* Pfitzer (45; 0/9 = 0%)**				
S. antenniferum Rolfe	C. Luer, *et al.* 8861 (JAUM)	–24.4	T	2400
S. gibberosum Rolfe	MOH 702 (JAUM)	–27.0	E	1940
S. grande Kraenzl.	J. Pipoly, *et al.* 16930 (JAUM)	–31.4	E	1330
S. lima Schltr.	E. Domínguez 377 ((TOLI)/Dendrology sec.)	–27.6	E	2580
S. odontochilum Kraenzl.	O. Pérez, *et al.* 204 (VALLE)	–32.8	T	2000
S. odontochilum Kraenzl.	Anon. *s.n.* (CUVC)	–34.1		

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
S. panduratum Luer & R.Escobar	J. F. Restrepo 392 (CAUP)	–25.3	E	1884
S. swertiifolium Rolfe	C. Luer, *et al.* 8995 (JAUM)	–31.9	E	2050
S. verrucosum Pfitzer	C. Luer, *et al.* 7717 (JAUM)	–26.7	E	2400
S. sp.	H. Mendoza 1318 (FMB)	–27.1	T	2500
***Specklinia* Lindl. (135; 0/9 = 0%)**				
S. brighamii (S.Watson) Pridgeon & M.W.Chase (= *Pleurothallis brighamii* S.Watson)	R. Escobar & M. A. Pérez 3128 (JAUM) Costa Rica	–32.1	E	1470
S. corniculata (Sw.) Mutel [= *Pleurothallis corniculata* (Sw.) Lindl.]	E. R. Echeverry 3216 (FAUC)	–24.1	T	2000
S. costaricensis (Rolfe) Pridgeon & M.W.Chase (= *Pleurothallis costaricensis* Rolfe)	F. Ramírez 3 (HUQ)	–28.2	E	1780
S. grobyi (Bateman ex Lindl.) F.Barros	J. F. Restrepo 297 (CAUP)	–27.6	E	1700
S. grobyi (Bateman ex Lindl.) F.Barros (= *Pleurothallis grobyi* Bateman ex Lindl.)	M. Hill GP-32 (HUA)	–28.6		5
S. macroblepharis (Rchb.f.) Pridgeon & W.Chase (= *Pleurothallis macroblepharis* Rchb.f.)	M. C. Iglesias 245 (CUVC)	–26.1	E	3575
S. cf. *picta* (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis* cf. *picta* Lindl.)	G. Reina, *et al.* 1165 (CUVC)	–33.8	E	1166
S. uniflora (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis leontoglossa* Rchb.f.)	J. Cuatrecasas 19260 (VALLE)	–28.1	E	3050
S. zephyrina (Rchb.f.) Luer	P. Stevenson & C. Prada 3193 (ANDES/P. stevenson Coll.)	–34.9	E	1900
S. sp.	M. Rincón 195 ((TOLI)/Dendrology sec.)	–31.9		100
***Stelis* Sw. (878; 0/57 = 0%)**				
S. cf. *alba* Kunth	P. A. Morales, *et al.* 681 (HUA)	–29.5	T	2439
S. angustifolia Kunth	D. A. García-Ramírez 89 (CUVC)	–26.3	E	2304
S. aprica Lindl.	P. A. Silverstone, *et al.* 5675 (CUVC)	–25.4	E	950
S. argentata Lindl.	M. Rincón 280 (TOLI)	–28.8	E	2600
S. atra Lindl. in Lindely	D. Bonilla 32 (TOLI)	–30.0	E	3000
S. attenuata Lindl.	C. Berrío, *et al.* 9 (HUQ)	–27.2	E	3020
S. cassidis (Lindl.) Pridgeon & M.W.Chase	R. Echeverry 3214 (TOLI)	–27.8	T	2000
S. cassidis (Lindl.) Pridgeon & M.W.Chase [= *Crocodeilanthe cassidis* (Lindl.) Luer]	W. G. Vargas 4819 (HUA)	–25.7	T	3578
S. cf. *chamaestelis* (Rchb.f.) Garay & Dunst. in Dunst. & Garay	G. Andrade 20 (FMB)	–29.6	E	2250
S. cochlearis Garay	W. Johnson & F. A. Barkley 180804 (VALLE)	–23.5	E	2700
S. aff. *concinna* Lindl. (= *S.* aff. *flexuosa* Lindl.)	C. Rincón-Useche, *et al.* 10 (CUVC)	–30.4	E	1600
S. decipiens Schltr.	D. Bonilla 68 (TOLI)	–29.1	E	3000
S. decipiens Schltr.	M. Hernández-Schmidt 1293 (FMB)	–24.9	E	2900
S. deregularis Barb.Rodr. [= *Pleurothallis deregularis* (Barb.Rodr.) Luer]	C. Luer 6716 (JAUM)	–27.5	E	2258
S. eugenii Schltr.	B. R. Ramírez, *et al.* 22913 (CAUP)	–30.1	E	3320
S. exigua Luer & Hirtz	M. J. Rodríguez & M. E. Pantoja 17 (CAUP)	–33.3	E	3327
S. fendleri Lindl.	R. Fonnegra, *et al.* 1219 (HUA)	–29.5	E	301
S. foetida O.Duque	D. A. García-Ramírez 81 (CUVC)	–33.2	E	2115
S. frontinensis O.Duque	D. A. García-Ramírez & J. S. García-Revelo 50 (CUVC)	–26.6	E	2245
S. furfuracea F.Lehm. & Kraenzl.	M. J. Rodríguez & M. E. Pantoja 38 (CAUP)	–26.6	E	3206
S. galeata (Lindl.) Pridgeon & M.W.Chase [= *Crocodeilanthe galeata* (Lindl.) Luer]	M. I. Gaurín 77-A (VALLE)	–28.0	E	1600

Table 1. Continued

Taxon	Accession/Voucher details‡	δ[13]C (‰)	G	Elevation (m)
S. galeata (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis trianae* Schltr.)	R. Londoño, *et al.* 735 (FAUC)	–27.4	T	3460
S. galerasensis (Luer) Pridgeon & M.W.Chase (= *Pleurothallis galerasensis* Luer)	S. M. Pasmiño & M. R. Posso 14 (CAUP)	–28.1	E	3240
S. gelida (Lindl.) Pridgeon & M.W.Chase [= *Specklinia gelida* (Lindl.) Luer]	J. Cuatrecasas 18794 (VALLE)	–29.6	E	3325
S. cf. *gelida* (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis* cf. *gelida* Lindl.)	E. Méndez 652 (HUQ)	–31.0	E	2550
S. cf. *glossula* Rchb.f.	C. Duque *s.n.* (FAUC)	–27.3	E	3120
S. gracilis Ames	N. F. Alzate 569 (FAUC)	–28.9	E	2608
S. humboldtina Luer & Hirtz	C. López 78 (TULV)	–28.9	T	3400
S. cf. *lanceolata* Willd.	O. Pérez 296 (CUVC)	–31.0	E	1600
S. lankesteri Ames	L. Uribe-Uribe 6472 (FAUC)	–25.0	E	2150
S. lentiginosa Lindl.	L. Uribe-Uribe 6742 (FAUC)	–28.9	E	2900
S. ligulata (Lindl.) Pridgeon & M.W.Chase (= *Pleurothallis hopfiana* Schltr.)	N de F & Álvarez & Gallego 224 (FAUC)	–27.5	E	2250
S. lindenii Lindl.	O. E. Meneses 6 (CUVC)	–28.9	E	1683
S. aff. *lumbricosa* O.Duque	M. Rincón 296 (TOLI)	–29.6	E	3400
S. maderoi Schltr.	A. M. Benavides, *et al.* 4047 (HUA)	–33.1	E	2503
S. cf. *minax**	A. F. Bohórquez, *et al.* 140 (FAUC)	–30.0	E	3212
S. morganii Dodson & Garay	D. A. García-Ramírez 113 (CUVC)	–29.0	E	2072
S. nanegalensis Lindl. (= *S. vulcanica* Schltr.)	N. H. Ospina-Calderón 339b (CUVC)	–28.9	E	1543
S. oblongifolia Lindl. (= *S. superposita* Schltr.)	F. González, *et al.* 2157 (TOLI)	–30.7	E	2800
S. papilio O.Duque	D. A. García-Ramírez & J. S. García-Revelo 57 (CUVC)	–30.8	E	2121
S. pardipes Rchb.f.	M. I. Guarín 93 (VALLE)	–27.1	E	2690
S. preclara Luer & Hirtz	P. Silverstone-Sopkin, *et al.* 7977 (CUVC)	–30.3	T	2110
S. aff. *pulchella* Kunth (= *Pleurothallis* aff. *pulchella* (Kunth) Lindl. in Hook.)	H. Bernal 1448 (FMB)	–30.0	E	3160
S. purpurea Willd.	C. Berrío, *et al.* 22 (HUQ)	–29.2	E	3500
S. pusilla Kunth	D. L. Echeverry & J. Pineda 57 (HUA)	–28.3	E	3000
S. reptans Pridgeon & M.W.Chase [= *Crocodeilanthe scansor* (Luer) Luer]	M. J. Rodríguez & M. E. Pantoja 5 (CAUP)	–28.8	T	3549
S. rhodotantha (Rchb.f.) Pridgeon & M.W.Chase (= *Pleurothallis potamophila* Schltr.)	J. Cuatrecasas 19264 (VALLE)	–28.9	E	3050
S. spathulata Poepp. & Endl.	P. Silverstone & N. Paz 7536 (CUVC)	–29.3	E	1500
S. strobilacea Luer	B. R. Ramírez & D. M. Munar 17684 (CAUP)	–32.5	T	3000
S. superbiens Lindl.	J. E. Ramos 1007 (CUVC)	–30.9	E	1000
S. tenuilabris Lindl. (= *S. alata* Lindl.)	J. M. Valencia & J. C. Ospina 28 (HUQ)	–29.8	E	3360
S. tridactylon Luer	P. A. Silverstone, *et al.* 10357 (CUVC)	–32.1	E	1960
S. velaticaulis (Rchb.f.) Pridgeon & M.W.Chase (= *Crocodeilanthe velaticaulis* (Rchb.f.) Luer)	K. von Sneidern 4706 (VALLE)	–24.4	E	1700
S. aff. *velutina* Lindl.	G. M. Rodríguez, *et al.* 1253 (FMB)	–24.9	E	2675
S. vulcani Rchb.f.	P. Viveros, *et al.* 797 (HUQ)	–27.0	E	1840
S. sp1.	M. Rincón 139 ((TOLI)/Dendrology sec.)	–32.4	E	100
S. sp2.	M. Rincón 401 ((TOLI)/Dendrology sec.)	–32.7	E	0
S. sp3.	P. Stevenson 3407 (ANDES/P. stevenson Coll.)	–33.1	E	1900

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
S. sp4.	M. Rincón 204 ((TOLI)/Dendrology sec.)	−28.2		2800
S. sp5.	P. Stevenson & C. Prada 3246 (ANDES/P. stevenson Coll.)	−31.5	E	1900
***Trichosalpinx* Luer (109; 0/8 = 0%)**				
T. berlineri (Luer) Luer	J. F. Restrepo 292 (CAUP)	−24.9	E	1884
T. chamaelepanthes (Rchb.f.) Luer	J. Betancur 1794 (HUA)	−29.3	E	2100
T. dependens (Luer) Luer	P. Silverstone-Sopkin, *et al.* 8796 (CUVC)	−25.9	E	1110
T. intricata (Lindl.) Luer	P. A. Silverstone, *et al.* 4148 (CUVC)	−30.4	E	1935
T. orbicularis (Lindl.) Luer	D. Cárdenas, *et al.* 6715 (COAH)	−30.7	E	200
T. pergrata (Ames) Luer	J. M. MacDouga, *et al.* 4370 (HUA)	−29.1	E	3435
T. pseudolepanthes Luer & R.Escobar	J. E. Ramos, *et al.* 1306 (CHOCO)	−32.9	E	1900
T. spathulata Luer	P. A. Silverstone, *et al.* 4830 (CUVC)	−33.1	E	2200
***Trisetella Luer* (23; 0/1 = 0%)**				
T. sp.	J. Espina, *et al.* 2648 (CHOCO)	−30.9	E	80
***Zootrophion* Luer (21; 0/1 = 0%)**				
Z. dayanum (Rchb.f.) Luer	J. F. Restrepo 380 (CAUP)	−31.2	E	1650
Subtribe Ponerinae				
***Isochilus* R.Br. (12; 0/1 = 0%)**				
I. linearis (Jacq.) R.Br.	J. F. Restrepo 346 (CAUP)	−26.6	E	1884
***Ponera* Lindl. (8; 0/1 = 0%)**				
P. striata Lindl.	D. Bonilla 39 (TOLI)	−23.7	E	1596
Tribe Malaxideae				
Subtribe Dendrobiinae Lindl. ex Endl.				
***Bulbophyllum* Thouars (1924; 1/2 = 50%)**				
B. setigerum Lindl.	J. Betancur & J. González 13378 (COAH)	−17.9	E	120
B. sp.	A. Idárraga & M. Da Silva 1715 (JAUM)	−29.4	E	250
Subtribe Malaxidinae				
***Liparis* Rich. (431; 0/2 = 0%)**				
L. cf. *caulescens* Frapp. ex Cordem.	A. J. Negret 371 (CAUP)	−30.0	T	2000
L. nervosa (Thunb.) Lindl.	M. Hernández, *et al.* 3098 (COAH)	−33.5	T	830
***Malaxis* Sol. ex Sw. (176; 0/3 = 0%)**				
M. andicola Kuntze	J. Becoche 40 (CAUP)	−35.7	T	1685
M. fastigiata Kuntze	M. de Fraume & Álvarez y Gallego 166 (FAUC)	−35.3	T	2250
M. parthoni C.Morren	C. Berrío, *et al.* 20 (HUQ)	−33.2	T	3500
Tribe Neottieae				
***Epipactis* Zinn (91; 0/1 = 0%)**				
E. sp.	K. Rosas 64 (CAUP)	−31.8	T	67
***Palmorchis* Barb. Rodr. (22; 0/3 = 0%)**				
P. puber (Cogn.) Garay	MOH 616 (JAUM)	−32.7	T	104
P. sp1.	W. Devia, *et al.* 10801 (TULV)	−34.1	T	1840
P. sp2.	C. Barbosa 1966 (FMB)	−34.9	T	80
Tribe Sobralieeae				
***Elleanthus* C.Presl (112; 1/35 = 2.9%)**				
E. ampliflorus Schltr.	J. S. García-Revelo & A. D. García-Ramírez 17 (CUVC)	−27.6	E	2246
E. cf. *arpophyllostachys* Rchb.f.	O. Pérez & E. Parra 531 (VALLE)	−32.7	E	1860
E. aurantiacus Rchb.f.	P. Stevenson & C. Prada 3262 (ANDES/P. stevenson Coll.)	−30.7	T	1900
E. aureus Rchb.f.	O. Pérez & E. Parra 1154 (CUVC)	−31.9	E	1800

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
E. capitatus Rchb.f. (= *Evelyna capitata* Poepp. & Endl.)	J. Cuatrecasas 20932 (VALLE)	−26.9	E	2200
E. capitatus Rchb.f.	C. Barbosa 2635 (FMB)	−27.3	E	2609
E. columnaris Rchb.f.	P. Franco, *et al.* 4700 (HUA)	−33.1	E	1325
E. discolor Rchb.f.	N. Paz, *et al.* 529 (CUVC)	−28.2	T	2300
E. ensatus Rchb.f.	A. Cavalier 41 (FMB)	−24.2	T	3200
E. flavescens Rchb.f.	L. A. de Escobar, *et al.* 2749 (HUA)	−33.3	T	1550
E. fractiflexus Schltr.	P. A. Silverstone, *et al.* 1570 (CUVC)	−29.5	E	1880
E. glaucophyllus Schltr.	P. A. Morales, *et al.* 611 (JAUM)	−29.0	T	2420
E. gracilis Rchb.f.	M. I. Guarín 111 (VALLE)	−27.4	E	1985
E. graminifolius (Barb.Rodr.) Løjtnant	L. A. de Escobar, *et al.* 2271 (HUA)	−31.1	E	1829
E. hirtzii Dodson	A. Cogollo & J. G. Ramírez 3171 (JAUM)	−27.4	E	1280
E. hymenophorus Rchb.f.	D. Cardona 1 (HUQ)	−29.2	T	3000
E. jimenezii (Schltr.) C.Schweinf. (= *Epilyna jimenezii* Schltr.)	Y. Rueda-Valoyes & J. García-Arias 7 (CHOCO)	−18.0	E	86.9
E. kermesinus Rchb.f.	C. Barbosa 2569 (FMB)	−28.3	T	3345
E. lancifolius C.Presl	O. Pérez, *et al.* 1077 (CUVC)	−28.8	E	1800
E. lancifolius C.Presl	P. Acevedo, *et al.* 1272 (HUA)	−30.2	E	1780
E. longibracteatus (Lindl. ex Griseb.) Fawc. (= *E. xanthocomus* Rchb.f.)	R. Moreno & F. Buitrago 27 (HUA)	−28.2	L	3000
E. longibracteatus (Lindl. Ex Griseb.) Fawc. (= *E. xanthocomus* Rchb.f.)	N. de P & Álvarez & Gallego 408 (JAUM)	−27.1	T	2250
E. maculatus Rchb.f. (= *E. lupulinus* Rchb.f.)	E. Segura, *et al.* 125 (FMB)	−31.2	E	3100
E. maculatus Rchb.f.	A. León 444 (FMB)	−27.6	E	3400
E. maculatus Rchb.f.	A. Idárraga, *et al.* 4034 (HUA)	−24.9	E	3153
E. magnicallosus Garay	M. S. González, *et al.* 2985 (CAUP)	−29.4	E	3000
E. cf. *myrosmatis* Rchb.f.	J. Cuatrecasas 15089 (VALLE)	−30.9	T	1040
E. cf. *oliganthus* Rchb.f.	V. Vargas, *et al.* 99 (COAH)	−34.6	E	450
E. purpureus Rchb.f.	M. Córdoba, *et al.* 3241 (FMB)	−27.5	T	2620
E. rhodolepis Rchb.f.	B. E. Salgado-Negret 75 (CAUP)	−26.9	T	2500
E. cf. *robustus* Rchb.f.	D. Gamba 53 (CUVC)	−26.9	E	2700
E. smithii Schltr.	P. Ortiz-Valdivieso 4011 (HPUJ)	−24.4	T	2050
E. sodiroi Schltr.	G. M. Urreta 8 (HPUJ)	−29.2	E	21
E. sphaerocephalus Schltr.	P. Viveros, *et al.* 465 (HUQ)	−32.4	E	1480
E. strobilifer Rchb.f.	A. Cogollo, *et al.* 3018 (JAUM)	−32.0	T	800
E. vinosus Schltr.	J. Cuatrecasas 18904 (VALLE)	−24.7	E	3325
E. virgatus (Rchb.f.) C.Schweinf.	S. Restrepo 188 (HPUJ)	−26.4	T	2050
E. wageneri Rchb.f.	B. R. Ramírez 14192 (CAUP)	−27.9	T	1850
E. cf. *wageneri* Rchb.f.	W. Rodríguez 6 (HPUJ)	−23.9	T	2750
E. sp. (= *Adeneleuterophora* Barb.Rodr.)	E. Escobar 91 (VALLE)	−27.6	E	1625
***Sertifera* Lindl. ex Rchb.f. (8; 0/3 = 0%)**				
S. colombiana Schltr.	J. S. García-Revelo & A. D. García-Ramírez 24 (CUVC)	−26.7	E	2182
S. lehmanniana (Kraenzl.) Garay	E. Forero, *et al.* 2079 (CHOCO)	−26.5	T	2075
S. major Schltr.	J. L. Luteyn, *et al.* 12276 (CUVC)	−27.6	T	1900
***Sobralia* Ruiz & Pav. (140; 0/31 = 0%)**				
S. atropubescens Ames & C.Schweinf.	G. M. Urreta 14 (HUA)	−31.7	E	96
S. bimaculata Garay	J. Giraldo-Gensini & L. O. Agredo 673 (CUVC)	−27.7	E	1900
S. bletiae Rchb.f. (= *S. suaveolens* Rchb.f.)	G. M. Urreta 276a (HPUJ)	−26.2	E	50
S. candida Rchb.f.	T. A. Medina 1425 (TOLI)	−27.3	T	1799
S. cattleya Rchb.f.	J. C. Ordóñez 20 (HPUJ)	−24.8	T	1580
S. ciliata C.Schweinf. ex Foldats	J. Farfán 870 (FMB)	−25.8	T	2400

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
S. crocea Rchb.f.	P. Ortiz-Valdivieso 1088 (HPUJ)	−28.6	E	1550
S. decora Bateman	M. I. Guarín 51 (VALLE)	−27.6	E	1653
S. decora Bateman (= *S. sessilis* Lindl.)	M. Gamboa & F. Pedreros 175 (CUVC)	−33.4	E	400
S. densifoliata Schltr.	M. I. Guarín 101 (VALLE)	−24.8	E	1535
S. dichotoma Ruiz & Pav.	S. A. Barclay, *et al.* 3499 (FMB)	−24.2	T	1450
S. fragrans Lindl.	G. M. Urreta 10a (HPUJ)	−28.4	E	222
S. gloriosa Rchb.f.	A. Castaño & W. Devia 201 (TULV)	−26.4	T	1800
S. granitica G.A.Romero & Carnevali	A. Rudas, *et al.* 7336 (COAH)	−26.6	E	300
S. hoppii Schltr.	E. Méndez-Vargas 6609 (CUVC)	−25.6	T	1878
S. klotzscheana Rchb.f.	S. Espinal 1927 (CUVC)	−25.2	T	1250
S. liliastrum Lindl.	N. Hernández, *et al.* 69 (COAH)	−30.0	T	231
S. luerorum Dodson	P. Stevenson, *et al.* 2631 (ANDES/P. stevenson Coll.)	−29.3	T	1600
S. macrantha Lindl.	K. Rosas 11 (CAUP)	−27.9	T	33
S. macrophylla Rchb.f.	G. M. Urreta 11b (HPUJ)	−28.3	E	222
S. cf. *macrophylla* Rchb.f.	G. Lozano & O. Rangel 5238 (FMB)	−29.4	E	40
S. mucronata Ames & C.Schweinf.	G. M. Urreta 12a (HPUJ)	−27.0	E	200
S. mutisii P.Ortiz	P. A. Sarmiento 7 (HPUJ)	−26.7	T	1650
S. pulcherrima Garay	A. H. Gentry & E. Rentería 24348 (HUA)	−27.4	T	100
S. roezlii Rchb.f.	P. Ortiz-Valdivieso 4447 (HPUJ)	−22.6	T	1781
S. roezlii Rchb.f.	J. Farfán 876 (FMB)	−27.2	T	1741
S. rosea Poepp. & Endl.	C. Acevedo, *et al*. 83888 (FMB)	−25.7	T	2585
S. semperflorens Kraenzl.	P. Ortiz-Valdivieso 4034 (HPUJ)	−25.9	T	1500
S. sobralioides (Kraenzl.) Garay	P. Ortiz-Valdivieso 911 (HPUJ)	−24.7	T	1250
S. valida Rolfe	G. M. Urreta 284d (HPUJ)	−24.0	E	750
S. violacea Linden ex Lindl.	J. Vargas & Y. Guiza 19 (LLANOS)	−28.1	E	687
S. virginalis Peeters & Cogn. in Cogn. & Gooss.	G. M. Urreta 232a (HPUJ)	−33.5	E	50
S. xantholeuca hort. ex Williams	S. Espinal, *et al.* 3714 (CUVC)	−24.4	T	2100
Tribe Triphoreae				
Subtribe Triphorinae				
***Psilochilus* Barb.Rodr. (7; 0/1 = 0%)**				
P. cf. *macrophyllus* Ames	P. Stevenson, *et al.* 2961 (ANDES/P. stevenson Coll.)	−33.1	T	1900
Tribe Tropidieae				
***Corymborkis* Thouars (6; 0/2= 0%)**				
C. flava Kuntze	D. Sanín, *et al.* 3095 (HUQ)	−32.7	T	1980
C. forcipigera (Rchb.f.) L.O.Williams	A. M. Hernández, *et al.* 2359 (COAH)	−31.4	T	1241
Tribe Vandeae				
Subtribe Angraecinae				
***Campylocentrum* Benth. (64; 3/3 = 100%)**				
C. brenesii Schltr. (= *C. longicalcaratum* Ames & C.Schweinf.)	P. A. Viveros 72 (HUQ)	−15.2	E	1800
C. micranthum (Lindl.) Rolfe	O. Pérez & E. Parra 165 (CUVC)	−14.1	E	1600
C. panamense Ames	D. Cárdenas 1133 (JAUM)	−14.9	E	15
Subtribe Polystachyinae				
***Polystachya* Hook. (239; 0/3 = 0%)**				
P. concreta (Jacq.) Garay & H.R.Sweet	J. G. Vélez, J. Correa & F. Villa 5577 (FMB)	−25.2	E	1420
P. foliosa (Hook.) Rchb.f. in Walp.	J. G. Ramírez & D. Cárdenas 1245 (HUA)	−24.2	E	735
P. stenophylla Schltr.	D. Macías & B. R. Ramírez 5012 (CUVC)	−31.9	E	300

Table 1. Continued

Taxon	Accession/Voucher details‡	δ^{13}C (‰)	G	Elevation (m)
SUBFAMILY ORCHIDOIDEAE				
Tribe Cranichideae				
Subtribe Cranichidinae				
***Aa* Rchb.f. (27; 0/3 = 0%)**				
A. colombiana Schltr.	J. Farfán, *et al.* 1102 (FMB)	–30.2	E	3250
A. hartwegii Garay	B. César 9474 (FMB)	–28.4	T	2532
A. paleacea (Kunth) Rchb.f.	L. M. Ospina 38 (FMB)	–29.8	T	2960
***Altensteinia* Kunth (7; 0/1 = 0%)**				
***Baskervilla* Lindl. (10; 0/1 = 0%)**				
B.colombiana Garay	B. R. Ramírez & D. Macías P 14700 (CAUP)	–34.1	T	2890
***Cranichis* Sw. (54; 0/5 = 0%)**				
C. cf. *antioquiensis* Schltr.	O. Pérez & V. Bub 1071 (CUVC)	–33.1	T	1800
C. cf. *ciliata* Kunth	P. Stevenson, *et al.* 3276 (ANDES/P. stevenson Coll.)	–36.3	T	1900
C. diphylla Sw.	M. Córdoba, *et al.* 3006 (FMB)	–33.4	T	3000
C. lehmanniana (Kraenzl.) L.O.Williams	S. L. Díaz-Ibarra 252 (CAUP)	–30.7	T	2880
C. muscosa Sw.	P. Ortiz-Valdivieso 4247 (HPUJ)	–34.6	T	1600
***Gomphichis* Lindl. (24; 0/8 = 0%)**				
G. altissima Renz	P. Silverstone-Sopkin, *et al.* 3848 (CUVC)	–31.9	T	2424
G. caucana Schltr.	C. Barbosa 9449 (159) (FMB)	–29.6	T	2532
G. cundinamarcae Renz	G. M. Rodríguez, *et al.* 1160 (FMB)	–29.9	T	3047
G. hetaerioides Schltr.	MOH 213 (JAUM)	–25.9	T	2500
G. scaposa Schltr.	MOH 115 (JAUM)	–29.7	T	3000
G. traceyae Rolfe	R. Fonnegra, *et al.* 5670 (HUA)	–27.2	T	2680
G. viscosa Schltr.	C. Berrío & G. Gómez 33 (HUQ)	–31.6	T	2800
G. sp.	P. Stevenson, *et al.* 3212 (ANDES/P. stevenson Coll.)	–30.9	E	1900
***Ponthieva* R.Br. (63; 0/3 = 0%)**				
P. diptera Linden & Rchb.f.	MOH 640 (JAUM)	–28.4	T	2595
P. microglossa Schltr.	J. Cuatrecasas 20698 (VALLE)	–32.6	T	2704
P. racemosa (Walter) C.Mohr	P. Silverstone 931 (TULV)	–29.5	T	2000
***Prescottia* Lindl. (26; 0/3 = 0%)**				
P. petiolaris Lindl.	M. Giraldo *s.n.* (CUVC)	–32.9	T	1871
P. stachyodes (Sw.) Lindl.	M. de Fraume & Álvarez y Gallego 177 (FAUC)	–29.9	T	2250
P. stachyodes (Sw.) Lindl.	J. Betancur & S. Churchill 2518 (HUA)	–31.4	T	2300
P. stachyodes (Sw.) Lindl. (= *P. longifolia* Schltr.)	A. M. Benavides, *et al.* 4014 (HUA)	–34.8	T	2495
P. sp.	J. Farfán, *et al.* 1134 (FMB)	–32.1	T	2600
***Pseudocentrum* Lindl. (7; 0/2 = 0%)**				
P. bursarium Rchb.f.	B. R. Ramírez 10525 (CAUP)	–29.4	T	3180
P. macrostachyum Lindl.	P. Silverstone-Sopkin, *et al.* 3894 (CUVC)	–31.9	E	2430
***Pterichis* Lindl. (20; 0/1 = 0%)**				
P. galeata Lindl.	B. R. Ramírez, *et al.* 22784 (CAUP)	–30.3	T	3205
Subtribe Goodyerinae				
A. fimbriata Kunth	P. Ortiz-Valdivieso 493 (HPUJ)	–27.1	T	2800
***Aspidogyne* Garay (45; 0/2 = 0%)**				
A. boliviensis (Cogn.) Garay	P. Silverstone-Sopkin, *et al.* 4695 (CUVC)	–33.6	T	2460
A. boliviensis (Cogn.) Garay [= *Erythrodes boliviensis* (Cogn.) Dodson & M.W. Chase]	O. Pérez & E. Parra 784 (CUVC)	–31.9	E	1900

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
A. foliosa (Poepp. & Endl.) Garay	J. G. Ramírez & D. Cárdenas 1362 (JAUM)	−35.0	T	550
Erythrodes **Blume (26; 0/1 = 0%)**				
E. sp.	W. Devia, *et al.* 4472 (TULV)	−32.6	T	100
Kreodanthus **Garay (12; 0/1 = 0%)**				
K. ecuadorensis Garay	D. Bonilla 53 (TOLI)	−34.0	T	3200
Ligeophila **Garay (10; 0/3 = 0%)**				
L. clavigera (Rchb.f.) Garay	O. Pérez, *et al.* 602–2 (CUVC)	−36.2	T	1800
L. stigmatoptera (Rchb.f.) Garay	M. Rincón 395 ((TOLI)/Dendrology sec.)	−30.0	T	100
L. sp.	Ohba, *et al.* 1022 (FMB)	−37.1	T	1276
Microchilus **C.Presl (137; 0/5 = 0%)**				
M. madrinanii Ormerod	S. Madriñan & C. E. Barbosa 168 (JBGP)	−35.6	T	916
M. major C.Presl (= *Erythrodes major* (C.Presl) Ames)	A. Juncosa 1763 (JAUM)	−35.1	T	450
M. major C.Presl	A. J. Negret 378 (CAUP)	−35.7	T	1800
M. cf. *nugax* Ormerod	O. Pérez, *et al.* 602–1 (VALLE)	−34.9	T	1800
M. procerus (Schltr.) Ormerod [= *Erythrodes procera* (Schltr.) Ames]	D. Hartman 422 (CUVC)	−31.7	T	2200
M. scrotiformis (C.Schweinf.) Ormerod (= *Erythrodes scrotiformis* C.Schweinf.)	N. H. Ospina-Calderón 299 (CUVC)	−35.8	T	1528
Platythelys **Garay (13; 0/1 = 0%)**				
P. maculata (Hook.) Garay	P. Viveros & J. Molina 142 (HUQ)	−37.1	T	1100
Subtribe Spiranthinae				
Coccineorchis **Schltr. (7; 0/1 = 0%)**				
C. cernua (Lindl.) Garay	P. Silverstone-Sopkin, *et al.* 2863 (CUVC)	−31.1	T	2300
Cyclopogon **C.Presl (80; 0/1 = 0%)**				
C. lindleyanus Schltr.	A. Castaño 39 (TULV)	−35.8	E	1150
C. cf. *ovalifolius* C.Presl	T. Hinestroza & A. L. Montoya 456 (JAUM)	−33.8	E	2400
Eurystyles **Wawra (20; 0/1 = 0%)**				
E. cotyledon Wawra	J. Castro, E. L. Velásquez 451 (JAUM)	−28.3	E	1500
Pelexia **Poit. ex Lindl. (78; 0/1 = 0%)**				
P. olivacea Rolfe	S. Garzón 22 (CUVC)	−34.8	T	1680
Sacoila **Raf. (7; 0/1 = 0%)**				
S. lanceolata (Aubl.) Garay [= *Stenorrhynchos lanceolatum* (Aubl.) Rich.]	J. M. MacDougal & M. P. Velásquez 4150 (HUA)	−24.3	T	790
Stenorrhynchos **Spreng. (5; 0/1 = 0%)**				
S. speciosum (Jacq.) Rich. ex Spreng.	A. Giraldo & T. Gross 8062 (CUVC)	−35.9	T	2025
Tribe Orchideae				
Subtribe Orchidinae				
Habenaria **Willd. (813; 0/5 = 0%)**				
H. gollmeri Schltr.	J. F. Restrepo & D. Salazar 495 (CAUP)	−28.6	T	2325
H. monorrhiza Cogn. (= *H. speciosa* Poepp. & Endl.)	P. Viveros, *et al.* 112 (HUQ)	−28.9	T	1100
H. monorrhiza Cogn.	A. Rojas 2155 (FMB)	−26.6	T	1695
H. obtusa Lindl.	R. Nascimento 472 (COAH) Brazil	−31.7	E	145
H. repens Nutt.	A. Castaño & W. Devia 318 (TULV)	−28.2	T	860
H. sp.	H. Mendoza 1469 (FMB)	−31.1	T	1900
SUBFAMILY VANILLOIDEAE				
Tribe Pogonieae				

Table 1. Continued

Taxon	Accession/Voucher details‡	$\delta^{13}C$ (‰)	G	Elevation (m)
***Cleistes* Rich. ex Lindl. (64; 0/1 = 0%)**				
C. rosea Lindl.	M. Ospina 603 (JAUM)	–27.9	T	1329
***Duckeella* Porto & Brade (3; 0/1 = 0%)**				
D. pauciflora Garay	P. A. Palacios & B. Plazas 1218 (COAH)	–29.8	T	229
Tribe Vanilleae				
***Epistephium* Kunth**				
E. duckei Huber	M. I. Guarín 36 (VALLE)	–29.9	T	1600
E. elatum Kunth	N. Zúñiga & N. Macías 24 (VALLE)	–32.0	T	1500
E. hernandii Garay	D. Cárdenas, *et al*. 23420 (COAH)	–31.6	T	204
E. parviflorum Lindl.	M. Córdoba, *et al*. 527 (FMB)	–30.8	T	500
E. subrepens Hoehne	M. V. Arbeláez & F. Sueroque 546 (COAH)	–28.3	T	203
***Vanilla* Mill. (103; 8/12 = 66.7%)**				
V. bicolor Lindl.	M. Rincón 136 ((TOLI)/Dendrology sec.)	–28.8	T	80
V. columbiana Rolfe	F. García & E. D. Agualimpia 325 (FMB)	–15.2	E	100
V. cribbiana Soto Arenas	R. T. González *s.n.* (Pers. Coll. Univer. del Pacífico)	–18.2	T	30
V. dressleri Soto Arenas	R. T. González *s.n.* (Pers. Coll. Univer. del Pacífico)	–16.4	T	1000
V. odorata C.Presl	R. T. González *s.n.* (Pers. Coll. Univer. del Pacífico)	–16.9	T	1030
V. oroana Dodson	R. T. González *s.n.* (Pers. Coll. Univer. del Pacífico)	–29.2	T	60
V. palmarum Lindl.	I. M. Idrobo, *et al*. 41423 (COAH)	–26.9	T	180
V. phaeantha Rchb.f.	J. Cabezas, *et al*. 149 (TOLI)	–16.9	T	272
V. planifolia Andrews	L. F. Prado & H. Berrío 387 (FMB)	–14.2	T	200
V. pompona Schiede	N. Pinilla, F.L.N 46 (FMB)	–15.1	T	874
V. rivasii Molineros, R.T.González, Flanagan & J.T.Otero	R. T. González *s.n.* (Pers. Coll. Univer. del Pacífico)	–16.9	T	30
V. trigonocarpa Hoehne	R. T. González *s.n.* (Pers. Coll. Univer. del Pacífico)	–27.4	T	30

Species classification into subfamilies, tribes and subtribes of Orchidaceae was based on the latest classification by Chase *et al.* (2015) and Freudenstein & Chase (2015). Synonyms are indicated in parentheses only for those species in which the name was originally provided in the herbarium sheet. Abbreviations for authorities followed The International Plant Names Index (IPNI) (https://www.ipni.org), The Plant List (http://www.theplantlist.org/) or Tropicos ((http://www.tropicos.org/). The total number of species for each genus was estimated using The Plant List. ‡Herbaria are denoted by their acronyms as in Thiers, B. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/science/ih/. The list of herbarium can be found in the Methods.
*Species not listed in International Plant Names Index (IPNI), The Plant List or Tropicos.

values were less negative than –20‰ (Crayn *et al.*, 2015). Leaf carbon stable isotopic signature was determined for 1192 orchid specimens and 1079 species, representing *c*. 25% of the total number of orchid species in Colombia (4270 species). Our analysis provides values for 230 endemic species, including *Cattleya trianae* Linden & Rchb.f., an endangered species and the emblematic Colombian national flower, and *Masdevallia ignea* Rchb.f., categorized as critically endangered in the red book of Colombia Orchids (Calderón-Sáenz, 2006).

Climatic data and statistical analysis

Climatic data for each orchid species was compiled using their geographical coordinates from herbarium labels and the WorldClim-Global Climate Data Base (Hijmans *et al.*, 2005). In the case of herbaria specimens without coordinates, we georeferenced them using the available information about locality on the herbarium sheet. However, some specimens had incorrect locality information. This became apparent once mapped, and we could identify locality errors, which allowed us to either correct the information or remove it from further analyses.

In addition, species without coordinates or locality information to georeference them were not included in the analyses. We downloaded a set of climate layers from WorldClim with a spatial resolution of *c.* 1 km^2 and used Qgis 2.12.3 software (QGIS Development Team, 2009) to extract the climatic data for each sampled orchid. We tested variables such as mean annual temperature (°C), annual precipitation (mm), precipitation of the wettest quarter (mm), precipitation of driest quarter (mm), the mean temperature of coldest quarter (°C) and mean temperature of warmest quarter (°C). In addition, we extracted cloud cover data using the layers from EarthEnv (Domisch, Amatulli & Jetz, 2015. www.earthenv.org).

Redundant climate variables were eliminated using a principal component analysis (PCA). Parameters from which the initial three PCA axes and correlation coefficients were < 0.40 were eliminated. With the remaining explanatory variables, we then performed a generalized linear model analysis (GLM) using a Gaussian distribution family because of the continuous nature of the response variable, δ^{13}C. All analyses were conducted in R (R Development Core Team, 2008). We used the Akaike information criterion to identify the best model of variables adjusted to the data to determine which series of variables better explained the distribution of photosynthetic pathways across the landscape. We used growth form as a dummy variable, where 1 represents epiphytes and 0 represents terrestrial species. Lithophytes were treated as epiphytes since both grow with no connection to the soil.

RESULTS

Across the 1079 orchid species we studied, δ^{13}C values ranged from –11.2‰ (*Notylia albida* Klotzsch) to –37.4‰ (*Lepanthes medusa* Luer & R.Escobar) (Table 1). The values showed a bimodal distribution; with a small peak between –11 and –20‰ typically associated with strong CAM and a larger peak between –20 and –37.4‰, associated with CO_2 uptake predominantly by the C_3 pathway (Fig. 2). Specifically, 983 species (91.1%) belonged to the C_3 cluster and 96 species (8.9%) showed δ^{13}C values indicative of strong CAM (Table 1).

The distribution of orchids in our analysis spanned an elevation range from sea level to 3800 m (Fig. 1). Mean annual precipitation ranged from 439 to 9000 mm per year, with the mean annual temperature ranging from 6.2 to 28.4 °C (Table S1). From the total number of species with reliable growth form information, 805 were epiphytes, 260 were terrestrials and five were lithophytes. C_3 photosynthesis was present in 729 epiphytes, 241 terrestrials and four lithophytes. Of the 96 species

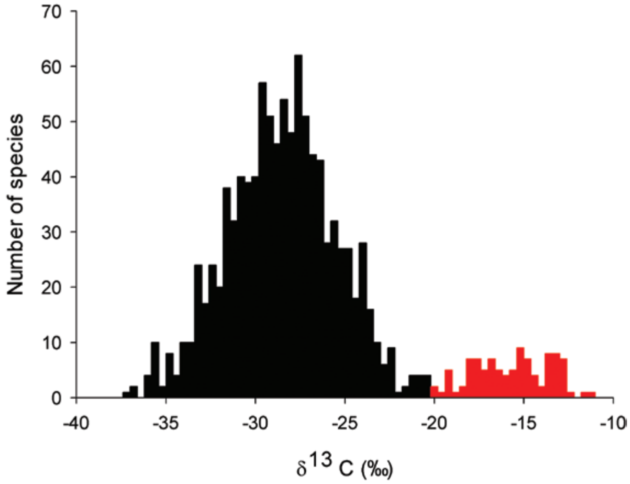

Figure 2. Histogram of δ^{13}C values from 1079 orchid species plotted in class intervals of 0.4‰. Red bars denote species with δ^{13}C values less negative than –20‰, indicating CO_2 fixation predominantly by CAM. Black bars denote species with δ^{13}C values more negative than –20‰ indicating CO_2 fixation predominantly by the C_3 pathway.

with strong CAM, 76 species (79.2%) were epiphytes, 19 species were terrestrials (19.8%) (Table 1) and one species was a lithophyte (1%).

After excluding redundant environmental variables, such as mean annual precipitation, precipitation of wettest month and cloud cover, we ran a series of GLMs with the remaining variables, with and without genera as a variable in the model. The best-fitted model included genera as the explanatory variable (AIC = 6391.2). In this model, the most significant variables that explained δ^{13}C variability were orchid genera (P = 0.00024), growth form (P = 0.049), precipitation of driest quarter ($P < 0.0001 = 5.08 \times 10^{-7}$) and mean annual temperature (P = 0.0068).

Given that several environmental variables changed with elevation, we also explored the relationship between photosynthetic pathway and elevation, using information from samples with reliable collection locality and elevation (Fig. 3). For the C_3 species (δ^{13}C values of –20.0‰ or more negative), we detected a small significant ($P < 0.001$) effect of elevation on δ^{13}C (Fig. 3A), with δ^{13}C values becoming slightly less negative with increasing elevation. In contrast, there was no statistically significant trend with elevation in the CAM group of species (δ^{13}C values less negative than –20.0‰). A similar result was observed for mean annual temperature (Fig. 3B), which is correlated with elevation. Annual precipitation and precipitation of the driest quarter were significantly correlated with δ^{13}C values for both the CAM and C_3 species groups (Fig. 3C, D).

We found two main peaks of orchid diversity based on elevation range: one at mid-elevation (e.g. at 1500 m along

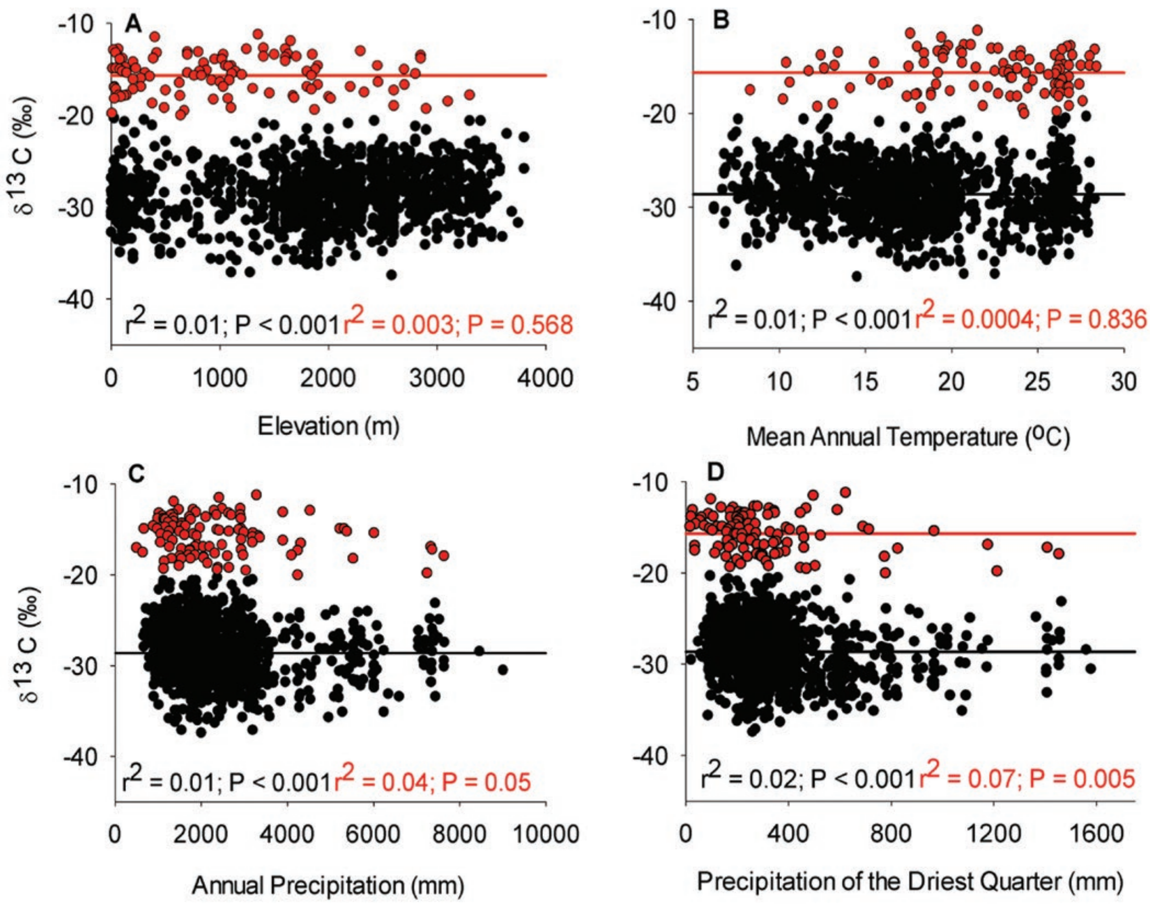

Figure 3. Relationship between: A, δ^{13}C and elevation, B, mean annual temperature, C, annual precipitation and D, precipitation of driest quarter. Each point corresponds to one herbarium sample. Data were analysed by least-square regression in two groups: samples with δ^{13}C values –20‰ or less negative indicates presence of CAM (red circles, $N = 105$) and samples with δ^{13}C values more negative than –20‰ indicates C_3 pathway (black circles, for elevation $N = 1087$; other variables $N = 1072$).

the belt of cloud forest) and another in the lowlands at < 500 m (Fig. 4), including wet forests of the Pacific region of the Chocó/Darien biodiversity hotspot. The largest proportion of CAM species occurred in lowland sites, followed by mid-elevation sites. The proportion of CAM species markedly decreased above 2000 m, and we found no evidence of CAM above 3500 m (Fig. 4). Nonetheless, CAM-type isotope values were noted in 14 orchid species occurring between 2000 and 3400 m (Fig. 4, Table 2).

From 178 genera analysed, 28 genera (15.7%) had at least one species showing strong CAM (Table 1). The genera with the highest number of CAM species were *Epidendrum* L. (33/191 species sampled), *Rodriguezia* Ruiz & Pav. (3/3 species sampled), *Ornithocephalus* Hook. (5/5 species sampled), *Comparettia* Poepp & Endl. (3/3 species sampled), *Laelia* Lindl. (3/3 species sampled), *Notylia* Lindl. (3/3 species sampled), *Cattleya* Lindl. (6/7 species sampled), *Encyclia* Hook. (5/5 species sampled), *Campylocentrum* Benth. (3/3 species sampled), *Trichocentrum* Poepp. & Endl. (3/3 species sampled) and *Vanilla* Mill. (8/12 species sampled) (Table 1). We report CAM for six genera previously not known to exhibit CAM, all in subfamily Epidendroideae, bringing the total number of orchid genera with CAM to 96 (following Silvera *et al.*, 2010). The genera where CAM is reported for the first time are: *Jacquiniella* Schltr. [one species; *Jacquiniella teretifolia* (Sw.) Britton], *Meiracyllium* (one species; *Meiracyllium trinasutum* Rchb.f), *Pabstiella* Brieger & Senghas [one species; *Pabstiella aryter* (Luer) F.Barros], *Psychopsis* Nutt. ex Greene for Raf. [one species; *Psychopsis papilio* (Lindl.) H.G.Jones], *Pterostemma* Kraenzl. (one species; *Pterostemma antioquiense* F.Lehm. & Kraenzl.) and *Solenidium* Lindl. (one species; *Solenidium racemosum* Lindl.) (Table 1).

DISCUSSION

Taxonomy and CAM

Our study represents the largest δ^{13}C survey for South American orchid species to date and assists in providing a representative picture of photosynthetic pathway distribution in the family and along a range of contrasting habitats. Our survey of 1079 species reveals that 8.9% exhibit CAM-type carbon isotopic signatures. This result is similar to that of a previous survey of 1002 orchid species from Panama and Costa Rica, which identified 9.6% as expressing CAM (Silvera *et al.*, 2010). These studies have 200 species in common and together provide information on isotopic values of 1881 Neotropical orchids corresponding to

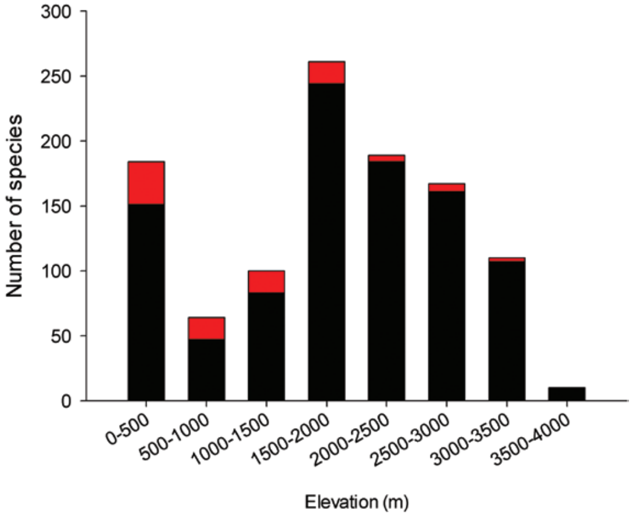

Figure 4. Total number of orchid species by elevational range. Red bars denote samples with $\delta^{13}C$ values less negative than −20‰ indicative of CAM. Black bars denote samples with $\delta^{13}C$ values more negative than −20‰ indicative of C_3.

6.2% of the global total. Consistent with previous observations, CAM species occurred in subfamilies Epidendroideae and Vanilloideae (Table 1), with no evidence of CAM in the subfamilies Cypripedioideae and Orchidioideae.

The large Neotropical genus *Epidendrum* with *c.* 1500 species worldwide was the most sampled taxon in this study (191 species); of these, 33 (17.3%) had $\delta^{13}C$ values typical of strong CAM. A similar percentage of *Epidendrum* spp. from Panama and Costa Rica (16.8%) showed CAM (Silvera *et al.*, 2010). If the proportion of CAM in this genus is *c.* 17%, as both surveys suggest, we can predict CAM in a total of about 300 *Epidendrum* spp.

Genera with only CAM species were *Brassavola* R.Br., *Campylocentrum*, *Comparettia*, *Encyclia*, *Laelia*, *Meiracyllium*, *Notylia*, *Oeceoclades* Lindl., *Ornithocephalus*, *Pabstiella*, *Plectrophora*, *Psychopsis*, *Pterostemma*, *Rodriguezia*, *Trichocentrum* and *Trizeuxis* Lindl. Combining our information and that from the previous study by Silvera *et al.* (2010) accounts for 5.3% of the total number of *Comparettia* spp. worldwide, 6.3% of *Campylocentrum* spp., 8.9% of *Notylia* spp., 20.4% of *Ornithocephalus* spp., 8.3% of *Rodriguezia* spp., 5.5% of *Encyclia* spp., 17.4% of *Laelia* spp. and 13.9% of *Trichocentrum* spp., in addition to the sole species (100%) of *Trizeuxis*.

Seventy-nine orchid genera consistently showed no evidence of CAM, even though many species possess thick leaves (e.g. *Lepanthes* Sw., *Stelis* Sw., *Masdevallia* Ruiz & Pav. and *Maxillaria* Ruiz & Pav.). Together with Silvera *et al.* (2010), we covered 21.3% of the species for *Maxillaria*, 11.7% for *Stelis*, 5.8% for

Table 2. Species with CAM-type isotopic signatures ($\delta^{13}C$ values less negative than −20‰) found above 2000 m above sea level.

Species	Growth form	Elevation (m)	$\delta^{13}C$ (‰)
Acianthera boliviana (Rchb.f.) Pridgeon & M.W.Chase	Epiphyte	2450	−14.6
Comparettia ottonis (Klotzsch) M.W.Chase & N.H.Williams	Epiphyte	2800	−15.5
Epidendrum aura-usecheae Hágsater, Rinc.-Useche & O.Pérez	Lithophytic	2600	−17.3
Epidendrum jamiesonis Rchb.f.	Epiphyte	2850	−13.8
Epidendrum macrogastrium Kraenzl.	Terrestrial	2900	−19.3
Epidendrum secundum Jacq.	Terrestrial	2000	−18.0
Epidendrum secundum Jacq.	Terrestrial	2695	−15.0
Epidendrum cf. *secundum* Jacq.	Epiphyte	2330	−17.5
Epidendrum melinanthum Schltr.	Terrestrial	2021	−18.2
Epidendrum paternale Hágsater. O.Pérez & E.Santiago*	Terrestrial	2600	−19.0
Epidendrum ptochicum Hágsater	Epiphyte	2295	−13.0
Epidendrum schistochilum Schltr.	Epiphyte	2700	−16.7
Epidendrum tulcanense Hágsater & Dodson	Terrestrial	3100	−18.5
Ornithocephalus urceilabris (P.Ortiz & R.Escobar) Toscano & Dressler	Epiphyte	2457	−16.4
Pleurothallis aff. testifolia (Sw.) Lindl.	Epiphyte	3300	−17.8
Pterostemma antioquiense F.Lehm. & Kraenzl.	Epiphyte	2200	−16.9

*Species not listed in The Plant List.

Lepanthes and 10.6% for *Masdevallia*. *Bulbophyllum* Thouars had mostly C_3 species but included one CAM species (*Bulbophyllum setigerum* Lindl.).

Bimodality of $\delta^{13}C$ values

We found the typical bimodal distribution of $\delta^{13}C$ values that has been reported in carbon isotopic surveys of other plant families containing CAM-exhibiting species (e.g. Medina *et al.*, 1977; Griffiths & Smith, 1983; Pierce, Winter & Griffiths, 2002; Winter & Holtum, 2002; Silvera *et al.*, 2005; Silvera *et al.*, 2010; Horn *et al.*, 2014; Crayn *et al.*, 2015). Few orchid species had intermediate $\delta^{13}C$ values between –20.1 and –22.0‰. The observation of two distinct groups of $\delta^{13}C$ values, forming a large C_3 cluster and a smaller CAM cluster, indicates disruptive selection, favouring either CO_2 fixation predominantly in the light via C_3 photosynthesis, or CO_2 fixation predominantly in the dark via CAM photosynthesis. However, CAM surveys based on $\delta^{13}C$ analysis alone, such as the one presented here, provide only conservative estimates of the occurrence of CAM. They do not identify species with weakly expressed constitutive and/or facultative CAM, in which CAM is present but C_3-derived carbon is still the principal determinant of the carbon isotopic signature (Winter & Holtum, 2002; Silvera *et al.*, 2005; Winter & Holtum, 2007; Winter, García & Holtum, 2008). Species with weakly expressed CAM are typically hidden in the C_3 cluster, and physiological measurements on living plants (titratable acidity, CO_2 exchange) are necessary to detect the operation of the CAM cycle in such species. Indeed, a titratable acidity study by Silvera *et al.* (2005) of 173 orchid species from a living collection in Panama identified low-level CAM in one third of the 128 species in the C_3 cluster of isotopic signatures, suggesting that close to 50% of the total number of study species were capable of CAM. It is therefore likely that if species with weakly expressed CAM would also be considered, the proportion of CAM-exhibiting species among Colombian orchids would be much greater than the 8.9% of species with $\delta^{13}C$ values less negative than –20.0‰. Further work is needed to explore the occurrence of weak CAM in orchid species and its role as an intermediate state between C_3 and strong CAM, or as an evolutionary reservoir for CAM adaptive radiations (Silvera & Lasso, 2016).

Relationship between $\delta^{13}C$ value, climate and other variables

The most significant variables that explained the distribution of $\delta^{13}C$ values on our survey were orchid genera, growth form, precipitation of driest quarter of the year and mean annual temperature. Orchid genera were important in explaining photosynthetic pathway distributions because the CAM trait is expected to be phylogenetically conserved, leading to a stronger probability of strong CAM presence among closely related species (Givnish *et al.*, 2015).

The relationships between temperature and precipitation variables and photosynthetic metabolism were significant but weak, due to the marked variability in the climatic data and the isotopic signals in each photosynthetic pathway cluster. Similar results were found for orchids from Costa Rica and Panama (Silvera *et al.*, 2009). The use of climatic variables extracted from platforms such as WorldClim, although providing robust approximations for the climate at the collection sites, do not represent the subtleties of microclimate conditions of individual orchid habitats, especially for epiphytes (Silvera & Lasso, 2016). In our survey, the most important environmental variables to explain the distribution of CAM orchids in Colombia were precipitation of driest quarter of the year and mean annual temperature. There is a small tendency towards $\delta^{13}C$ values becoming more negative with increasing precipitation of the driest quarter, suggesting that precipitation during the driest quarter is more important in determining the presence of CAM than the total amount of water received during the year.

For the C_3 group of orchid species ($\delta^{13}C$ values of –20‰ or more negative), there was a significant effect ($P < 0.001$) of elevation on $\delta^{13}C$ values, which increased by 0.4‰ per 1000 m. Similar, albeit much larger increases in $\delta^{13}C$ value with increasing elevation were observed for C_3 bromeliads (1.47‰ per 1000 m; Crayn *et al.*, 2015), species of Rapataceae (3.3‰; Crayn, Smith & Winter, 2001) and a range of other species from different taxa around the globe (1.2‰; Körner, Farquhar & Roksandic, 1988; Körner, Farquhar & Wong, 1991). Intraspecific changes of 1.6 and 2.4‰ per 1000 m have been found for conifers (Hultine & Marshall, 2000) and for *Metrosideros polymorpha* Gaudich. (Myrtaceae) (Cordell *et al.*, 1999). Less negative $\delta^{13}C$ values with increasing elevation may be linked to lower ratio of intercellular to ambient CO_2 mole fractions (c_i/c_a ratios) during photosynthesis at higher elevations, resulting in increased carboxylation efficiency of rubisco at decreasing oxygen partial pressure (Farquhar & Wong, 1984; Cernusak *et al.*, 2013). As for CAM bromeliads (Crayn *et al.*, 2015), there was no statistically significant trend of $\delta^{13}C$ with elevation in the CAM group of orchid species.

Elevation and orchid diversity

Orchid species richness usually peaks at mid-elevation, where clouds are common and the temperature and moisture conditions allow orchids, especially epiphytes, to thrive (Whittaker & Niering, 1975; Silvera *et al.*, 2009). In Colombia, we found a corresponding diversity optimum between 1500 and 2000 m. Species diversity was also high in the lowlands (< 500 m). High relative species richness in the lowlands is based on orchid species that mostly inhabit the tropical humid forest in the Amazonas region and the Chocó biogeographic region, one of the most diverse (Myers *et al.*, 2000) and wettest areas of the world (Eslava, 1994). Chocó and Amazonas are considered the second and third most diverse regions regarding general species richness in Colombia, after the Andean region (Rangel & Rivera, 2004), with orchids being one of the most representative plant families in the Chocó region (Rangel & Rivera, 2004). Below 500 m, we sampled 181 species; of which most (82.3%) were epiphytes and 18.2% showed CAM-type isotopic signatures.

The proportion of CAM species gradually decreased with increasing elevation and CAM species were absent above 3500 m. Similar elevational trends in the proportion of CAM species were previously observed in orchids from Papua New Guinea (Earnshaw *et al.*, 1987), Panama and Costa Rica (Silvera *et al.*, 2009), in Panamanian *Clusia* L. (Holtum *et al.*, 2004) and in a broad survey of bromeliads (Crayn *et al.*, 2015). Although CAM orchids were not found above 2600 m in Papua New Guinea, Panama or Costa Rica, our study revealed nine orchid species with $\delta^{13}C$ values ranging from −19.3 to −13.8‰ between 2600 and 3300 m, in cloud forests, paramo or highland grasslands. Four, one and four of these species were epiphytic, lithophytic and terrestrial, respectively. Most of the highland species with $\delta^{13}C$ values less negative than −20‰ belonged to *Epidendrum*. In a recent stable isotope study of 46 orchid species from a single cloud forest site in Colombia, *Epidendrum secundum* Jacq. was the only species with a CAM-type carbon isotopic signature (Díaz-Álvarez, Felix & De la Barrera, 2019).

Physiological reasons for the decline of CAM species with increasing elevation were discussed by Earnshaw *et al.* (1987) and Crayn *et al.* (2015). Nonetheless, species exhibiting features of CAM do exist at high elevations, as demonstrated here for several species of Orchidaceae and previously for Andean species of Crassulaceae (Medina & Delgado, 1976), Cactaceae (Keeley & Keeley, 1989), Montiaceae (Arroyo, Medina & Ziegler, 1990) and Bromeliaceae (Crayn *et al.*, 2015). Although the studies of Medina & Delgado (1976) and Keeley & Keeley (1989) provide some information on microclimatic conditions and physiological performance, it is not yet possible to conclusively assess the adaptive significance of CAM in the high-elevation orchids studied here, particularly given the absence of microclimate data and *in situ* measurements of tissue temperatures, tissue acidity and CO_2 exchange throughout the annual cycle.

Epiphytic versus terrestrial life form

For many years, CAM was thought to be restricted to epiphytic orchids until Kluge *et al.* (1995) demonstrated CAM in the terrestrial orchid genus *Lissochilus* R.Br. (now considered a synonym of *Eulophia* R.Br. or *Oeceoclades* Lindl. (subtribe Eulophiinae, subfamily Epidendroideae) from Madagascar. A comprehensive study of the Eulophiinae highlighted CAM evolution in four terrestrial lineages that colonized dry environments in Africa and Madagascar (Bone *et al.*, 2015). Early-diverging lineages comprise C_3 and mostly epiphytic taxa, and the transition from epiphytic to terrestrial habit coincides with the transition from C_3 to CAM. Our study included the terrestrial CAM orchid *Oeceoclades maculata* (Lindl.) Lindl. (the monk orchid; Eulophiinae) native to tropical Africa, which is now widespread in South and Central America. All other terrestrial strong CAM species from our survey (excluding *Vanilla* spp.) belong to *Epidendrum* and ranged from 700 to 3400 m. From 16 terrestrial *Epidendrum* spp., nine occur above 2000 m.

Although species such as *Epidendrum radicans* Pav. ex Lindl. and *Epidendrum xanthinum* Lindl. are found only on the ground over a wide elevational range, other mainly terrestrial species such as *Epidendrum secundum* and *Epidendrum ibaguense* Kunth can also grow epiphytically or lithophytically. *Epidendrum secundum* occurs from 180 m to almost 3000 m, and *E. ibaguense* has been recorded from 60 to 2420 m with no obvious shift in life form. The *Vanilla* spp. listed in Table 1 as terrestrial orchids may, strictly speaking, be considered nomadic vines (Zotz, 2013). Thus, whereas the evolution of CAM in Eulophiinae from Madagascar and Africa is tightly linked with the occupation of dry terrestrial habitats, the terrestrial and epiphytic life-forms are not mutually exclusive in some of the terrestrial *Epidendrum* spp. studied here. The preponderance of terrestrial forms of *Epidendrum* with CAM-type isotope ratios at high elevation deserves further investigation and may be partly related to a decrease of epiphytic opportunities because of the reduction of tall vegetation.

About 72% of all orchid species are epiphytes (Benzing, 1990; Gravendeel *et al.*, 2004). In our survey, 805 species (75.2%) were epiphytes, of which 76 species (9.4%) exhibited isotopic signatures indicative of strongly expressed CAM. This percentage of epiphytic CAM species is lower than in other, albeit much smaller orchid flora surveys. For example, in a survey of 87 epiphyte orchids species from Australia, 64% exhibited CAM-type isotopic signatures (Winter *et al.*, 1983), whereas in New Guinean forests 18.8% of 112 epiphytic orchid species were CAM (Earnshaw *et al.*, 1987). At a Panamanian lowland forest site, 40% of 50 epiphytic orchid species were CAM (Zotz & Ziegler, 1997) and in a Mexican dry forest all six epiphytic orchid species surveyed showed CAM (Mooney, Bullock & Ehleringer, 1989; Santiago *et al.*, 2017). Our survey was largely skewed towards samples from humid forests where diversity tends to be high, with few samples from dry forest. Only *c*. 81 orchid species have been collected for areas with relatively low annual precipitation between 250 and 2000 mm (Holdridge, 1967; Murphy & Lugo, 1986), representing only 7200 km^2 (0.63%) of the total land area for Colombia (Pizano & García, 2014). Based on our results, 29 out of these 81 species showed CAM (Table S1).

OUTLOOK

Our $\delta^{13}C$ survey identified CAM as the major pathway of carbon acquisition in 8.9% of the mostly epiphytic species studied, a similar proportion to that of the orchid flora of Panama and Costa Rica. This percentage is substantially lower than that of another epiphytic species-rich family in the tropics, Bromeliaceae, in which 43% of species show CAM-type isotopic signatures. To further advance our understanding of CAM occurrence and CAM evolution in Orchidaceae, extensive sampling of understudied paleotropical orchids is required. In addition to $\delta^{13}C$ analysis, future studies should also include physiological characterizations of the CAM cycle to identify species with weakly expressed CAM and thus to approach the true number of CAM-exhibiting orchids. Furthermore, detailed *in situ* measurements of microclimate and CAM physiology of orchids at high-elevation sites are needed to better understand the adaptive significance of CAM in these habitats.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1. Leaf carbon isotopic values (‰) reported in this study for 1177 specimens belonging to 1071 species including the elevation of collection, annual mean temperature, annual precipitation and precipitation of the driest quarter. Species and specimens without reliable georeferenced information are not listed in this table. Climatic variables were extracted from Bioclim grids from WorldClim with a resolution of 30 s (Hijmans *et al.*, 2005). Species are organized in alphabetic order.

