



# A new and unusual species of *Dichaea* (*Orchidaceae: Zygopetalinae*) from Costa Rica

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## Key words

autogamy  
*Dichaeopsis*  
Flora of Costa Rica  
new species  
plant diversity  
section *Pseudodichaea*

**Abstract** A new and florally unusual species of the genus *Dichaea* is described and illustrated from Costa Rica, where it is apparently endemic, and its relationships are discussed. *Dichaea auriculata* is compared with the group of species close to *D. graminoides*, from which it can be distinguished by the lip with a long isthmus, provided with two rounded auricles at the base, instead of the sessile lip typical of the group. It is also compared with another Costa Rican endemic in the same complex, *D. gracillima*, from which it can be distinguished by the autogamous, mostly cleistogamous, flowers, the 3-lobed lip with rounded basal lobes, the high keel along the lip isthmus, and the bifid ligule of the column. Notes on the habitat and the ecology of the new species are provided.

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## INTRODUCTION

*Dichaea* Lindl. (1833: 208) species are a fairly common element in the understory of Costa Rican vegetation, where they can be observed in every kind of suitable habitat, both pristine and altered. Whilst most species inhabit the temperate and humid regions of the Costa Rican cordilleras in the range of 400–1500 m of elevation, a few taxa span vertically to the seasonal and rain forests close to sea level and to the cool, cloud submontane forests up to 2500 m (Pupulin 2005, 2007). Only the driest regions of northern Pacific Costa Rica, with a dry season exceeding four months, can be considered inhospitable for the species of this otherwise ubiquitous genus (Pupulin 2007). Costa Rica is home to 29 species of genus *Dichaea* (Pupulin 2007, 2010), roughly corresponding to 30 % of the whole genus, making this small region one of the countries with the highest diversity in *Dichaea*. Costa Rica is second only to Ecuador (with 40 species; Dodson 2004) and Colombia (36 species, according to Ortiz Valdivieso 2016). However, when the respective size of these countries is taken in account in a diversity index, Costa Rica has four times the *Dichaea* diversity of Ecuador, and more than 15 times that of Colombia. The higher relative diversity of *Dichaea* in Costa Rica is a general trend also observed in *Orchidaceae* as a whole (Karremans & Bogarín 2013). It may be that these figures reflect the greater effort made in Costa Rica to clarify the taxonomy of the genus for Flora Costaricensis (Pupulin 2010) when compared to other Neotropical countries, but the position of Costa Rica on the land bridge that connects South America with the core Central America and the North American continent may also account for the high diversity of its orchid flora in general terms.

After the completion of the treatment of *Dichaea* for the Flora of Costa Rica, when almost one thousand specimens of this genus were collected and/or studied, it was unexpected to find

a new species that completely escaped our attention during the field work intended for the Flora. Nevertheless, this taxon is so unusual and conspicuously different in floral morphology from any other species of the genus, that we have no hesitation in describing it here as a species new to science with the name of:

## TAXONOMIC TREATMENT

*Dichaea auriculata* Pupulin & Karremans, *sp. nov.* — Fig. 1, 2; Map 1

Species sectionis *Pseudodichaeae*, ab omnibus species *Dichaeae* Lindl. auriculis magis rotundatis et carina alta in basi labelli facile distinguenda; inter species foliis articulatis ovarioque glabro munitis (genus *Dichaeopsis* sensu Pfitzer vel coetum *Dichaeae panamensis* informaliter dictum), *Dichaea gracillima* C.Schweinf. in habitu formaque et dimensione floris similis sed floribus plerumque autogamis labello distincte trilobo lobulis basalibus rotundatis, carina alta in isthmo labelli, ligula columnae bipartita recedit. — Type: A.P. Karremans 7333, I. Chinchilla, M. Díaz & G. Rojas-Alvarado (holo JBL), Costa Rica, Cartago, Turrialba, Tayutic, Jicotea, N9°47'25.74" W83°32'29.45", 1014 m, epiphytic in secondary mature vegetation along the roadside, wet premontane forest, 22 Sept. 2016.

*Etymology.* From the Latin *auriculatus*, provided with ears, in reference to the small, ear-like basal lobes of the lip, unique in the genus.

Epiphytic, caespitose, patent to subpendent *herb*, forming intricate masses of delicate, leafy stems. *Roots* produced at the base of the vegetative stems (basal) and from the lower nodes along the stem (caulinar); basal roots flexuous, long, c. 1 mm diam; caulinar roots short (the exposed portion usually less than 1 cm long), 0.5–0.7 mm diam. *Stems* slender, terete, patent to gently pendent, rarely suberect, up to 15 cm long, producing short lateral branches 1.5–4 cm long, completely covered by the conduplicate, tightly to loosely clasping foliar sheaths. *Sheaths* subrectangular, conduplicate, to 10 by 3 mm, articulate with the leaf, green when young, becoming dry-papyraceous when old. *Leaves* linear-subacicular, 15–23 by 1.5–2.2 mm, strongly conduplicate, acuminate, the apical margins often touching each other into a false mucron. *Inflorescence* lateral, 1-flowered, emerging from the axils of the upper leaves and flowering under the leaves, to 20 mm long; peduncle terete, arched, 15–18 mm long, covered at the base by a tubular, acuminate bract to 6 mm long, completely hidden within the leaf-sheath.

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*Floral bract* double, the external bract broadly ovate-triangular, c. 3 by 1.5 mm, apex acuminate, deeply cucullate at the base, strongly conduplicate-folded at apex; the inner bractlet ligulate, c. 2.5 by 0.5 mm, apex acuminate. *Ovary* pedicellate, cylindrical, rounded in section, with well-marked valvate ribs, c. 2 mm long including the pedicel. *Flowers* ephemeral, in anthesis for 1–2

days, not completely spreading, autogamous, mostly cleistogamous, with sepals and petals white to pale greenish white, the petals faintly suffused with purple, especially along the basal veins, the lip white, the column white tinged with rose-purple toward the apex, with distinct purple stripes along the lateral edges and the stigmatic rims towards the apex of the ligule.



**Fig. 1** *Dichaea auriculata* Pupulin & Karremans. a. Habit; b. flower; c. dissected perianth; d. column and lip, lateral view (the pollinarium bent into the stigma); e. column, three views; f. anther cap and pollinarium (three views). — Scale bars: a = 5 cm; b–c = 5 mm; d–e = 4 mm; f = 1 mm. — Drawn by F. Pupulin and rendered by S. Poltronieri from the holotype.



**Fig. 2** Flowers of *Dichaea auriculata* Pupulin & Karremans (Karremans et al. 7333). — Photos by: a. A.P. Karremans; b. F. Pupulin.

*Dorsal sepal* lanceolate, c. 6 by 2.5 mm, apex acute, 3-veined, concave. *Lateral sepals* asymmetrically lanceolate, the adaxial half broader, c. 5 by 2.5 mm, apex acute, 3-veined, concave. *Petals* elliptic-lanceolate, c. 4.5 by 2 mm, apex acute to abruptly short-acuminate, 3-veined, subporrect, incurved. *Lip* 3-lobed from a short claw, c. 4 by 3.5 mm when spread, the rectangular claw c. 0.3 mm long; the lateral lobes auriculate, c. 0.6 by 0.6 mm, apex rounded, suberect; the midlobe sagittate from a long, obtuse isthmus; the blade anchor-shaped, rounded, minutely apiculate; the lateral lobes short, truncate; the disc provided with a high, rounded keel from the base of the lip, flushing into the blade at  $\pm$  the middle portion of the isthmus. *Column* semiterete, subrectangular in ventral view, c. 4 by 3 mm, around the stigma, apically narrowed into a shallow clinandrium with thin, entire walls; the ventral surface provided with a long, triangular, distinctly bifid, glabrous ligule; the sigma ventral, rounded; the anther frontal sub-incumbent, the tapetum continuous with a massive, triangular, long, attenuate rostellum

c. 1 mm long. *Anther cap* trapezoidal, truncate-emarginate, shallowly cucullate at the base, obscurely 2-celled, c. 0.6 by 1 mm. *Pollinia* 4, dorsiventrally superposed, almost similar in size, obovate, strongly complanate, c. 0.45 by 0.4 mm, on a triangular, apically long-attenuate stipe of c. 1 by 0.4 mm, and an ovate to rounded, hyaline viscidium of c. 0.3 by 0.2 mm. *Fruit* an ellipsoid-obovoid, glabrous capsule, c. 7 by 4 mm, the faded floral parts drying in place.

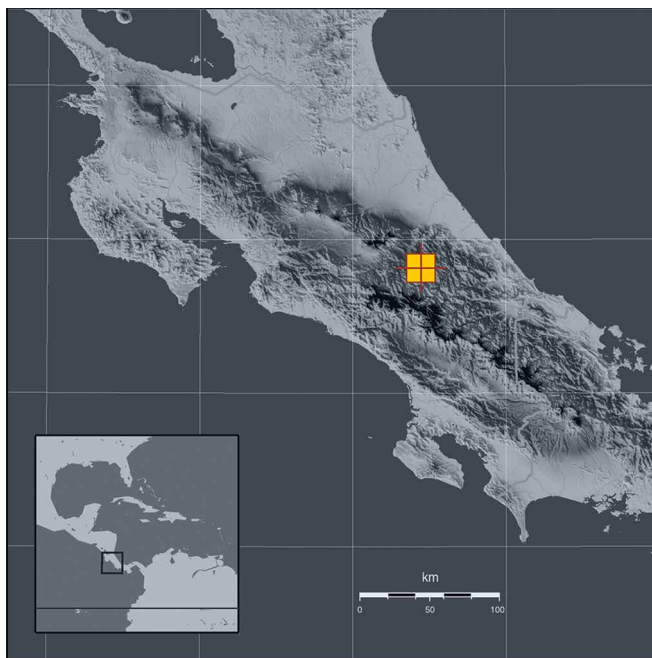
**Distribution** — Only known from the type locality in Costa Rica.

**Habitat & Ecology** — *Dichaea auriculata* is known from a single population, found in the constantly wet and warm region of the Río Tuis, which drains into the Caribbean. Plants of *D. auriculata* have been observed on shaded branches of the lower canopy, on trees of secondary mature vegetation. Flowering: February to April, but it is probable that, once the stem has reached maturity, the plant may flower at any time of the year.

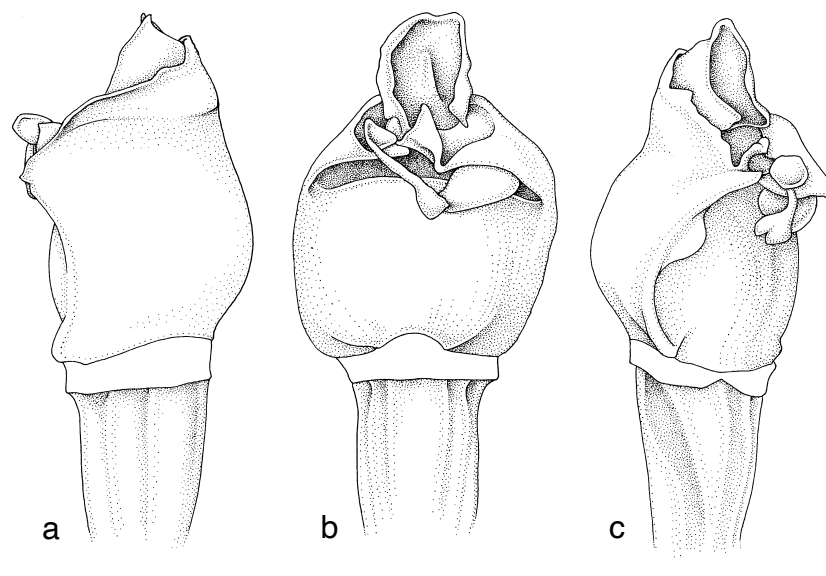
**Conservation status** — With the actually available data, we cannot produce a solid assessment about the conservation status of this species. As a result of six field trips in the area where *Dichaea auriculata* was discovered, we only could observe three plants surely belonging to the species, which were subsequently cultivated and documented at Lankester Botanical Garden. At least locally, *D. auriculata* is likely not a common species, but if we consider the enormous extent of unexplored, suitable habitats on the Talamanca mountain range, protected within several National Parks and indigenous reserves, then the species is probably more common, but our data prevent any conclusion at this stage.

## DISCUSSION

Pfizer (1887) created the genus *Dichaeopsis* (typified by *D. graminoides* (Sw.) Lindl.) (Garay & Sweet 1972) to group species of *Dichaea* with articulate leaves. Cogniaux (1906) retained this concept at the sectional rank for those species with leaves articulated to the sheaths that also have glabrous ovaries. However, both morphological (Pupulin 2007) and molecular analyses (Whitten et al. 2005, Neubig et al. 2009) of *Dichaea* have irrefutably shown that section *Dichaeopsis* is polyphyletic and that articulate, deciduous leaves and glabrous ovaries are symplesiomorphies widespread in subtribe *Zygopetalinae*.



**Map 1** Distribution of *Dichaea auriculata* Pupulin & Karremans (yellow square).



**Fig. 3** Column of *Dichaea auriculata* Pupulin & Karremans showing autogamic pollination. a. Lateral view; b. ventral view; c. three quarters view. — Scale bar = 4 mm. — Drawn by F. Pupulin and rendered by S. Poltronieri from the holotype.

A member of sect. *Pseudodichaea* Cogn., in terms of vegetative architecture, *D. auriculata* seems to belong to the so-called '*Dichaea graminoides*' complex (Chiron et al. 2016), with plants presenting delicate stems provided with articulate, narrow, and usually small leaves. Also the relatively small and delicate flowers with a glabrous ovary are reminiscent of *D. graminoides* or one of the other Central American species in the complex. However, the lip with a long isthmus and two small, rounded, basal lobes, immediately distinguish *D. auriculata* from *D. graminoides* and the allied species, which have a distinctly sessile lip. Here we interpret the lip of species in the *D. graminoides* complex as sessile, with a lamina that may be distinctly 3-lobed and with a more or less pronounced isthmus (as in *D. graminoides*), or simply sagittate, in which case the basal, obtuse portion of the blade may be provided with a longitudinal keel or not. The position of the callus confirms, in our view, that the 'claw' of the lip in species of this complex is actually the basal lobe of the lip, as in the *Zygopetalinae* the callus, when present, is generally placed on the disc and beyond the claw.

Among the species of sect. *Pseudodichaea* previously recorded from Costa Rica, the new species is close to *D. gracillima* C. Schweinf., but its mostly cleistogamous flowers, the 3-lobed lip with rounded basal lobes, the high keel along the lip isthmus, and the two-parted ligule of the column, keep it apart from the latter species.

During the short time of anthesis, the delicate cap of the anther is uplifted, and the pollinarium is partially released. The comparatively large viscidium remains in place at the apex of the long rostellum, while the stipe is dislodged and bends to one side of the rostellum acting like a pendulum. At this point, the lightest of breezes already blows one or two pollinia within the large stigmatic cavity, where they contact the stigmatic fluid, completing the autogamous pollination process (Fig. 3). As the apical viscidium is fully functional and could easily be glued to the frontal region of the head of an insect visiting the inner parts of the flower (as it has been observed in other species of the genus; see Dressler 1968, Folsom 1987), cleistogamy and autogamy in *D. auriculata* are likely facultative, probably coexisting with assisted cross-pollination.

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