# Genera *Zygopetalinarum*:

## 1 The genus *Daiotyla*

FRANCO PUPULIN considers the qualities of plants in this genus, recently split from *Chondrorhyncha*

FEW OTHER ORCHID GROUPS have such beautiful, delicate flowers as species of the so-called *Chondrorhyncha* complex. This group belongs to subtribe *Zygopetalinae*, a large assemblage of genera including more than 400 species (Govaerts 2002) native to tropical America, ranging from Mexico, through the West Indies, to Brazil, Bolivia and Argentina in South America. The *Zygopetalinae* are highly diverse in vegetative and floral morphology, and the subtribe is mainly characterised by the presence of four flattened, superposed pollinia and a narrow stigma, which in many taxa is reduced to a transverse slit. Other frequent features in the group are the presence of a keel, tooth, or ligule on the ventral surface of the column, and the characteristic colour of the flowers in various shades of violet.

### Three main clades

The subtribe is composed of three main clades. *Zygopetalum* and its relatives have prominent pseudobulbs, convolute leaves, and many-flowered inflorescences. The genera with homoblastic pseudobulbs and plicate leaves related to *Warrea* form a second clade; and the conduplicate-leaved, one-flowered genera, usually lacking pseudobulbs, are placed into the *Huntleya* clade.

Although some authors formally treated these assemblages at subtribal level (Szlachetko 1995), recent studies based on combined molecular data sets (Whitten *et al* 2000, 2005) strongly support the monophyly of the *Zygopetalinae*, as well as the inclusion within the subtribe of the two morphologically anomalous genera *Cryptarrhena* and *Dichaea*.

Most genera of the *Huntleya* clade are easy to identify on the basis of their characteristic floral features, and nobody doubts the generic placement of species of *Chaubardiella*, *Huntleya*, *Kefersteinia* or *Pescatorea*/*Bollea*. However, the delimitation of the remaining genera of this group, often referred to as the *Chondrorhyncha* complex, has been traditionally difficult.

### Deceit morphology

In many species related to *Chondrorhyncha* the lateral sepals are swept back and revolute to form a false spur, and the lip has a notch on either side of its base, allowing entrance to the tubular base of the sepals. These false nectaries deceive pollinators, which insert their tongue into the funnel-shaped sepals searching for nectar (Ackerman 1983). The analogies in floral morphology within this group are likely the result of pollination mechanisms related to the nectar-deceit. Apparently the same flower morphology that deceives pollinators also fooled botanists, who for a long time shifted many of the species of this taxonomically difficult group from one genus to another

A flower of *Daiotyla albicans* with a cream callus, from Varablanca, on the high drainage of Río Sarapiquí, in Costa Rican Central Volcanic range

(Fowlie 1966, Garay 1969, Senghas & Gerlach 1992–1993, Dressler 1981, 1993, 2000).

Many students of the Neotropical orchid flora were conscious of the unnatural grouping of so many different taxa under the concept of *Chondrorhyncha*, and field experience usually allowed them to assign instinctively each species to a distinct 'subset' of this inflated genus. Recent molecular work carried out by W Mark Whitten and collaborators (Whitten *et al* 2000, 2005), strongly indicates that species of *Zygopetalinae* with this deceit morphology are scattered among various clades with other floral mechanisms, showing unequivocally that the genera traditionally based on gross floral morphology are polyphyletic.

In fact, morphological features of the flowers within this group proved rather inconsistent for assessing generic boundaries on a solid basis. Molecular systematic studies strongly helped to clarify the generic relationships within the *Chondrorhyncha* complex, often in conflict with traditional generic delimitations, revealing the existence of numerous well-supported clades that warrant generic recognition.

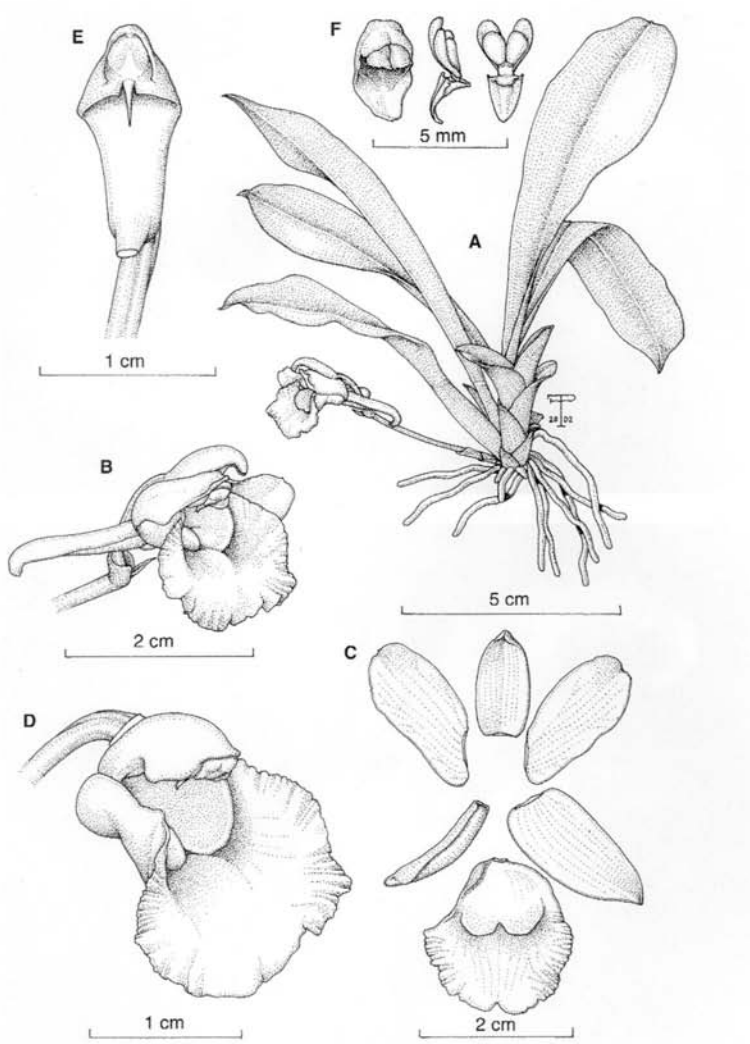
**Segregated genera**

To resolve the polyphyly of *Chondrorhyncha*, and to recognise formally these monophyletic clades at the generic level, several new genera were recently segregated from a broadly defined *Chondrorhyncha* (Whitten *et al* 2005).

One of the genera split from *Chondrorhyncha* is *Daiotyla* Dressler. This genus differs mainly from *Chondrorhyncha* in the distinctly thick, two-part callus at the base of the lip, which extends to about the middle of the blade.

The generic name is derived ➤

**Top:** A form of *D. albicans* with a solid purple callus, originally collected on the Caribbean watershed of the Cordillera de Talamanca in Costa Rica, close to the Pacuare River
**Above:** A specimen of *Daiotyla crassa* from the submontane, wet forests of the Cordillera de Talamanca in central Costa Rica




*Daiotyla albicans*: A - habit B - flower C - perianth flattened D - column and lip, three-quarters view E - column, central view F - anther cap and pollinarium (two views). Drawn by the author from *F Pupulin 3510*

from the Greek words *daio* = divide, and *tyle* = knot, in reference to the characteristic shape of the callus in species of this genus.

The molecular data by Whitten and co-workers (2005) place *Daiotyla* as sister to *Stenia*, which the new genus resembles in vegetative habit, with rather short, distinctly oblong to oblanceolate, dark green leaves. The shape of the lip, however, is quite different from that of *Stenia*. The large subclade to which *Daiotyla* belongs includes, among others, *Cochleanthes* and *Kefersteinia*.

As known today, the genus encompasses three species, but another taxon from Panama is probably distinct and waiting for adequate material to be properly described (R L Dressler pers. comm.).

**Taxonomy**

***Daiotyla*** Dressler, Lankesteriana 5(2): 92 (2005).
Type species: *Chondrorhyncha albicans* Rolfe. A genus of three to four species ranging from Costa Rica to Colombia.

***Daiotyla albicans*** (Rolfe) Dressler, Lankesteriana 5(2): 92. 2005. Fig 1–3.
Basionym: *Chondrorhyncha albicans* Rolfe, Bull. Misc. Inform. Kew 1898: 195. 1898.
Type: Costa Rica (without specific locality) flowered in the collection of the Hon Walter Rothschild, Tring Park, June 1896 (holotype K; AMES 23409-photo!).

***Plant*** epiphytic, caespitose, without pseudobulbs, the stem enclosed by 5–6 imbricating sheaths, the upper ones foliaceous. ***Leaf*** shortly petiolate, conduplicate, widely oblanceolate, acuminate, dark green, shiny, 8.5–20 x 2.2–4.3cm. ***Inflorescence*** lateral, from the axil of the lower sheaths, 1-flowered; peduncle terete, suberect, to 6cm long. ***Floral bract*** double, conduplicate, the external one widely ovate, the internal bractlet ligulate. ***Ovary*** pedicellate, to 2cm long including the pedicel. ***Flower*** proportionately large, the sepals and petals white to pale cream, the callus of the lip tinged pale yellow or purple. ***Dorsal sepal*** elliptic, acute, conduplicate-folded, hooked at apex, 16 x 7mm. ***Lateral sepals*** elliptic-lanceolate, subacute, reflexed, strongly conduplicate-folded, hooked at apex, 20 x 9mm. ***Petals*** obovate-elliptic, rounded, 20 x 9mm. ***Lip*** subrhombic-obovate, rounded, retuse, the apical margin finely crisped, the basal margins erect, 24 x 20mm; disc with a massive, thickened, bilobed, rounded callus, apically emarginate-bilobed, ca. 6 x 10mm. ***Column*** straight, clavate, with a foot, ca. 10mm long, the ventral surface plain,

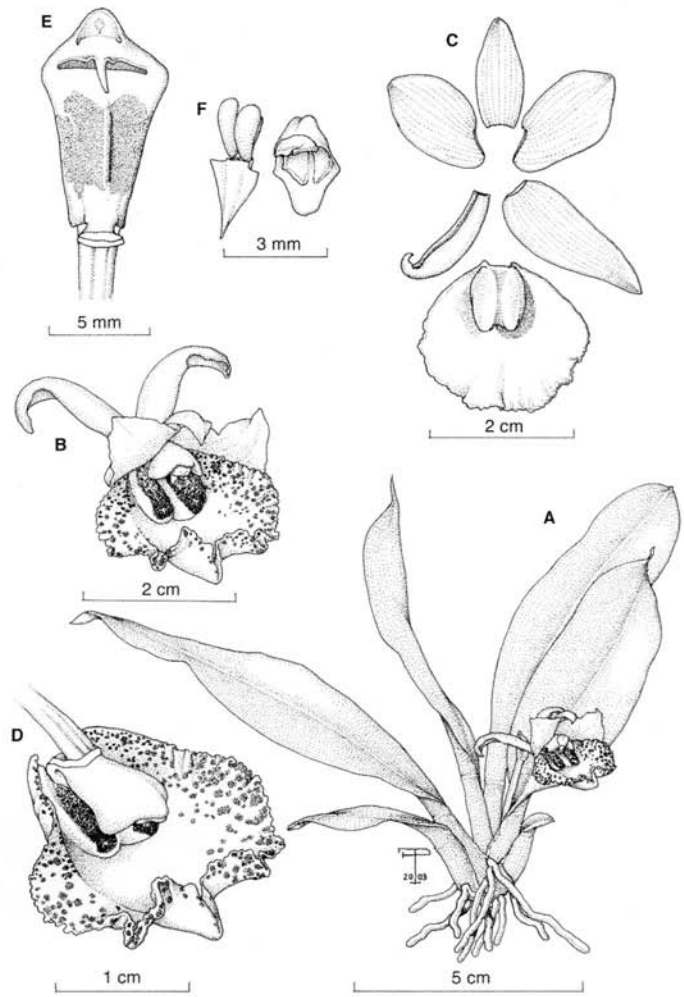
with a transverse, narrow stigma. ***Anther cap*** elliptic, cucullate, 2-celled. ***Pollinia*** 4, in 2 pairs of different size, on a triangular-ovate, hyaline viscidium.

Distribution: Costa Rica, Panama and Colombia
Habitat and ecology: An epiphyte usually found in shady places in low-altitude to submontane wet forests at 250–1,700m elevation, from both the watersheds of the Continental divide in southern central America. Flowering has been recorded from March to December.

**Notes**

Robert A Rolfe described *Chondrorhyncha albicans* in the Kew Bulletin on the basis of a plant originally collected in Costa Rica, which flowered in 1896 in the collection of Walter Rothschild at Tring Park. The specific epithet, from the Latin adjective *albicans*, milk-white, refers to the immaculate flower of the typical form of this species. *Daiotyla albicans* is an uncommon epiphyte, known in a few localities from Costa Rica to Colombia. In Costa Rica, it has been recorded from the temperate wet forests along the Caribbean watershed of the Tilarán, Central Volcanic and Talamanca mountain ranges, and from the Pacific slopes of the Cordillera Central, at elevations between 700 and 1,600m. In his field guide to the orchids of Costa Rica and Panama, Dressler (1993) recorded the presence of this species from the Caribbean mountain forests in Panama.

The photograph of *Chondrorhyncha* sp., published in the series of native orchids of Colombia (Escobar 1994: 685) undoubtedly depicts *D. albicans*. The relatively short and wide, rounded lip, with the lateral margins erect at the base to flank the column, the massive bilobed callus that occupies most of the basal half of the lip, and the white flowers, easily distinguish this species.




*Daiotyla crassa*: A - habit B - flower C - perianth flattened D - column & lip, three-quarters view E - column, central view F - pollinarium & anther cap. Drawn by the author from *F Pupulin 4257* (Jardín Botánico Lankester-Spirit)

*Daiotyla albicans* presents two distinct forms. According to Rolfe's protologue, the *forma typica* has flowers completely white, faintly tinged with green, and this is the form more commonly observed in the field. However, another form exists with the callus solidly blotched with purple-red (eg *Bello **1995***). Pupulin (2005) gives photographs of both forms (as *Chondrorhyncha*).

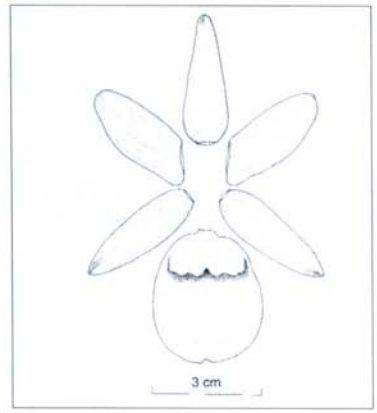
***Daiotyla crassa*** (Dressler) Dressler, Lankesteriana 5(2): 92 (2005). Fig 4–5. Basionym: *Chondrorhyncha crassa* Dressler, Die Orchidee 34: 222 (1983). Type: Panama. Chiriquí: Fortuna Valley, north side of river near La Sierpe, 11 May 1982, flowered in cult. 20 May through July, *RL Dressler **6055*** (holotype US, isotope PMA).

***Plant*** epiphytic, caespitose, without pseudobulbs, the abbreviated stem with 4–5 imbricating sheaths, the upper ones foliaceous. ***Leaf*** petiolate, conduplicate, oblanceolate to elliptic-obovate, acuminate, abaxially keeled, dark green, shiny, 6.5–12 x 2.2–3.6cm, the petiole to 2cm long. ***Inflorescence*** lateral, from axil of the lower sheaths, 1-flowered; peduncle terete, arching, to 4cm long. ***Floral bract*** double, conduplicate, loose, the external one widely ovate-elliptic, the subopposite internal bractlet narrowly elliptic-ligulate. ***Ovary*** pedicellate, subclavate, to 18mm long including the pedicel. ***Flower*** rather large, the sepals and petals cream to pale yellow, the lip cream heavily spotted and blotched with purple, especially toward the margins and the apex, the callus cream spotted with purple, with two large purple blotches at apex. ***Dorsal sepal*** lanceolate, acute, strongly conduplicate-folded, hooked at apex, 12 x 5.5mm. ***Lateral sepals*** elliptic-lanceolate, subacute, reflexed, strongly conduplicate-folded, hooked at apex, 17 x 7mm. ***Petals*** obovate, rounded, apiculate, 14 x 8mm. ***Lip*** broadly obovate, obtuse, concave, margins crisped, infolded apically, 20 x 18mm; disc with a bilamellate, widely obovate callus, apically emarginate-bilobed, thickened at the sides, ca. 13 x 8mm, median groove shallow. ***Column*** straight, clavate, ca. 7mm long, the ventral surface plain, with transverse, narrow stigma. ***Anther cap*** ovate-rhombic, 2-celled. ***Pollinia*** 4, in 2 pairs of different size, on a triangular-ovate, hyaline viscidium.

Distribution: Costa Rica and Panama. Habitat and ecology: A rare epiphyte from wet submontane forests of the Caribbean watershed of the Continental divide in southern Costa Rica and Panama, at elevations between 800 and 1,200m. Once new growth is mature, plants flower in succession all year.

## Notes

Robert L Dressler originally described *Chondrorhyncha crassa* from Panama, naming the new species from the Latin *crassus* = thick, in reference to the thick, laminar callus on the disc of the lip, which is characteristic of the species. Traditionally considered to be endemic to western Panama,




*Daiotyla maculata* with flattened perianth. Modified by the author from the original sketch by L A Garay on the type sheet at AMES herbarium (courtesy of G A Romero González)

G Escobar; courtesy of the Sociedad Colombiana de Orquideología

*Daiotyla maculata* flower that served as the holotype, reproduced from *Orquideología*

*D. crassa* was recently recorded from Costa Rica (Pupulin 2003) on the basis of a plant growing intermixed with specimens of *C. albicans* collected on the Caribbean side of the Talamanca range. The large, flat lip, with the apical margins recurved, the pale creamy yellow colour of the flower, and the large, bi-partite callus heavily spotted and blotched with purple, distinguish this species. Drawings and photographs of *D. crassa* (as *Chondrorhyncha*) are given by Dressler (1983) and Pupulin (2003, 2005).

***Daiotyla maculata*** (Garay) Dressler, Lankesteriana 5(2): 92 (2005). Fig 6–7. Basionym: *Chondrorhyncha maculata* Garay, Orquideología 4: 161. 1969. Type: Colombia. Caldas: Santuario Caldas, 1800m alt., *G. Escobar* ***543*** (holotype and drawing of the holotype, AMES 090676!).

***Plant*** epiphytic, caespitose, without pseudobulbs, the abbreviated stem with 4–5 imbricating sheaths with hyaline margins, the upper ones foliaceous. ***Leaf*** petiolate, conduplicate, elliptic to elliptic-lanceolate, acute to subacuminate, dark green, shiny, to 10 x 2.5cm. ***Inflorescence*** lateral, from the axil of the lower sheaths, 1-flowered; peduncle terete, suberect, to 3cm long. ***Floral bract*** suborbicular, obtuse, 5mm long. ***Ovary*** pedicellate, 1cm long including the pedicel. ***Flower*** small, the sepals and petals greenish yellow, the lip blotched with purple. ***Dorsal sepal*** narrowly ovate-elliptic, obtuse, concave, hooked at apex, 16 x 6mm. ***Lateral sepals*** narrowly ovate-elliptic, obtuse, strongly reflexed, abaxially slightly keeled, conduplicate-folded, 20 x 7mm. ***Petals*** elliptic, rounded, apiculate, 16 x 8mm. ***Lip*** broadly obovate from a cuneate base, rounded, slightly emarginate, concave, the margins undulate, the basal margins erect, flanking the column, 20 x 16mm; disc with a transverse, bilobed callus, apically erose-undulate, notched, ca. 13 x 6mm, the median groove shallow. ***Column*** straight, subclavate, to

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10mm long, with a long foot and transversal, narrow stigma.
***Pollinia*** 4, in 2 pairs of different size.

Distribution: Endemic to Colombia.
Habitat and ecology: A rare epiphyte from the wet submontane forests of the western watershed of the Central mountain range, Colombia, at 1,800m elevation. Flowering time not recorded.

### Notes

Leslie A Garay described *Chondrorhyncha maculata* from a single specimen collected by Gilberto Escobar (no. 543) at Santuario Caldas, on the western side of the Colombian Cordillera Central, deriving the name from the Latin *maculatus* = blotched, in reference to the purple blotches covering the lip.

*Daiotyla maculata* is apparently a very rare species, only known from the type specimen. The photograph by Gilberto Escobar originally published together with the protologue (Garay 1961), and reproduced here, is the same given in Escobar (1994). ■


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## CULTIVATING *DAIOTYLA*

Reynaldo Gómez, Greenhouses Coordinator, Lankester Botanical Garden, University of Costa Rica, offers the following advice:

**Situation:** Daiotylas are shade-loving plants, usually found in extremely wet environments. They can be satisfactorily grown on plaques of wood or tree fern, but in this case watering must be very frequent in order to avoid complete desiccation of the substratum. With the upright habit of the plants and the erect inflorescences, species of *Daiotyla* are perhaps best suited to be grown in pots, which helps to retain constant moisture around the roots.

**Compost:** The compost used at Lankester Botanical Garden for many small members of *Zygopetalinae* is made up of three parts of coconut husk, one part finely chopped sphagnum moss and one part small gravel, around 5–6mm in size. To prevent excessive retention of water in the compost, the plants should never be over-potted – a mature *Daiotyla* specimen can be grown in a 10cm pot, provided with excellent drainage. Repotting should be done every two years after flowering.

**Temperature:** Intermediate temperatures, like those of the *Cattleya* house, are suitable for growing *Daiotyla*, although plants can tolerate warmer temperatures.

**Shading:** The delicate foliage is very sensitive to strong light and must be protected from direct sun. With proper care, the leaves of *Daiotyla* species should be dark, velvety green.

**Watering and feeding:** Plants are watered three times a week during the driest months, and twice a week in the rainy season. At Lankester Botanical Garden, a slow-release granular fertiliser is usually added to the compost, but the plants can also be fertilised weekly all year round with a balanced formula at low concentration.