



DICHAEA Lindl.

The first species of the genus actually known as *Dichaea* was described from French Guiana by Aublet in 1775 as *Limnodorum pendulum*. In the next fifty years, other species of *Dichaea* were described under the genera *Epidendrum*, *Cymbidium*, *Fernandezia*, and *Isobilus*. It was in 1832 when John Lindley recognized the need for a separate genus for these distinctive plants, and for the first time made mention of the name “Dichaea” for a group of species close to the *Cymbidium echinocarpon* described by Swartz from Jamaica. In 1833, he formally published the new genus in his *The Genera and Species of Orchidaceous Plants*.

Since then, over one hundred species of *Dichaea* have been described, distributed all over the Neotropics from Mexico to Argentina. They basically fit into two main groups based on leaf articulation, a characteristic first noted in 1889 by Pfitzer, who recognized the genus *Dichaea* for the species with persistent leaves and created the genus *Dichaeopsis* for the plants having leaves articulate with the sheaths (the latter reduced to sectional status by Kuntze in 1903). Cogniaux included fruit vestiture as a feature deserving sectional recognition, thus creating two new sections within the genus: *Dichaeastrum* and *Pseudodichaea*, a view substantially followed by Schlechter in 1914 in his treatment of *Dichaea* for the *Orchis* magazine. In 1923, the genus was monographed by Kränzlin, who accepted sections *Dichaea* and *Dichaeopsis*, and created section *Maxillariopsis* for four species described by him, all of them actually referable to the genus *Maxillaria* Ruiz & Pav. James P. Folsom accurately revised *Dichaea* section *Dichaea* in 1987, suggesting the need for sectional recognition of the complexes of species allied to *D. tenuifolia* Schltr. and *D. hystricina* Rchb.f., as well as for *D. camaridoides* Schltr.

The plants of the genus *Dichaea* are easy to recognize. They are usually scandent or pendent (rarely semi-erect) epiphytes, with long stems covered by distichous, evenly spaced, conduplicate leaves, and compressed sheaths clasping the stems. The inflorescences are short and one-flowered, produced from the leaf sheath. The flowers are generally small, white to pale orange, characteristically blotched and spotted with violet-blue, and usually fragrant. In most of the species the flowers have temporal activity. The flower segments begin to open during the night, are widely opened (and fragrant) in the morning, and then close in the afternoon. Activity of the single flower usually spans two or three days, then the flower fades and eventually falls with the pedicel. The duration of perianth activity, when it is attractive for pollinators, seems correlated with environmental conditions, and the flowers usually close early in the afternoon or even during the morning when the day is overcast. The flowers of species with articulating leaves of the section *Dichaeopsis* generally have a more succulent substance and do not show temporal activity.

Although the pseudomonopodial growth habit, the pseudo-

bulbless stems, the leaves distichously arranged and the characteristic features of the inflorescence and the flowers clearly mark this group of plants, the phylogenetic affinities of the genus have long been uncertain. Originally placed near *Pachyphyllum* Kunth, the genus was included by Schlechter in a monotypic subtribe Dichaeinae, where it was traditionally maintained. Although he accepted subtribe Dichaeinae in his fundamental work of 1981 on classification of the Orchidaceae, Dressler noted the similarity of *Dichaea* with members of the *Chondrorhyncha* complex, and suggested its derivation from some Zygotetralinae-like ancestors. Current studies based on molecular analysis, by Whitten and co-workers, reveal that *Dichaea* is embedded within the subtribe Zygotetralinae as the basal member of mostly pseudobulbless Huntleyinae.

Species of the genus *Dichaea* are pollinated by male euglossi-



Dichaea sarapiquiensis Folsom

Heredia: Sarapiquí: Horquetas, unpaved road to Rara Avis, 275 m, F. Pupulin 4856, M. Pupulin, C. Pupulin & C. Ossenbach. Photographed in situ, 26 July 2003.

Left

Dichaea poicillantha Schltr.

Cartago: Turrialba, Santa Cruz, San Antonio, orillas del Río Guayabito, Quebrada Loca, 9°57'56"N 83°42'32"W, 1400-1500 m, flowered in cultivation at Jardín Botánico Lankester, D. Bogarín 712, A. Karremans, H. León-Páez & F. Pupulin. Photographed: 15 June 2004. Reproduction ratio: 6:1.

ne bees of the genera *Eulaema* and *Euglossa* in search of perfumes, which are produced at the base of the lip. As noted by Folsom during experimental work, a single bee can spend over three minutes on the labellum, collecting compound.

The study of this interesting genus is made difficult by the scarcity of available material. Dichaeas are not commonly cultivated, and herbarium specimens often lack flowers or are poorly preserved. Some thirty-five species of *Dichaea* have been recorded from Costa Rica, some of them reduced in synonymy by different workers. New species have been added recently to the genus (see Dressler 2002) and new taxa should be described from the country after exhaustive fieldwork.

Both species of sections *Dichaea* and *Dichaeopsis* are represented in the country, as well as members of the *D. tenuifolia* and *D. hystericina* groups.

In section *Dichaea* the following species were recorded: the endemic *D. acostae* Schltr., only known from the type collection, and *D. costaricensis* Schltr., *D. cryptarrhena* Rchb.f. ex Kraenzl. (one of the most common species), the distinctive *D. dammeriana* Kraenzl., *D. eligulata* Folsom from the central and southern Pacific regions, *D. muricatoides* Hamer & Garay, distributed from Mexico to Costa Rica, *D. obovatipetala* Folsom (which ranges southward to Panama), *D. oxyglossa* Schltr., the widespread *D. pendula* (Aubl.) Cogn., ranging just to Bolivia in South America, the endemic and common *D. poicillantha* Schltr., the deeply violet *D. sarapiquiensis* Folsom from the Caribbean lowlands, *D. schlechteri* Folsom, *D. squarrosa* Lindl. (known from Mexico to Panama), and the freely branching *D. trichocarpa* (Sw.) Lindl. from Central America and the West Indies.

In section *Dichaeopsis* we have the endemic *D. acrolephara* and *D. amparoana* Schltr., *D. brachypoda* Rchb.f. ranging to South America, the recently described *D. elliptica* Dressler & Folsom, only known in Costa Rica from a single collection, *D. lankesteri* Ames with flowers totally white, the distinctive *D. glauca* (Sw.) Lindl. with its whitish leaves, the rare *D. gracillima* C. Schweinf., only collected once, the large *D. morrisii* Fawc. & Rendle [a name which is predated by *D. muricata* (Sw.) Lindley, also described by Schlechter from Costa Rica as *D. bradeorum*] and a couple of closely related, undescribed species, the common *D. panamensis* Lindl. from the lowlands, and *D. trulla* Rchb.f., with its unmistakable long and narrow leaves.

In *D. tenuifolia* group, characterized by the glabrous ovary and the thin texture of the leaves, two species have been recorded: *D. tenuifolia* (a species from South America, perhaps distinct from Costa Rican populations) and the diminutive, creeping *D. tuerckheimii* Schltr., similar to a bryophyte and probably the smallest species in the genus.

The last group only includes in Costa Rica, in my opinion, *D. hystericina*, a rather variable species with respect to vegetative habit, for which the name of *D. ciliolata* Rolfe and *D. lycopodioides* Kraenzl. have also been used.

As a result of increasing knowledge about the genus in Costa Rica, aimed at preparing the Zygotetinae treatment for the

Flora Costaricensis, a new species in section *Dichaea* was discovered just a few months before the publication of the present book. This finding is particularly interesting because it represents the first record in Costa Rica of a species of the *D. lagotis* Rchb.f. group, whose distribution is eminently South American. It is a pleasure to dedicate the new species to my two young daughters, Margherita and Carlotta, who participated in the type collection, with the name of:

***Dichaea filiarum* Pupulin, sp. nov.**

TYPE: COSTA RICA. Cartago: Turrialba, Monumento Nacional Guayabo, 9°56'N 83°43'W, ca. 800 m, premontane wet forest, epiphytic on a short tree in the understory forest, 9 Aug. 2003, flowered in cultivation at Jardín Botánico Lankester, 8 October 2003, F. Pupulin 4944, M. Pupulin, C. Pupulin & H. León-Páez (holotype, USJ).

Species *Dichaeae laxae* (Ruiz et Pav.) Poepp. et Endl. similis, sed caulibus brevioribus, sepalis non tuberculatis, sepalis lateralibus lanceolatis, labelli humeris perspicuis sine trichomatibus, ligula glabra, clinandrii marginibus serrulatis recedit.

Plant epiphytic, caespitose, to 60 cm long. *Roots* filiform, basal, 0.5-0.7 mm in diameter. *Stems* pendent, few from base, 20-60 cm long, 0.5-0.8 cm wide across conduplicate sheaths, rarely branching. *Leaves* closely spaced along stem, spreading, thick-coriaceous, dark olive green, 12-18 x 6-8 mm, broadly lanceolate, the apex shortly acuminate, abaxially api-

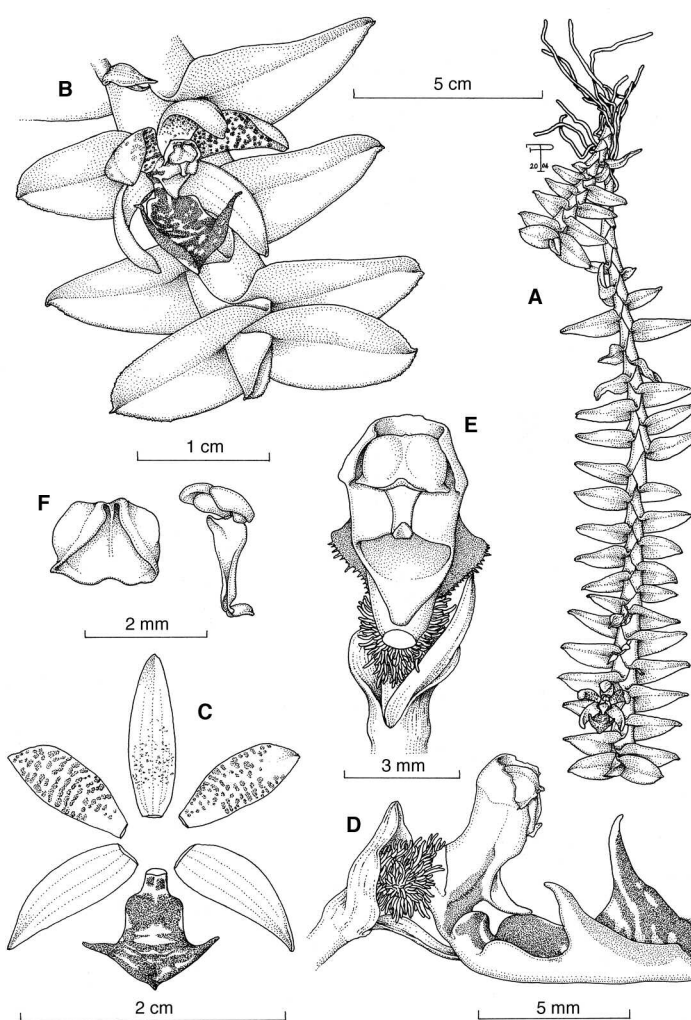


Plate 2. *Dichaea filiarum* Pupulin. A - Habit. B - Flower. C - Perianth flatten. D - Column and lip, lateral view. E - Column, ventral view. F - Anther cap and pollinarium. Drawn by the author from the holotype.



culate, the apical margins raggedly serrulate, somewhat curled backwards, with conspicuous cross-veining; sheaths clasping, 6-8 × 5-8 mm. *Inflorescences* solitary, 1-flowered, emerging above foliage, perpendicular to stem, to 13 mm long, provided with a basal, cylindrical bract, 4 mm long. *Floral bract* double, the outer bract widely ovate, 5.0 × 3.5 mm, the inner bract narrowly oblong, 7 mm long. *Pedicel* cylindrical, 2 mm long. *Ovary* 2 mm long, muricate. *Flower* large for the section, not completely spreading, the sepals creamish white, slightly tinged of pale pink, abaxially cream, the dorsal sepal flecked pale purple-violet, the petals pale cream, flecked violet, the lip white, heavily barred pale violet, the column white with violet wings; no fragrance detected. *Dorsal sepal* erect, concave, narrowly elliptic-lanceolate, acute, 12 × 4 mm. *Lateral sepals* obliquely lanceolate, concave, acute, 11 × 4 mm. *Petals* oblanceolate, incurved toward apex, subacute, 10 × 4 mm. *Lip* 3-lobed, anchoriform, clawed, 8.5 × 10 mm when spread, the claw 1.5 × 1.5 mm, the hypochile subquadrate, forming distinct shoulders, 4.0 × 4.5 mm, the exochile shortly acuminate, microscopically ciliate toward apex, 3.5 × 6.0 mm, laterally producing spreading to recurved, triangular-acuminate lobes, 2.5 × 0.8 mm. *Column* erect, 5 mm long, with distinct foot, the clinandrium cucullate, irregularly crenulate, provided with widely triangular, ciliate wings; ligule oblong, glabrous, 1.5 × 0.8 mm; fruit not seen.

PARATYPES: COSTA RICA. Limón: Pococí, Guápiles, San José-Limón highway, km 47, Quebrada Molinete, 10°10'43"N 83°54'57"W, 470 m, tropical wet, transition to premontane wet forest, epiphytic in primary forest along the river banks, 9 July 2004, *F. Pupilin 5250 & D. Bogarín* (Jardín Botánico Lankester-Spirit); same locality, flowered in cultivation at jardín Botánico Lankester, 28 July 2004, *F. Pupilin 5253 & D. Bogarín* (Jardín Botánico Lankester-Spirit); *F. Pupilin 5254 & D. Bogarín* (Jardín Botánico Lankester-Spirit).

DERIVATION OF NAME: from the Latin *filia*, daughter, and its genitive plural *filiarum*, "of the daughters", in honor of Margherita Pupilin and Carlotta Pupilin. I will never forget the beloved hands of Margherita, standing on my shoulders, when she was trying to reach the pendent plant that served as the type, nor the efforts by my dear Carlotta to find the small *Dichaea* among the many plants and herbs of the forest floor after it felt down.

ECOLOGY: epiphytic in shade in tropical to premontane wet forests on the Caribbean side of the continental divide, at 500-800 m elevation.

Dichaea filiarum pertains to a group of truly pendent species of Section *Dichaea* native from northern and western South America, among which are *D. histrio* Rchb.f., *D. laxa*,

D. lagotis, *D. potamophila* Folsom, *D. tuberculilabris* Folsom, and *D. violacea* Folsom. It is most similar to *D. laxa* from Bolivia and Peru, from which it differs in the shorter stems, the non-tuberculate sepals, the lateral sepals lanceolate, the prominent, glabrous shoulders of the hypochile, the ligule without any pubescence, and the serrulate margins of the clinandrium. *Dichaea lagotis* has a bifid ligule very unlike that of *D. filiarum*, whereas the hypochile of *D. histrio* and *D. potamophila* has no shoulders. The Panamanian *D. violacea* differs from *D. filiarum* in the strong violet coloration of the floral segments, its very wide hypochile, and the retrorse lobes of the exochile. Apart from *D. costaricensis*, which presents a few cross-veins between the parallel longitudinal veins of the leaves, *D. filiarum* is the only Costa Rican species having conspicuous cross-veining in its leaf blades, a character otherwise restricted to species native from South America.

Plants of the genus *Dichaea* constitute a common element of the understory vegetation all around the country, from sea level to about 2400 m elevation. The greatest diversity in number of species, as well as in size of populations, is found in premontane wet forest at 1000-1300 m, mostly along the Caribbean watershed of the continental divide. However, species like *D. filiarum*, *D. obovatipetala*, *D. panamensis*, *D. sarapiquiensis*, *D. standleyi*, and *D. trulla* are most common in the warm climate of lowland tropical forests, whereas *D. cryptarrhena*, *D. glauca*, *D. lankesteri*, *D. pendula*, *D. poicillantha*, *D. squarrosa* and *D. trichocarpa* are restricted to the cooler environment of lower montane wet forests.

Dichaeas are shade-loving plants, invariably growing in subdued light on the main trunk (often near the soil) and large, shaded branches of the host trees. Most of the species are completely intolerant to direct sunlight exposition, and they usually prefer to establish themselves on wood covered by thick layers of mosses, which ultimately cover large portions of the plants.

At Lankester Botanical Garden, the living collection of *Dichaea* is cultivated on large slabs covered with sphagnum and suspended under the main benches, where humidity is constantly high and the amount of direct light is extremely reduced.

Previous page

Dichaea filiarum Pupilin

Cartago: Turrialba, Monumento Nacional Guayabo, 9°56'N 83°43'W, ca. 800 m, 9 Aug. 2003, flowered in cultivation at Jardín Botánico Lankester, *F. Pupilin 4944*, *M. Pupilin*, *C. Pupilin* & *H. León-Páez*. Photographed: 8 October 2003. Reproduction ratio: 5:1.

Right

Dichaea poicillantha Schltr.

San José: Pérez Zeledón, Pérez Zeledón, Las Nubes de Quizarrá, 1250 m, 22 March 1995, flowered in cultivation at Jardín Botánico Lankester, *R.L. Dressler & D.E. Mora* sub *F. Pupilin 702*. Photographed: 13 May 1998. Reproduction ratio: 4:1





Dichaea obovatipetala Folsom

Cartago: Juan Viñas, Pejivalle, La Marta, shore of Río Pejivalle, 9°47'47"N 83°42'55"W, 690 m, 10 Jan. 2004, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin 5066, S. Dalström & H. León-Páez. Photographed: 24 February 2004. Reproduction ratio: 5:1.



Dicbaea dammeriana Kraenzl.

Cartago: Turrialba, Moravia de Chirripó, Tzipirí, 9°48'N 83°23'W, 1090 m, 3 May 2002, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin, J. Warner & R. Gómez 3732.
Photographed: 14 June 2002. Reproduction ratio: 4:1.





Dichaea eligulata Folsom

San José: Dota, eastern slopes of Cerro Nara, 1050-1140 m, 14 January 1999, flowered in cultivation at Gaia Botanical Garden, F. Pupulin, D. Castellfranco & L. Spadari 1094. Photographed: 18 October 2002. Reproduction ratio: 1.5:1.

Left, top

Dichaea trichocarpa (Sw.) Lindl.

Puntarenas: Monteverde, Bullpen, ca. 10°18'N 84°47'W, 1550 m, 1 June 2001, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin P. Cribb & G. Barboza 3207. Photographed: 20 June 2001. Reproduction ratio: 5:1.

Left, bottom

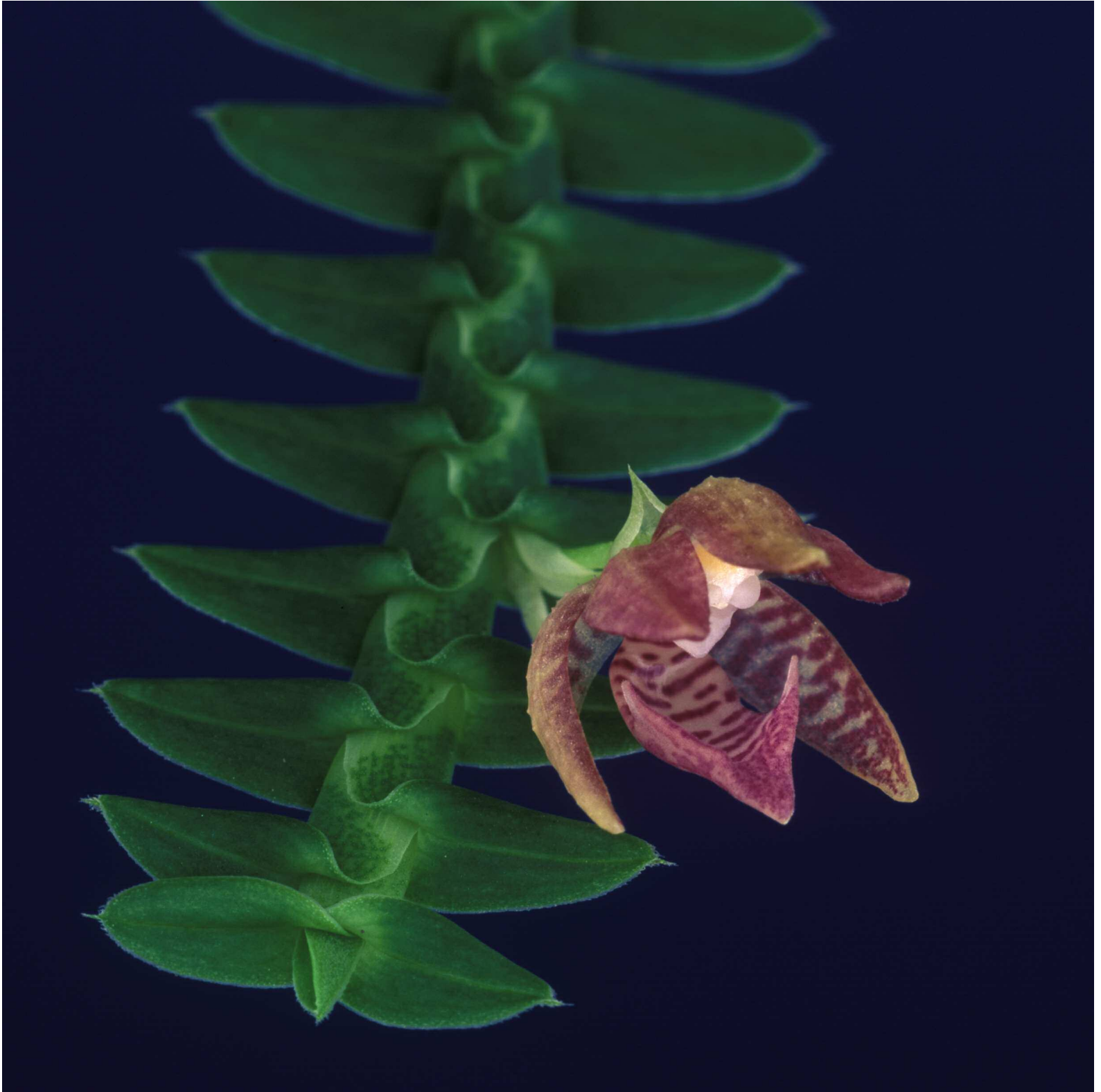
Dichaea trichocarpa (Sw.) Lindl.

Heredia: San Rafael, road to Monte de La Cruz, deviation point to Residencial El Tirol, shore of Río Segundo, 1800 m, 17 April 2003, flowered in cultivation at Jardín Botánico Lankester, D. Bogarin 173. Photographed: 17 May 2003. Reproduction ratio: 5:1.



Dichaea pendula (Aubl.) Cogn.

Alajuela: Bajos del Toro, northern slopes of Volcán Poás, 1450 m, 5 March 2001, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin 3024.
Photographed: 22 November 2002. Reproduction ratio: 7:1.



Dichaea costaricensis Schltr.

Cartago: San José: Dota, eastern slopes of Cerro Nara, 1050-1140 m, 14 January 1999, flowered in cultivation at Gaia Botanical Garden, F. Pupulin 4797.
Photographed: 21 July 2004. Reproduction ratio: 6:1.



Top

Dichaea cryptarrbena Rchb.f. ex Kraenzl.

San José: Santa María, road to San Joaquín, about km 6, 9°36'17"N 83°58'48"W, 1825 m, 23 March 2004, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin 5210 & H. León-Páez. Photographed: 24 June 2004. Reproduction ratio: 1.5:1.

Bottom

Dichaea schlechteri Folsom

Without collecting data, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin 4808. Photographed: 18 June 2003. Reproduction ratio: 2:1.

Top

Dichaea eligulata Folsom

Cartago: San José: Dota, eastern slopes of Cerro Nara, 1050-1140 m, 14 January 1999, flowered in cultivation at Gaia Botanical Garden, F. Pupulin, D. Castellfranco & L. Spadari 1094. Photographed: 18 October 2002. Reproduction ratio: 3:1.

Bottom

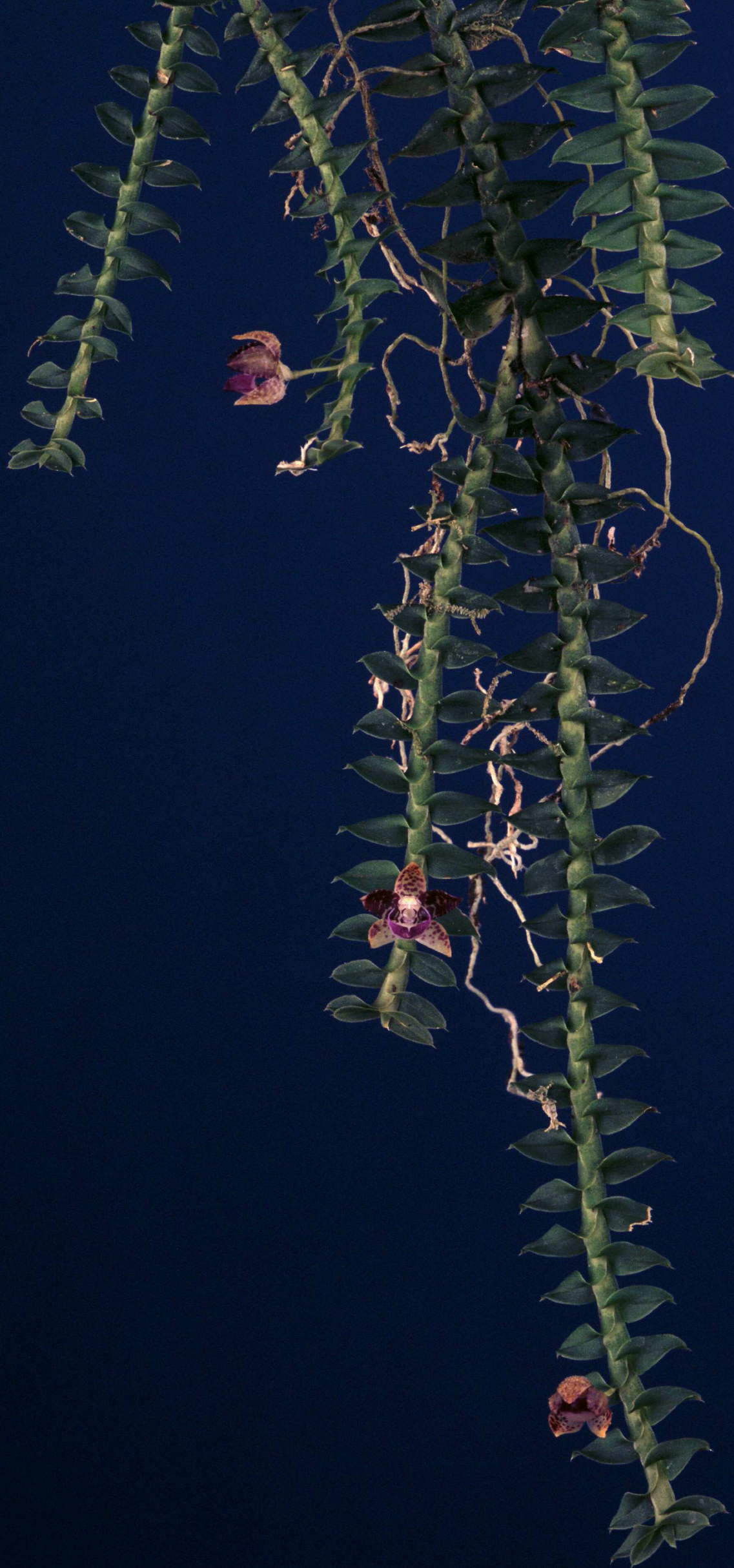
Dichaea cf. *poicillantha* Schltr.

San José: Pérez Zeledón, General Viejo, road to La Hermosa, 780 m, 10 November 2001, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin, H. León-Páez & A.C. Rodríguez 3420. Photographed: 3 November 2002. Reproduction ratio: 2:1.

Right

Dichaea poicillantha Schltr.

Without collecting data, flowered in cultivation at Jardín Botánico Lankester. Photographed: 2 May 2003. Reproduction ratio: 1.5:1.







Dichaea bystricina Rchb.f.

Alajuela: San Ramón, Los Ángeles, deviation point to Villa Blanca, km 1.5, 10°19'11"N 84°28'28"W, 1120 m, 27 February 2003, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin, D. Bogarin, H. León-Páez & A.C. Rodríguez 4319. Photographed: 8 March 2003. Reproduction ratio: 6:1.

Left

Dichaea bystricina Rchb.f.

Cartago: Turrilaba, Moravia de Chirripó, hills north of Moravia, 9°50'18"N 83°26'45"W, 1150-1250 m, 12 June 2002, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin, M. Bonilla, R. Gómez, H. León-Páez & W. Schug 3925. Photographed: 26 May 2003. Reproduction ratio: 5:1.



Dichaea hystrix Rchb.f.

Puntarenas: Aguirre, Aguirre, road between Quepos and San Marco de Terrazú, 750 m, 8 June 1999, flowered in cultivation at Gaia Botanical Garden, F. Pupulin & D. Castellfranco 1618. Photographed: 10 June 2001. Reproduction ratio: 4:1.



Dichaea hystrix Rchb.f.

San Ramón, Santiago, mountains towards San Rafael, 10°01'N 84°30'W, 1300 m, 1 February 2004, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin 5095 & E. Salas. Photographed: 15 June 2004. Reproduction ratio: 4:1.



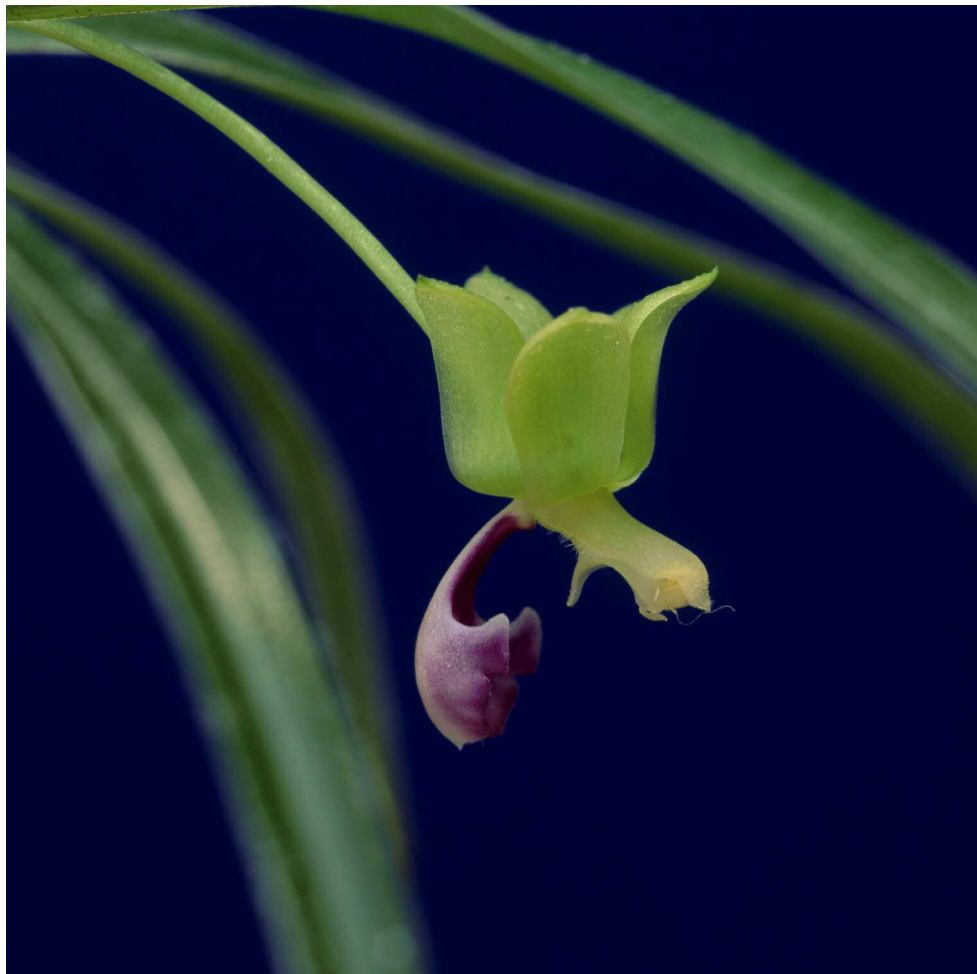
Dichaea tuerckbeimii Schltr.

Puntarenas: Santa Elena, Monteverde, Bullpen, ca. 1500 m, on old trees in pastures, lower montane cloud forest, with G. Barboza, 29 April 2003, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin & G. Barboza 4718.
Photographed: 15 August 2003. Reproduction ratio: 8:1.



Dichaea trulla Rchb.f.

Without collecting data, flowered in cultivation at Jardín Botánico Lankester, F. Pupulin 751. Photographed: 17 June 1998. Reproduction ratio: 3:1.



Dichaea trulla Rchb.f.

Puntarenas: Aguirre, road between Quepos and San Marcos de Terrazú, 9°33'01"N 84°05'01"W, 750 m, 27 May 1999, flowered in cultivation at Gaia Botanical Garden, F. Pupulin & D. Castellfranco 1518. Photographed: 6 April 2001. Reproduction ratio: 4:1.



Dichaea morrisii Fawc. & Rendle

Heredia: Road to Cerro Chompipe, 10° 04' 56.6"N 84° 04' 41.4"W, 1960 m, 25 July 2003, flowered in cultivation at Jardín Botánico Lankester, W.M. Whitten 2171, M. Blanco, D. Bogarin & Hilda León-Páez . Photographed: 18 August 2003. Reproduction ratio: 4:1.



Dichaea fragrantissima Folsom
subsp. *eburnea* Dressler & Pupulin

Alajuela: San Ramón, A.M. Brenes Biological Preserve, flowered in cultivation at Jardín Botánico Lankester, M. Blanco 513. Photographed: 13 June 2000. Reproduction ratio: 4:1.



Dichaea globosa Dressler & Pupulin

San José: Dota, eastern slopes of Cerro Nara, 9°29'01"N
84°00'45"W - 9°28'20"N 84°00'25"W, 740-840 m, 14 January
1999, flowered in cultivation at Gaia Botanical Garden,
F. Pupulin, D. Castellfranco & L. Spadari 1088.
Photographed: 25 December 1999. Reproduction ratio: 4:1.



Dichaea globosa Dressler & Pupulin

San José: Pérez Zeledón, Las Nubes de Quizarrá, 1250 m,
22 March 1995, flowered in cultivation at Jardín Botánico
Lankester, R.L. Dressler, D.E. Mora & J. Cambrónero s.n.
Photographed: 19 May 1998. Reproduction ratio: 4:1.

Right

Dichaea globosa Dressler & Pupulin

San José: Pérez Zeledón, Las Nubes de Quizarrá,
ca. 1150 m, flowered in cultivation
at Jardín Botánico Lankester, F.Pupulin 1367.
Photographed: 26 February 1999. Reproduction ratio: 3:1.





Dichaea amparoana Schltr.

Heredia: Barva, San José de la Montaña, Calle Higuerón, 10°03'43"N
84°06'06"W, 1800 m, 30 January 2004, flowered in cultivation
at Jardín Botánico Lankester, *D. Bogarin 679* & *A. Prendas*.
Photographed: 34 March 2004. Reproduction ratio: 7:1.



Dichaea lankesteri Ames

Alajuela: Bajos del Toro, northern slope of Volcán Poás,
1450 m, along a small river, 5 March 2001, flowered in
cultivation at Jardín Botánico Lankester, *F. Pupulin 3030*.
Photographed: 28 November 2003. Reproduction ratio: 6:1.



Dichaea sp.

Cartago: Turrialba, Peralta, 800 m, 9°56'N 83°41'W,
F. Pupulin, C. Pupulin, M. Pupulin & H. León-Páez 4945.
Photographed: 9 August 2003. Reproduction ratio: 6:1.



Dichaea acrolepbara Schltr.

Heredia: Sarapiquí, Horquetas, road to Rara Avis, ca. km 4,
farm La Sleva, 10°20'24"N 83°59'30"W, 115 m, F. Pupulin,
C. Pupulin, M. Pupulin, C. Ossenbach & B. Arias 4851.
Photographed: 26 July 2003. Reproduction ratio: 5:1.