

Notes on the genus *Trichocentrum* (Orchidaceae, Oncidiaceae) and its relatives

Dariusz L. Szlachetko & Marta Kolanowska

Summary: The generic delimitation within *Trichocentrum* clade is discussed in the light of molecular and morphological research results. The comparative morphology of *Trichocentrum*, *Cobniella*, *Lophiaris*, *Lophiarella*, *Saundersia* and *Grandiphyllum* is presented together with a key for their identification. Morphological characteristics of the studied taxa are provided together with photographs and illustrations of representatives of each genus.

Keywords: Neotropics, Oncidiaceae, taxonomy, comparative morphology, key, *Trichocentrum*

Since the first important taxonomic analysis of orchids published by LINDLEY (1830–1840), numerous classification systems were proposed. Obviously, most of them based on various morphological characters of the plants (e.g. BENTHAM 1881; PFITZER 1887; SCHLECHTER 1915, 1926; DRESSLER & DODSON 1960; VERMEULEN 1966; BURNS-BALOGH & FUNK 1986; DRESSLER 1993; SZLACHETKO 1995). The first genetic study of orchids was presented by CAMERON et al. (1999) and the rapid development of methods of molecular analysis brought abundant new, sometimes astonishing information about the relationships between these plants.

In the last years, several molecular studies were conducted on *Oncidium* Sw. and related genera (WILLIAMS et al. 2001, 2005; CARNEVALI FERNÁNDEZ-CONCHA et al. 2009, CHIRON et al. 2009; NEUBIG et al. 2012) and despite new data, the systematic of oncidoid orchids is a topic of ongoing discussion between taxonomists. The great morphological diversity of these plants in vegetative and floral characters make them difficult but interesting study objects. There is no consensus neither on the subtribal classification of *Oncidium*-related genera nor on the generic delimitation within numerous taxa. While some taxonomists accept the broad concept of the subtribe Oncidiinae (e.g. DRESSLER & DODSON 1960; DRESSLER 1993, CHASE et al. 2003), others prefer to segregate several smaller subtribes within the tribe Oncidiaceae (SZLACHETKO 1995) as proposed by PFITZER (1887) who established this taxon.

The results of molecular studies of WILLIAMS et al. (2001) completely changed previous knowledge of the relationship between *Trichocentrum* Poepp. & Endl. and other oncidoid orchids. This research indicates the close relation between *Trichocentrum*, *Cobniella* Pfitzer and *Lophiaris* Raf. which turns out as sister to other Oncidiinae. An expanded genetic analysis was conducted by NEUBIG et al. (2012) with an even more surprising result: the *Trichocentrum* clade includes also representatives of *Grandiphyllum* Docha Neto and *Saundersia* Rchb.f. Six distinct assemblages may be identified within the clade (Fig. 1). The first one includes the major part of *Lophiaris* species, along with *Lophiarella* Szlach., Mytnik & Romowicz and those two are sister to *Trichocentrum* s.s. *Cobniella* is embedded in *Trichocentrum* s.l. *Saundersia* represented in the molecular analysis by *S. paniculata* Brade is sister to *Trichocentrum* s.l. (including *Cobniella* group). *Grandiphyllum* is sister to the previously mentioned taxa.

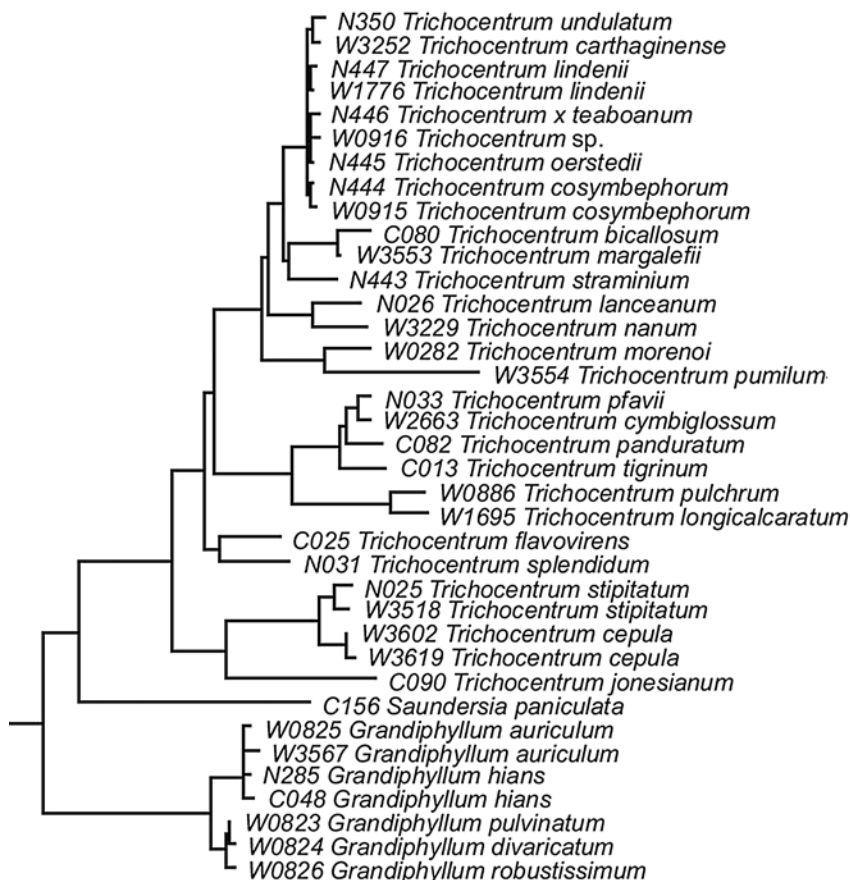


Figure 1. Fragment of the single maximum likelihood tree resulting from analysis of the combined, seven-region data set for Oncidiinae presented by NEUBIG et al. (2012).

NEUBIG et al. (2012) proposed to combine *Lophiarella*, *Lophiaris*, *Cobniella* and *Trichocentrum* and to maintain the generic separateness of *Grandiphyllum* and *Saundersia* only. This decision was based on the morphological distinctness of the latter genus that in the authors' opinion should not be lumped with *Trichocentrum*. Hereby, the authors' concept of Oncidiinae is unclear as the morphology was omitted in other transfers made within the subtribe (NEUBIG et al. 2012).

The aim of the presented study was to evaluate the morphological differences between the taxa included by NEUBIG et al. (2012) in the *Trichocentrum* clade.

Taxonomic concepts of the genera of *Trichocentrum* clade

Trichocentrum s.str.

The genus *Trichocentrum* was described by POEPPIG & ENDLICHER (1838) at first based on *T. pulchrum* which the authors found unique in somewhat campanulate flowers and a spurred lip connate with the ventral gynostemium margins (Fig. 2). It was recognized by PFITZER (1887) as a member of newly created Ionopsidae. SCHLECHTER (1915) proposed to establish a new subtribe Trichocentrinae, in which he included *Trichocentrum* and *Centroglossa* Barb. Rodr. Later, *Trichocentrum* was often recognized as a large genus that included *Lophiaris* and was placed in a broad concept of Oncidiinae (e.g. DRESSLER & DODSON 1960; DRESSLER 1993;

Notes on the genus *Trichocentrum*



Figure 2. I. *Trichocentrum pulchrum*. A – Habit; B – Dissected perianth. Redrawn by N. Olędzzyńska from DUNSTERVILLE & GARAY (1965). II. *Trichocentrum tigrinum* flower (photo by Emilio).

CHASE et al. 2003), but SENGHAS (1995) as well as SZLACHETKO (1995; SZLACHETKO & MYTNIK-EJSMONT 2009) found it distinct from other oncidoid orchids and classified it in monotypic Trichocentrinae.

Lophiaris

This taxon was established by RAFINESQUE (1838) based on *Oncidium lanceanum* Lindl. characterized by fleshy tepals, pandurate lip and disc ornamented with a lobulate callus (Fig. 3). It



Figure 3. I. *Lophiaris lanceana*. A – Habit; B – Dissected perianth. Redrawn by N. Olędzzyńska from DODSON (1989). II. *Lophiaris pumila*. A – Habit; B – Flower close-up (photos by L.F. Varella).



Figure 4. I. *Cobniella ascendens*. A – Habit; B – Dissected perianth. Redrawn by N. Olędrzyńska from the global orchid taxonomic network (*Pupulin* 322). II. *Cobniella cebolleta*. A – Habit; B – Flower close-up (photos by L.F. Varella).

was not recognized by SCHLECHTER (1915) as distinct genus. The author included it (as *Oncidium lanceanum* Lindl.) in Oncidiinae. This concept was generally accepted, however, *Lophiaris* was often considered as synonym of *Trichocentrum* (DRESSLER & DODSON 1960; DRESSLER 1993; CHASE et al. 2003). SENGHAS (1997) as well as SZLACHETKO & MYTNIK-EJSMONT (2009) recognized it as a distinct genus within Oncidiinae.

Cobniella

Cobniella was formally established in the late XIX century (PFITZER 1889) based on *Cobnia quekettioides*, which was described by Reichenbach in 1852, but this name was illegitimate since the same generic epithet was given to a representative of Asparagaceae Juss. by Kunth in 1850. Reichenbach found *C. quekettioides* related to *Sigmatostalix* Rchb.f. and *Neodryas* Rchb.f., but the terete, fleshy leaves allow to distinguish *Cobniella* from all other *Oncidium* relatives easily. The genus had not been accepted for years and new species morphologically corresponding to *Cobniella* were described as representatives of *Oncidium* and included in section *Cebolletae* Lindl. (GARAY & STACY 1974) or *Teretifolia* (COGNIAUX 1906). The resurrection of *Cobniella* was proposed by CHRISTENSON (1999; Fig. 4). The genus was included by PFITZER (1889) in a group 'Adeae' together with *Neodryas* and *Trizeuxis* Lindl. SCHLECHTER (1915) considered it as a member of the subtribe Ionopsidinae. *Cobniella* was not recognized by numerous authors, e.g. DRESSLER & DODSON (1960), DRESSLER (1993) and CHASE et al. (2003). SZLACHETKO & MYTNIK-EJSMONT (2009) considered the genus as a member of subtribe Oncidiinae.

Notes on the genus *Trichocentrum*

Figure 5. I. *Lophiarella flavovirens*. A – Habit; B – Dissected perianth. Redrawn by N. Olędryńska from HÄGSATER & SALAZAR (1990). II. *Lophiarella splendida* flowers (photo B. Gratwicke).

Lophiarella

In 2006, SZLACHETKO et al. excluded two species from *Lophiaris*, *L. microchila* (Bateman ex Lindl.) Senghas and *L. pumila* (Lindl.) Braem based on their gynostemium morphology and a relatively small 3-lobed lip with a rather obscure middle lobe. They named the new taxon *Lophiarella* (SZLACHETKO et al. 2006; Fig. 5). Subsequent studies of CARNEVALI et al. (2013) combining morphological and molecular data resulted in a greatly modified specific composition of the genus. *Lophiarella pumila* (Lindl.) Szlach., Mytnik & Romowicz was included in *Lophiaris* again, and two other species, *Lophiaris flavovirens* (L.O. Williams) Braem and *L. splendida* (A. Rich. ex Duch.) Christenson were transferred to *Lophiarella*. CARNEVALI et al. (2013) circumscribed the latter genus by rigidly fleshy-coriaceous leaves and rigidly erect inflorescence with peduncles coated with a waxy film. The ascendent or nutant inflorescence of *Lophiaris* is not glaucous. Such defined *Lophiaris* and *Lophiarella* overlap in lip morphology and gynostemium structure what can be interpreted as homoplasy.

Grandiphyllum

In 2006, section *Pulvinata* of *Oncidium* was elevated to the generic rank by two scientific teams almost simultaneously. DOCHA NETO et al. (2006) decided to name the newly established taxon *Grandiphyllum* and included 10 *Oncidium* species designating *O. divaricatum* Lindl. as generitype. ROMOWICZ & SZLACHETKO (2006) named the taxon *Aurinocidium* typified by *O. pulvinatum* Lindl. and embracing 7 species. Based on the priority rule of International Code of Botanical Nomenclature, the valid name for *Oncidium* section *Pulvinata* is *Grandiphyllum*. In the same year, DOCHA NETO & BAPTISTA (2006) recognized three alliances within the genus. Representatives of *Grandiphyllum* are easily distinguished from *Oncidium* species by the stiff, coriaceous leaf and simple lip callus (Fig. 6). Formerly, *Grandiphyllum* species, as a part of the genus *Oncidium*, were included in ‘Odontoglossae’ by PFITZER (1887) and classified within Oncidiinae by all subsequent authors (SCHLECHTER 1915; DRESSLER & DODSON 1960; DRESSLER 1993; SENGHAS 1997; CHASE et al. 2003; SZLACHETKO & MYTNIK-EJSMONT 2009).

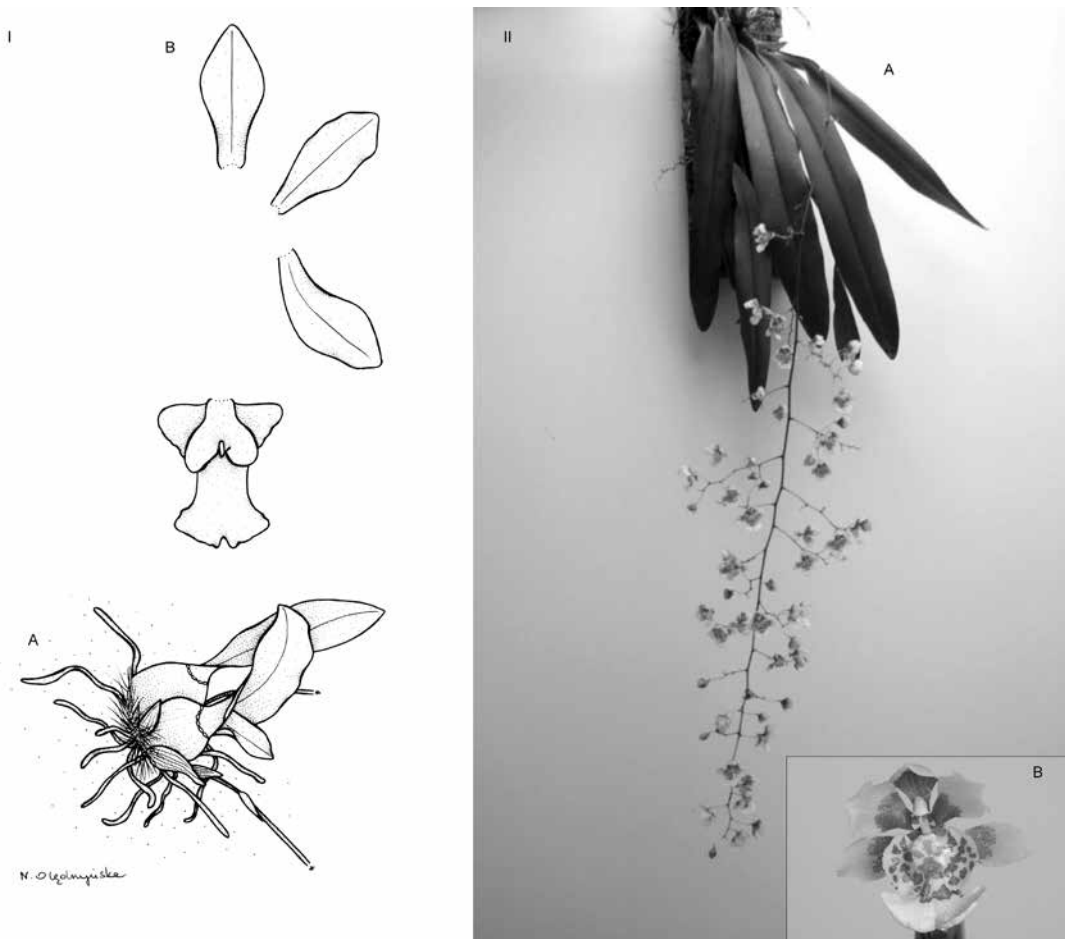


Figure 6. I. *Grandiphyllum schunkeanum*. A – Pseudobulbs; B – Dissected perianth. Redrawn by N. Olędrzyńska from original illustration of *Oncidium schunkeanum*. II. *Grandiphyllum pulvinatum*. A – Habit; B – Flower close-up (photos by L.F. Varela).

Saundersia

The genus was proposed Reichenbach in 1866 and initially it included solely *S. mirabilis*. The other species described within *Saundersia*, *S. bicallosa* Ruschi, was rapidly found synonymic with *S. mirabilis*. Over 70 years after genus description a second species, *S. paniculata*, was discovered by Brade. Representatives of *Saundersia* are readily distinguished from other oncioid orchids as their roots, ovary and sepals are covered with a dense indumentum, which is a unique character (Fig. 7). PFITZER (1887) recognized the genus as a member of newly created Ionopsidinae and this concept was first followed by SCHLECHTER (1915), who transferred *Saundersia* to Saundersiinae several years later (SCHLECHTER 1926). As a member of Oncidiinae, *Saundersia* was recognized by DRESSLER & DODSON (1960), DRESSLER (1993) and CHASE et al. (2003). SENGHAS (1999) followed SCHLECHTER (1926) and accepted monotypic subtribe Saundersiinae. SZLACHETKO & MYTNIK-EJSMONT (2009) included the genus in the subtribe Leochilinae established by SZLACHETKO in 1995. The subtribe comprises such genera as *Capanemia* Barb. Rodr., *Goniochilus* M.W. Chase, *Hybochilus* Schltr., *Polyotidium* Garay, *Sutrina* Lindl. or *Trizeuxis* Lindl. and it is characterized by lip concave at the base and column with two apical, fleshy appendages.

Notes on the genus *Trichocentrum*



Figure 7. I. *Saundersia paniculata*. A – Habit; B – Dissected perianth. Redrawn by N. Olędryńska from HOEHNE (1949). II. *Saundersia paniculata* inflorescence (photo R.N. Ximenes).

Materials and methods

A total of over 200 herbarium specimens and liquid preserved flowers deposited in AMES, AMO, BM, COL, CUVV, F, FLAS, HUA, JAUM, K, MO, NY, P, PMA, UGDA, VALLE and W (THIERS 2015) were examined according to standard procedures. Every studied sheet was photographed and data from the labels were taken. Vegetative and generative characters of each plant were examined. The shape and size of the pseudobulbs and leaves were examined first. Then inflorescence architecture as well as the shape and size of the floral bracts were studied. Finally, flower morphology was examined after rehydration.

Results

The conducted studies showed significant morphological differences between the genera included by NEUBIG et al. (2012) in *Trichocentrum* clade. The comparison of the vegetative and floral characters of the genera in question is presented in Table 1.

Key to the genera of *Trichocentrum* clade

- 1. Leaves terete *Cobniella*
- Leaves conduplicate 2
- 2. Basal part of the lip elongate into spur *Trichocentrum*
- Spur of the labellar origin absent 3
- 3. Roots, ovary and sepals covered by dense indumentum *Saundersia*
- Roots, ovary and sepals glabrous 4
- 4. Pseudobulbs reduced *Lophiaris*
- Pseudobulbs conspicuous 5
- 5. Leaves thickened, peduncle without waxy cover *Grandiphyllum*
- Leaves not thickened, peduncle coated by waxy film *Lophiarella*

Table 1. Comparative morphology of genera of *Trichocentrum* clade.

	<i>Trichocentrum</i>	<i>Cobniella</i>	<i>Lophiaris</i>	<i>Lophiarella</i>	<i>Saundersia</i>	<i>Grandiphyllum</i>
Pseudobulbs	inconspicuous, bilaterally compressed, unifoliate	inconspicuous, cylindrical, unifoliate	inconspicuous, subquadrate, unifoliate	conspicuous, suborbicular to subquadrate, unifoliate	inconspicuous, ellipsoid, unifoliate	conspicuous, suborbicular, compressed, unifoliate
Leaves	conduplicate, coriaceous or somewhat fleshy	terete, fleshy coriaceous	conduplicate, coriaceous or fleshy coriaceous	conduplicate, rigid and thick, fleshy coriaceous	conduplicate, coriaceous or deciduous	conduplicate, coriaceous
Inflorescence	shorter than the subtending leaf, pendent, usually 1- to 4-flowered	longer than the subtending leaf, branching or not, laxly multi-flowered, more or less erect	longer than the subtending leaf, usually branching or not, few- to many-flowered, ascendent or arching to nutant	longer than the subtending leaf, stiffly erect, rarely branching, many-flowered	shorter than the subtending leaf, pendent, few- to many-flowered	longer than the subtending leaf, pendent, many-flowered
Teapals	subsimilar, glabrous	subsimilar, glabrous	subsimilar, glabrous	subsimilar, glabrous	subsimilar, papillate	subsimilar, glabrous
Lip	ovate to elliptic, more or less incised apically; callus simple or few-lobulate, basal spur cylindrical, elongate or saccate	3-lobed, lacking a spur; callus composed of a series of plates and/or teeth	3-lobed, lacking a spur; callus 3-5-lobed	3-lobed, lacking a spur; callus composed of a series of plates and/or teeth	lanceolate, apically bilobulate, lacking a spur; wedge-shaped callus composed of a raised mass	3-lobed, lacking a spur; callus simple, covered with glandular hairs
Gynostemium	elongate, gently upcurved towards apex, rather stout; column part ca. 4 times longer than anther, fused in lower half with lip, slightly dorsiventrally compressed, with two large, widely spread wings near anther, wings entire or irregularly fimbriate	short, erect, robust, column part as long as anther or slightly longer, distinctly winged near stigma, glabrous, wings short, thick	robust, erect or gently sigmoid; column part ca. twice as long as anther, fused broadly with lip at base, broadly winged near stigma, wings obliquely subquadrate to obliquely ovate, entire on margins	erect, rather slender; column part ca. twice as long as anther, basally fused with lip, with two conical-digitate projections at stigma base	short; column part obscure, distinctly shorter than anther, minutely papillate, with two apical wings on both side of rostellum	erect, stout; column part slightly longer than anther, winged near stigma, wings obliquely ovate to elliptic, entire and papillate on margins

Notes on the genus *Trichocentrum*

Anther	subapical, erect, operculate, slightly laterally flattened at apex, oblong ellipsoid, obscurely 2-chambered	apical, incumbent, operculate, ellipsoid, dorsiventrally compressed, obscurely 2-chambered	subapical, incumbent, operculate, ovoid-ellipsoid, slightly laterally flattened, obscurely 2-chambered, papillate	subapical, incumbent, operculate, ovoid, obscurely 2-chambered, papillate	subdorsal, incumbent, operculate, dorsiventrally compressed, ellipsoid-cordate, obscurely 2-chambered	subapical, incumbent, operculate, ellipsoid, obscurely 2-chambered, papillate
Pollinia	2, obliquely obovoid to obovoid-ellipsoid, dorsiventrally compressed, almost flat, hard, split at apex	2, obliquely obovoid, hard, very unequally and deeply cleft, hollow inside	2, obliquely obovoid, slightly dorsiventrally flattened, hard, unequally cleft, hollow inside	2, obovoid-obovoid, shallowly cleft at apex, hard	2, obovoid-clavate, shallowly cleft at apex, hard	2, oblong obovoid, dorsiventrally flattened, hard, unequally and deeply cleft, empty inside
Clinandrium	usually prominent, forming a narrow collar-like structure surrounding anther base	narrow	obscure	obscure	obscure	obscure
Stigma	large, elliptic, concave	large, elliptic, deeply concave	oblong obovate to elliptic, deeply concave	large, elliptic-obovate, deeply concave	small, transversely elliptic, flat	large, elliptic, deeply concave
Rostellum	erect, rounded; remnant bilobulate at middle, slightly concave between acute lobules	shortly conical-digitate in middle, ligulate, blunt; remnant bilobulate in the middle, with oblique shallowly concave plate between acute lobules, canaliculate on dorsal surface	short and wide, obtuse, rather massive; remnant bilobulate at middle, with very large concave plate between acute lobules	elongate, cylindrical, rostrate, obtuse; remnant rostrate, bilobulate at apex, canaliculate on dorsal surface	erect, rostrate-digitate, blunt; remnant shallowly bilobed at apex	short, conical-digitate in the middle, obtuse; remnant bilobulate in the middle, with oblique shallowly concave plate between acute lobules
Viscidium	single, rather large, oblong ovoid to ellipsoid, thick, sticky on outer surface	single, selliform, rather small, thick	single, large, transversely elliptic or disk-like, thick, stout	single, very small, ellipsoid, thick, fleshy	single, small, oblong, thick, fleshy	single, very small, elliptic
Tegula	single, oblong-obtriangular, thin, lamellate	single, oblong in basal half, more or less apically expanded, thin, lamellate	single, nearly as long as viscidium, transversely elliptic, more or less bilobed in upper part, thin, lamellate	single, oblong-oblanceolate, thin, lamellate, slightly folded at apex	single, linear, thin, lamellate	single, oblong, apically expanded and here selliform, thin, lamellate

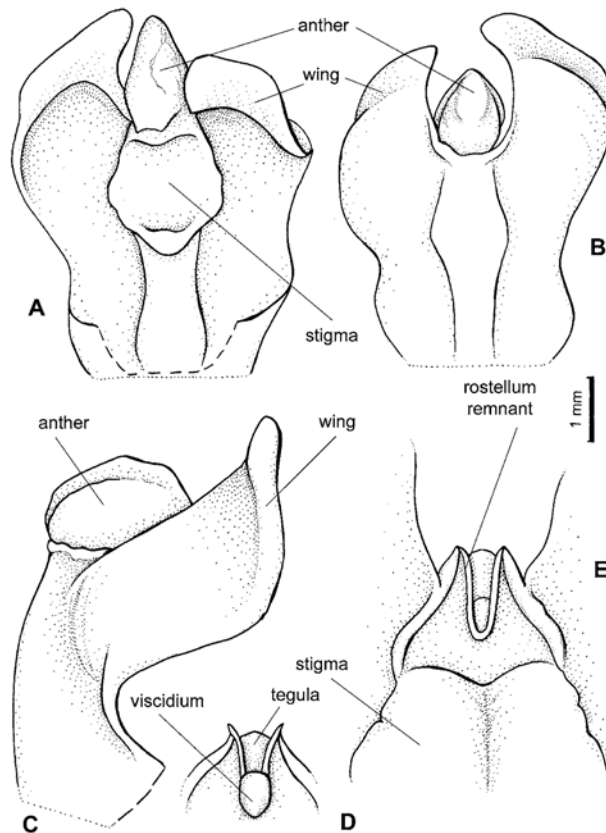


Figure 8. Gynostemium of *Trichocentrum panamense*. A – Gynostemium, bottom view; B – Gynostemium, back view; C – Gynostemium, side view; D – Rostellum; E – Rostellum remnant (Chase 84077, UGDA-DLSz).

Taxonomic treatment

Trichocentrum Poepp. & Endl., Nov. Gen. Sp. Pl. 2: 11, pl. 115. 1838 [1836]. — TYPE: *Trichocentrum pulchrum* Poepp. & Endl.

Epiphytic plants. Rhizome abbreviated. Pseudobulbs inconspicuous, laterally compressed. Leaf oblong, thick, coriaceous or somewhat fleshy, often red dotted. Inflorescence basal, pendent, usually 1–4-flowered. Flowers, showy. Tepals subsimilar. Lip ovate to elliptic, more or less emarginated apically, with simple or lobulate callus near the base. Spur cylindric, elongate or saccate. Gynostemium elongate, gently curved towards apex, rather stout. Column part ca. 4 times longer than anther, fused in lower half with lip, slightly dorsiventrally compressed, with two large, widely spread wings near anther, wings entire or irregularly fimbriate. Anther subapical, erect, operculate, slightly laterally flattened at apex, oblong ellipsoid. Connective narrow, elongate towards apex, very thick. Pollinia 2, obliquely obovoid to obovoid-ellipsoid, dorsiventrally compressed, almost flat, hard, split at apex. Apical clinandrium usually prominent, forms a narrow collar-like structure surrounding anther base, margins more or less denticulate. Stigma rather large, elliptic, concave. Rostellum erect, rounded. Viscidium single, rather large, oblong ovoid to ellipsoid, thick, sticky on outer surface. Tegula single, oblong-obtriangular, thin, lamellate. Rostellum remnant bilobulate at middle, slightly concave between acute lobules (Fig. 8).

The genus includes about 20 species distributed from Mexico to Bolivia and Brazil.

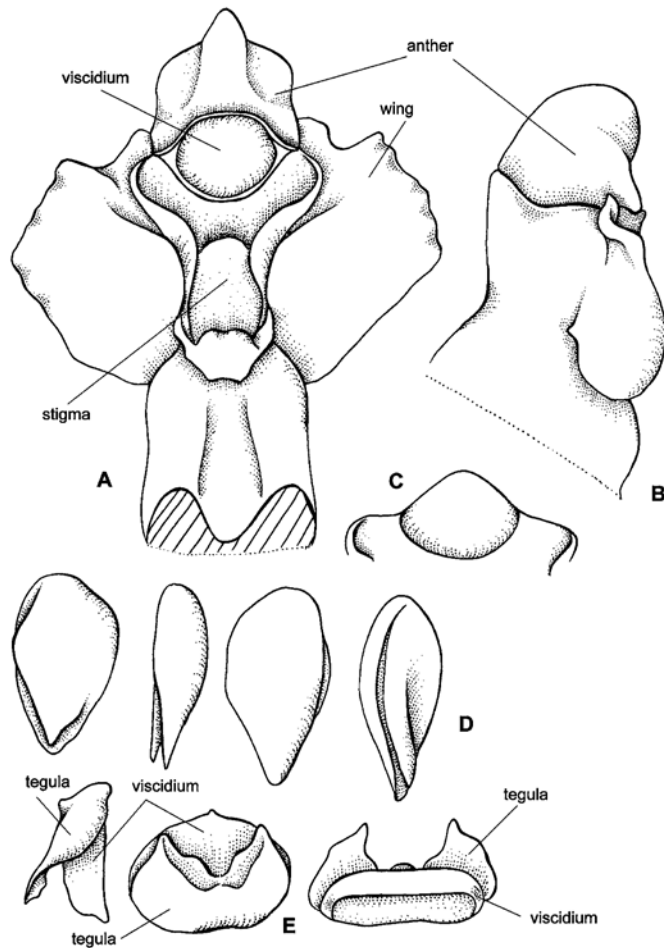
Notes on the genus *Trichocentrum*

Figure 9. Gynostemium of *Lophiaris lanceana*. A – Gynostemium, bottom view; B – Gynostemium, side view; C – Rostellum remnant, bottom view; D – Pollinia, various views; E – Tegula and viscidium, various views (Heidelberg BG O-370, HEID).

Lophiaris Raf., Fl. Tellur. 4: 40–41. 1836 [1838]. — TYPE: *Lophiaris lanceana* (Lindl.) Braem. [≡ *Oncidium lanceanum* Lindl.]

Epiphytic plants. Pseudobulbs reduced, inconspicuous. Leaf erect, thick, coriaceous, oblong elliptic to ovate-lanceolate. Inflorescence lateral, erect or arched, branched or not, few- to many-flowered. Flowers medium-sized to large, showy, concolor or variously marked, spurless. Tepals subsimilar, obovate, spatulate or elliptic, often undulate at margins, more or less unguiculate. Lip 3-lobed, often pandurate in outline, callus 3–5-lobed; middle lobe is the largest, often lobulate and wavy at margins; lateral lobes small, obliquely lanceolate to ovate. Gynostemium erect or gently sigmoid, robust. Column part ca. twice as long as anther, fused broadly with lip at base, broadly winged near stigma, wings obliquely subquadrate to obliquely ovate, entire at margins. Anther subapical, incumbent, operculate, ovoid-ellipsoid, slightly laterally flattened, papillate. Connective narrow, thickened on dorsal surface. Pollinia 2, oblong ellipsoid-obovoid, dorsiventrally flattened, hard, unequally and deeply cleft, hollow inside. Apical clinandrium obscure. Stigma oblong obovate to elliptic, deeply concave. Rostellum short and wide, obtuse, rather massive. Viscidium single, large, transversely elliptic or disk-like, thick, stout. Tegula

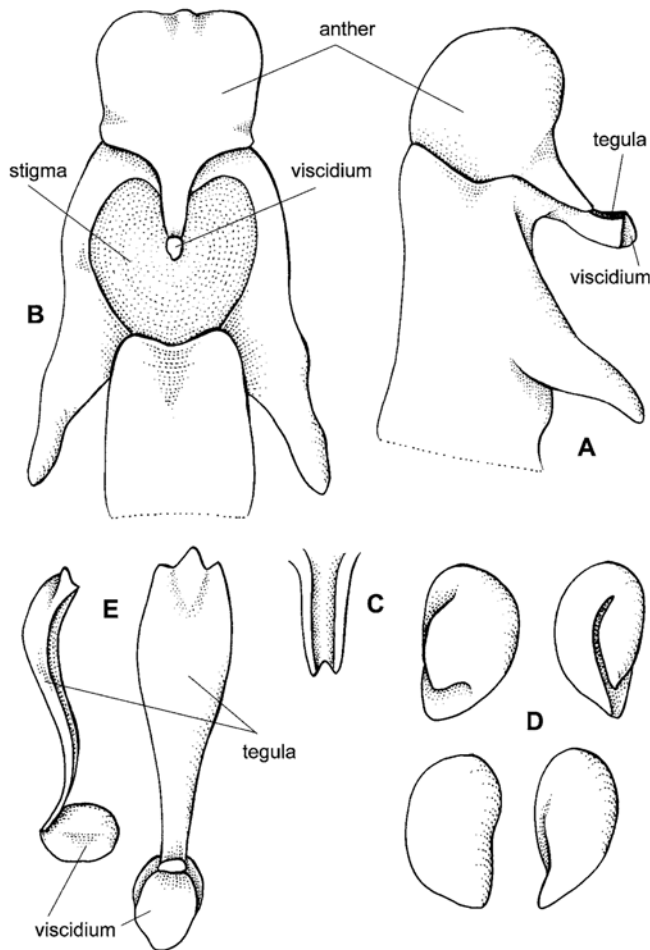


Figure 10. Gynostemium of *Lophiarella microchila*. A – Gynostemium, side view; B – Gynostemium, bottom view; C – Rostellum remnant; D – Pollinia, various views; E – Tegula and viscidium, various views (Heidelberg BG O-9036, HEID).

single, nearly as long as viscidium, transversely elliptic, more or less bilobed in upper part, thin, lamellate. Rostellum remnant bilobulate at middle, with very large concave plate between acute lobules (Fig. 9).

The genus embraces about 30 species distributed from Florida (USA) to Brazil and Argentina.

Lophiarella Szlach., Mytnik & Romowicz, Polish Bot. J. 51: 53. 2006. — TYPE: *Lophiarella microchila* (Bateman ex Lindl.) Szlach., Mytnik & Romowicz. [≡ *Oncidium microchilum* Bateman ex Lindl.]

Epiphytic or lithophytic plants. Pseudobulbs relatively large and conspicuous. Leaf single, thick, elliptic to ovoid. Inflorescence lateral, racemose, rarely branching, many-flowered, peduncle waxy coated. Flowers small to large, showy, concolor or variously marked. Tepals subsimilar, obovate, spatulate or elliptic, often undulate at margins, more or less unguiculate. Lip 3-lobed, with large, central callus; middle lobe reduced or well-developed. Gynostemium erect, rather slender or short. Column part ca. twice as long as anther, basally fused with lip, with two conical-digitate or wing-like projections near stigma. Anther subapical, incumbent, operculate, ovoid, papillate.

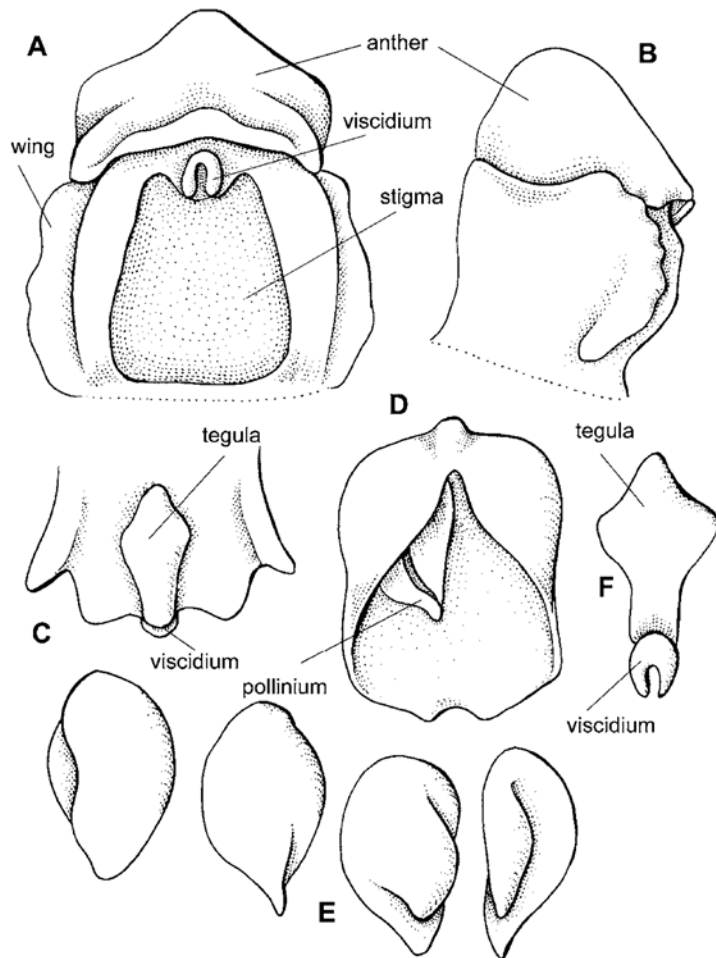
Notes on the genus *Trichocentrum*

Figure 11. Gynostemium of *Cobniella nuda*. A – Gynostemium, bottom view; B – Gynostemium, side view; C – Rostellum, front view; D – Anther; E – Pollinia, various views; F – Tegula and viscidium, front view (Heidelberg BG O-16789, HEID).

Connective narrow, sometimes elongate apically to form a rostrate appendix. Pollinia 2, obliquely obovoid, slightly dorsiventrally flattened, hard, unequally cleft, hollow inside. Apical clinandrium obscure. Stigma rather large, elliptic-obovate, deeply concave. Rostellum elongate, cylindrical, rostrate, obtuse. Viscidium single, very small, ellipsoid, thick, fleshy. Tegula single, oblong-ob lanceolate, thin, lamellate, slightly folded at apex. Rostellum remnant rostrate, bilobulate at apex, canaliculate on dorsal surface (Fig. 10).

Nowadays the genus includes three Central American species.

Cobniella Pfitzer, Nat. Pflanzenfam. 2(6): 194. 1889. — TYPE: *Cobniella quekettioides* (Rchb. f.) Pfitzer. [≡ *Cobnia quekettioides* Rchb. f.]

= *Stilifolium* König & Pongratz, Arcula 7: 186. 1997. — TYPE: *Stilifolium cebolleta* (Jacq.) König & Pongratz. [≡ *Epidendrum cebolleta* Jacq.]

Epiphytic or lithophytic plants. Pseudobulbs small, suborbicular, encloded by 3 small, scarious sheaths. Leaf terete, acuminate, thick, erect or pendent. Inflorescence lateral, elongate, usually

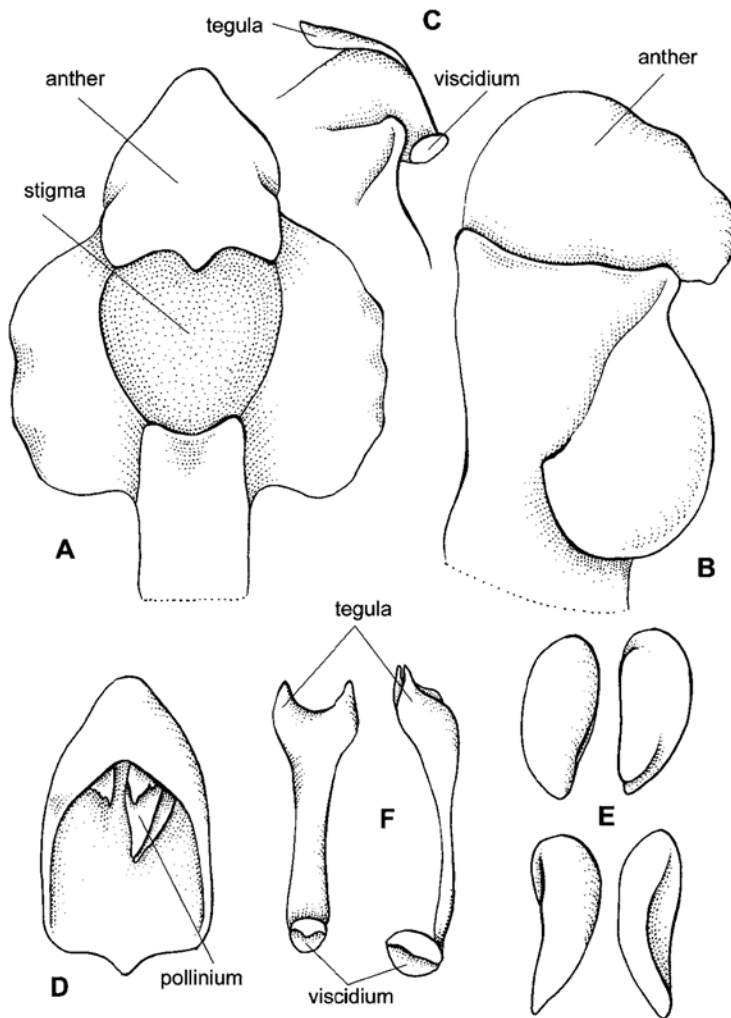


Figure 12. Gynostemium of *Grandiphyllum pulvinatum*. A – Gynostemium, bottom view; B – Gynostemium, side view; C – Rostellum, side view; D – Anther; E – Pollinia, various views; F – Tegula and viscidium, various views (Heidelberg BG O-376, HEID).

paniculate, rarely racemose, few- to many-flowered. Flowers showy. Sepals and petals subsimilar, sepals distinctly unguiculate. Lip unguiculate, lamina 3-lobed with prominent callus at the base. Gynostemium short, erect, robust. Column part as long as anther or slightly longer, distinctly winged near stigma, glabrous, wings short, thick. Anther apical, incumbent, operculate, ellipsoid, dorsiventrally compressed. Connective narrow, thin, apically elongate to form a short roof. Pollinia 2, obliquely obovoid, hard, very unequally and deeply cleft, hollow inside. Apical clinandrium narrow. Stigma large, elliptic, deeply concave. Rostellum shortly conical-digitate in middle, ligulate, blunt. Viscidium single, selliform, rather small, thick. Tegula single, oblong in basal half, more or less apically expanded, thin, lamellate. Rostellum remnant bilobulate at middle, with oblique shallowly concave plate between acute lobules, canaliculate on dorsal surface (Fig. 11).

About 23 species are included in *Cobmiella*. They are widely distributed from northern Mexico to northern Argentina.

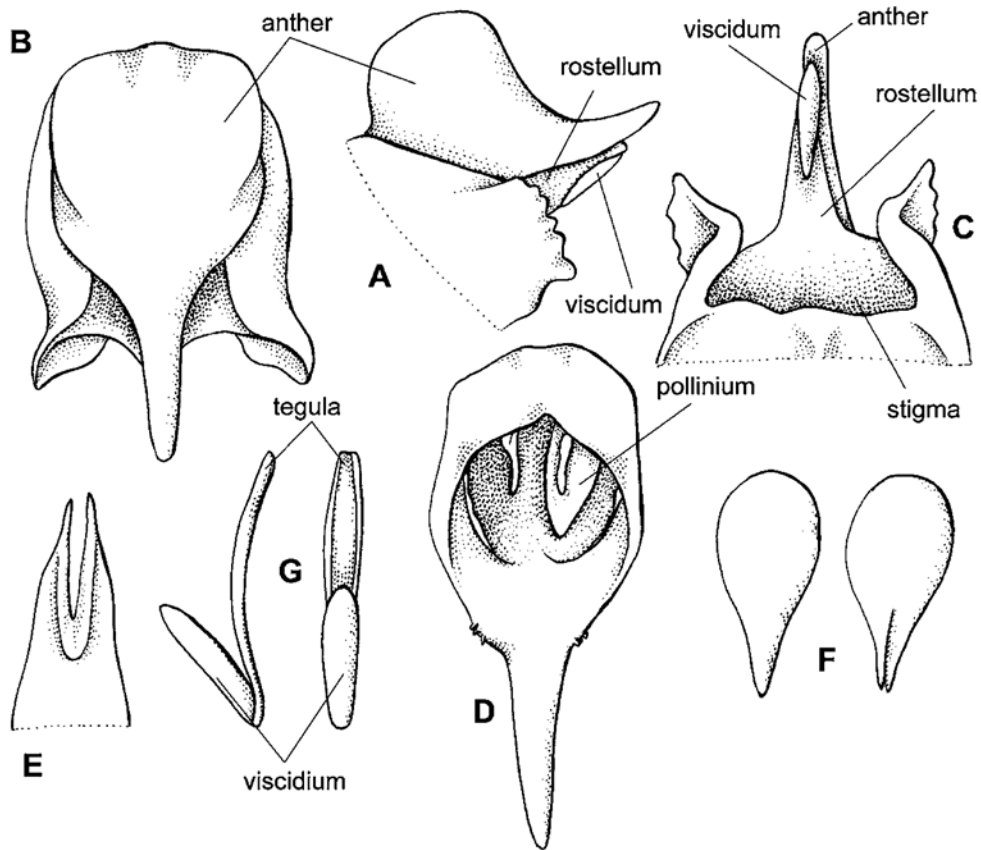
Notes on the genus *Trichocentrum*

Figure 13. Gynostemium of *Saundersia paniculata*. A – Gynostemium, side view; B – Gynostemium, front view; C – Gynostemium, bottom view; D – Anther, back view; E – Rostellum remnant; F – Pollinium, various views; G – Tegula and viscidium, various views (Heidelberg BG O-5986, HEID).

Grandiphyllum Docha Neto, Colet. *Orquídeas Brasil*. 3: 75. 2006 (10 Feb 2006). — TYPE: *Grandiphyllum divaricatum* Lindl. [≡ *Oncidium divaricatum* Lindl.]

= *Oncidium* Sw. sect. *Pulvinata* Lindl. in Paxt., *Fl. Gard.* 1: 24. 1850. — TYPE: *Oncidium pulvinatum* Lindl.

= *Aurinocidium* Romowicz & Szlach., *Polish Bot. J.* 51: 43. 2006 (21 Jul 2006). — TYPE: *Aurinocidium pulvinatum* (Lindl.) Romowicz & Szlach. [≡ *Oncidium pulvinatum* Lindl.]

Epiphytic plants. Pseudobulbs conspicuous, suborbicular, compressed. Leaf stiff, coriaceous, oblong to elliptic. Inflorescence lateral, elongate, flexuous, paniculate, many-flowered. Flowers relatively small, usually yellow with dark markings. Sepals and petals subsimilar. Lip 3-lobed with simple, basal callus covered with glandular hairs. Gynostemium erect, stout. Column part slightly longer than anther, winged near stigma, wings obliquely ovate to elliptic, entire and papillate at margins. Anther subapical, incumbent, operculate, ellipsoid, papillate. Connective narrow, slightly thickened on dorsal surface and apically elongate to form a roof-like projection. Pollinia 2, oblong obovoid, dorsiventrally flattened, hard, unequally and deeply cleft, empty inside. Apical clinandrium obscure. Stigma large, elliptic, deeply concave. Rostellum short, conical-digitate in the middle, obtuse. Viscidium single, very small, elliptic, thick, fleshy. Tegula single, oblong,

apically expanded and here selliform, thin, lamellate. Rostellum remnant bilobulate in the middle, with oblique shallowly concave plate between acute lobules (Fig. 12).

About 10 Brazilian species are currently included in *Grandiphyllum*.

Saundersia Rchb. f., Rep. Proc. Int. Hort. Exhib. Bot. Congr. London 120. 1866. — TYPE: *Saundersia mirabilis* Rchb. f.

Epiphytic plants. Roots covered with indumentums. Pseudobulbs inconspicuous, covered by bracts. Leaf stiff, coriaceous, oblong-lanceolate. Inflorescence lateral, elongate, branched or not, few- to many-flowered. Flowers small. Ovary and sepals covered with dense indumentums. Sepals and petals subsimilar. Lip lanceolate with bilobulate apex, callus wedge-shaped. Gynostemium short. Column part obscure, distinctly shorter than anther, minutely papillate, with two apical wings on both sides of rostellum. Anther subdorsal, incumbent, operculate, dorsiventrally compressed, ellipsoid-cordate. Connective narrow, thin, papillate, forming prominent apical rostrate projection in front. Pollinia 2, obovoid-clavate, shallowly cleft at apex, hard. Apical clinandrium obscure. Stigma rather small, transversely elliptic, flat. Rostellum erect, rostrate-digitate, blunt. Viscidium single, small, oblong, thick, fleshy. Tegula single, linear, thin, lamellate. Rostellum remnant shallowly bilobed at apex (Fig. 13).

As currently recognized, the genus includes two orchid species which are restricted in their distribution to eastern Brazil.

Conclusions

The results of molecular studies of WILLIAMS et al. (2001) and NEUBIG et al. (2012) clearly revealed the close relation between *Trichocentrum*, *Lophiaris*, *Lophiarella*, *Cobniella*, *Saundersia* and *Grandiphyllum* and indicated their membership in the subtribe Oncidiinae. However, the morphological data incline to maintain all six genera as separated taxa. The separateness of *Cobniella* from the complex *Trichocentrum-Lophiaris-Lophiarella* was supported additionally by the results of leaf anatomical studies (CETZAL-IX et al. 2013). The distinctiveness of *Cobniella*, *Trichocentrum*, *Lophiaris* and *Lophiarella* was also suggested by CARNEVALI et al. (2013). Based on morphological differences between the studied taxa that were summarized in Table 1, we postulate to maintain the generic status of *Trichocentrum*, *Lophiaris*, *Lophiarella*, *Cobniella*, *Grandiphyllum* and *Saundersia*. The last genus is a case of strict conflict between molecular and morphological outcomes. The gynostemium structure and especially presence of dense indumentum covers on roots, ovary and sepals are unique in *Trichocentrum* clade. Even if the gynostemium architecture can tie *Saundersia* with Leochilinae *sensu* SZLACHETKO (1995), the very peculiar indumentums place it in a separate position in the whole subtribe Oncidiinae s.l. Therefore we propose to maintain status of *Saundersia* as *incertae sedis*.

Acknowledgements

We are grateful to the Curators and staff of the cited herbaria for access to their collections and facilities. We would like to thank Natalia Ołędryńska for preparing the illustrations. We are grateful to Emilio, Luiz Filipe Varella, Renato Ximenes Bolsanello and Brian Gratwicke for providing photos of the studied orchids. The research described here has been supported by the Polish Ministry of Science and Higher Education (research grant no. 8124/B/PO1/2011/40).

References

- BENTHAM G. (1881): Notes on Orchideae. – J. Linn. Soc., Bot. **18**: 281–360.
- BURNS-BALOGH P. & FUNK V.A. (1986): A phylogenetic analysis of the Orchidaceae. – Smithsonian Contr. Bot. **61**: 1–79.
- CAMERON K. M., CHASE M. W., WHITTEN W. M., KORES P. J., JARRELL D. C., ALBERT V. A., YUKAWA T., HILLS H. G. & GOLDMAN D. H. (1999): A phylogenetic analysis of the Orchidaceae: evidence from rbcL nucleotide sequences. – Amer. J. Bot. **86**: 208–224.
- CARNEVALI FERNÁNDEZ-CONCHA G., DUNO DE STEFANO R., ROMERO-GONZÁLEZ G. A., BALAM R., CETZAL-IX W., TAPIA-MUÑOZ J. L. & RAMÍREZ I. M. (2009): A reappraisal of the turtle-orchids, genus *Chelyorchis* (Oncidiinae: Orchidaceae): Molecular, phylogenetic, and morphometric approaches. – J. Torrey Bot. Soc. **136**: 164–185.
- CARNEVALI G., CETZAL-IX W., BALAM R., LEOPARDI C. & ROMERO-GONZÁLEZ G. A. (2013): A combined evidence phylogenetic recircumscription and a taxonomic revision of *Lophiarella* (Orchidaceae: Oncidiinae). – Syst. Bot. **38**: 46–63.
- CETZAL-IX W., NOGUERA-SAVELLI E., JAUREGUI D. & CARNEVALI G. (2013): Anatomía foliar comparada y sistemática del clado *Trichocentrum* con énfasis en *Cohniella* (Asparagales: Orchidaceae). – Revista Biol. Trop. **61**: 1–20.
- CHASE M. W., CAMERON K. M., BARRETT R. L. & FREUDENSTEIN J. V. (2003): DNA data and Orchidaceae systematics: a new phylogenetic classification. – In: DIXON K. W., KELL S. P., BARRETT R. L. & CRIBB P. J. [eds]: Orchid Conservation: 69–89. – Kota Kinabalu, Sabah: Natural History Publications.
- CHIRON G., OLIVEIRA P., SANTOS T., BELLVERT F., BERTRAND C. & VAN DEN BERG C. (2009): Phylogeny and evolution of *Baptistonia* (Orchidaceae, Oncidiinae) based on molecular analyses, morphology and floral oil evidences. – Pl. Syst. Evol. **281**: 35–49.
- CHRISTENSON E. A. (1999): The return of *Cohniella* (Orchidaceae: Oncidiinae). – Lindleyana **14**: 176–177.
- COGNIAUX A. (1906): Orchidaceae. *Oncidium*, Sect. *Teretifolia*. – Fl. Brasil. **3**: 437–444.
- DOCHA NETO A. & BAPTISTA D. H. (2006): *Grandiphyllum* Docha Neto: Revisão taxonômica, proposta de novas alianças e sinônimos em Orchidaceae. – Orchidstudium **1**: 17–25.
- DOCHA NETO A., BAPTISTA D. H. & CAMPACCI M. A. (2006): Novos generos baseados em *Oncidium* brasileiros. – Colet. Orquíid. Brasil. **3**: 20–95.
- DODSON C. (1989): Icones Plantarum Tropicarum series 2, fascicle 2. Orchids of Peru. – St. Louis: Missouri Botanical Garden.
- DRESSLER R. L. (1993): Phylogeny and classification of the orchid family. – Portland: Dioscorides Press.
- DRESSLER R. L. & DODSON C. H. (1960): Classification and phylogeny in the Orchidaceae. – Ann. Missouri Bot. Gard. **47**: 25–68.
- DUNSTERVILLE G. C. K. & GARAY L. A. (1965): Venezuelan orchids illustrated. Vol. 3. – London: Andre Deutsch.
- GARAY L. A. & STACY J. E. (1974): Synopsis of the genus *Oncidium*. – Bradea **1**: 393–429.
- HÁGSATER E. & SALAZAR G. A. (1990): Icones Orchidacearum, fascicle I. Orchids of Mexico, part 1. – Mexico: Asociación Mexicana de Orquideología.
- HOEHNE F. (1949): Iconografia de Orchidaceas do Brasil. – Sao Paulo: Secretaria de Agricultura.
- LINDLEY J. (1830–1840): The genera and species of orchidaceous plants. – London: Ridgways.
- NEUBIG K. M., WHITTEN W. M., WILLIAMS N. H., BLANCO M. A., ENDARA L., BURLEIGH J. G., SILVERA K., CUSHMAN J. C. & CHASE M. W. (2012): Generic recircumscriptions of Oncidiinae (Orchidaceae: Cymbidieae) based on maximum likelihood analysis of combined DNA datasets. – Bot. J. Linn. Soc. **168**: 117–146.

- PFITZER E. (1887):** Entwurf einer natürlichen Anordnung der Orchideen. – Heidelberg: Carl Winter's Universitätsbuchhandlung.
- PFITZER E. (1889):** Orchidaceae. – In: ENGLER A. & PRANTL K. [eds]: Die natürlichen Pflanzenfamilien, Teil 2, Abt. 6: 52–218. – Leipzig: Wilhelm Engelmann.
- POEPPIG E. & ENDLICHER S. (1838):** Nova genera ac species plantarum quas in regno Chilensi Peruviano et in terra Amazonica, annis 1827 ad 1832. – Leipzig: Hofmeister.
- RAFINESQUE C. (1838):** Flora Telluriana, 4. – Philadelphia: Probasco.
- ROMOWICZ A. & SZLACHETKO D. L. (2006):** Genera et species Orchidaliium 12. Oncidieae. – Polish Bot. J. **51**: 43–47.
- SCHLECHTER R. (1915):** Die Orchideen: ihre Beschreibung, Kultur und Züchtung. – Berlin: Paul Parey.
- SCHLECHTER R. (1926):** Das System der Orchidaceen. – Notizbl. Bot. Gart. Berlin-Dahlem **9**: 563–591.
- SENGHAS K. (1997):** Rudolf Schlechter's Die Orchideen, Band I/C: 33–36. – Berlin: Paul Parey.
- SZLACHETKO D. L. (1995):** Systema Orchidaliium. – Fragm. Florist. Geobot., Suppl. **3**: 1–152.
- SZLACHETKO D. L. & MYTNIK-EJSMONT J. (2009):** Gynostemia Orchidaliium IV. – Acta Bot. Fenn. **180**: 1–313.
- THIERS B. (2015):** Index Herbariorum: A global directory of public herbaria and associated staff. – New York Botanical Garden's Virtual Herbarium. – <http://sweetgum.nybg.org/ih/>
- VERMEULEN P. (1966):** The system of the Orchidales. – Acta Bot. Neerl. **15**: 224–253.
- WILLIAMS N. H., CHASE M. W., FULCHER T. & WHITTEN W. M. (2001):** Molecular systematics of the Oncidiinae based on evidence from four DNA regions: expanded circumscriptions of *Cyrtochilum*, *Erycina*, *Otoglossum* and *Trichocentrum* and a new genus (Orchidaceae). – Lindleyana **16**: 113–139.
- WILLIAMS N. H., WHITTEN W. M. & DRESSLER R. L. (2005):** Molecular systematics of *Telipogon* (Orchidaceae: Oncidiinae) and its allies: nuclear and plastid DNA sequence data. – Lankesteriana **5**: 163–184.

Address of the authors:

Dariusz L. Szlachetko
Marta Kolanowska (author for correspondence)
Department of Plant Taxonomy and Nature Conservation
The University of Gdańsk
Wita Stwosza 59
80-308 Gdańsk
Poland
E-mail: martakolanowska@wp.pl

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Wulfenia](#)

Jahr/Year: 2016

Band/Volume: [23](#)

Autor(en)/Author(s): Szlachetko Dariusz L., Kolanowska Marta

Artikel/Article: [Notes on the genus *Trichocentrum* \(Orchidaceae, Oncidieae\) and its relatives 203-220](#)