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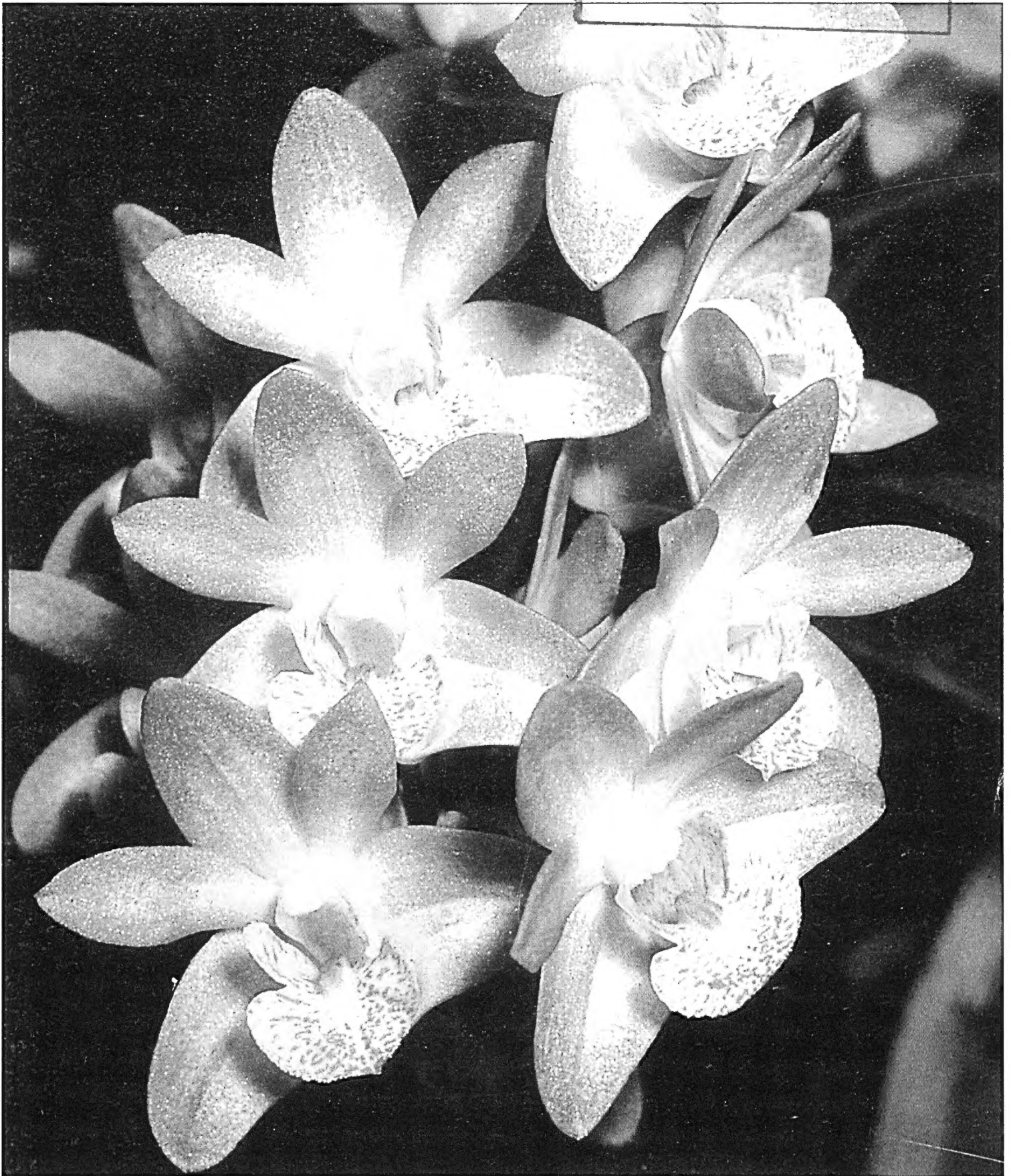
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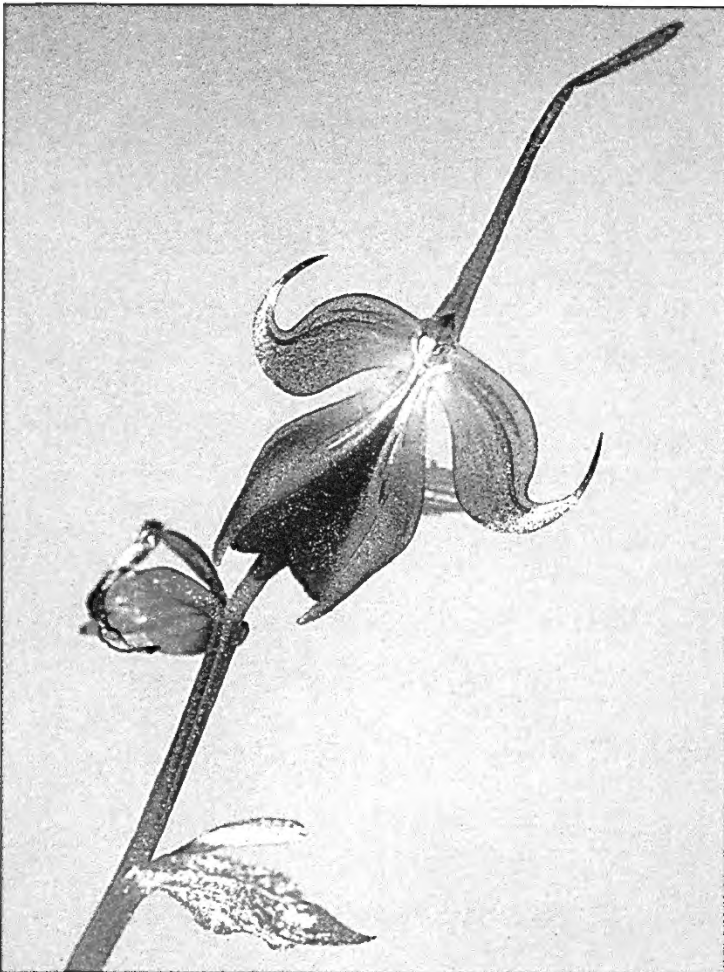
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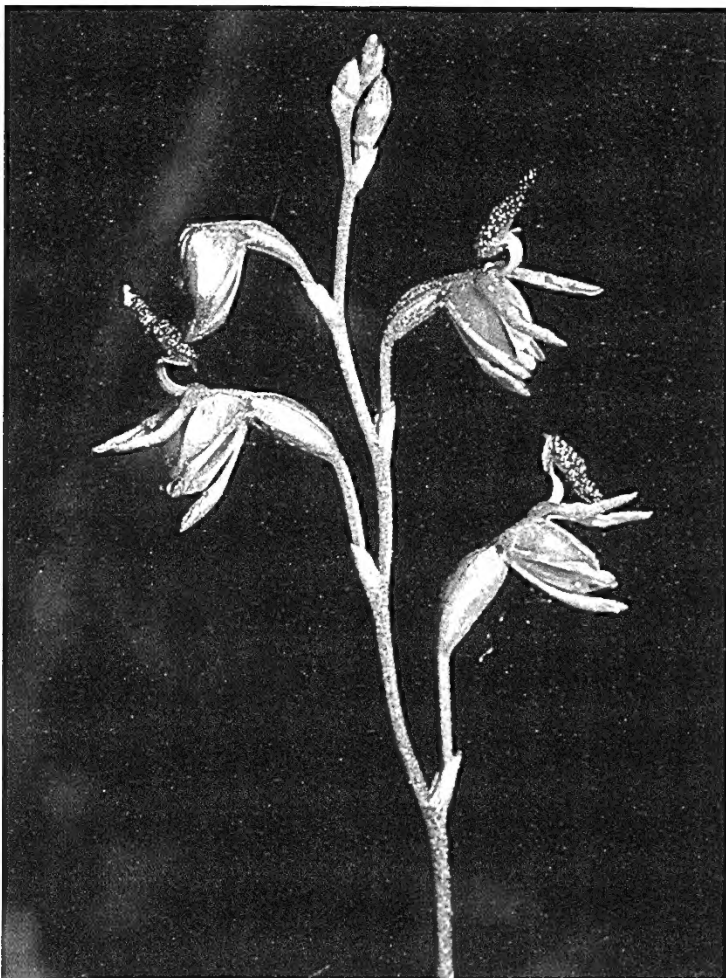
M.A. Clements

*Acianthopsis cymbalariifolia*  
from New Caledonia



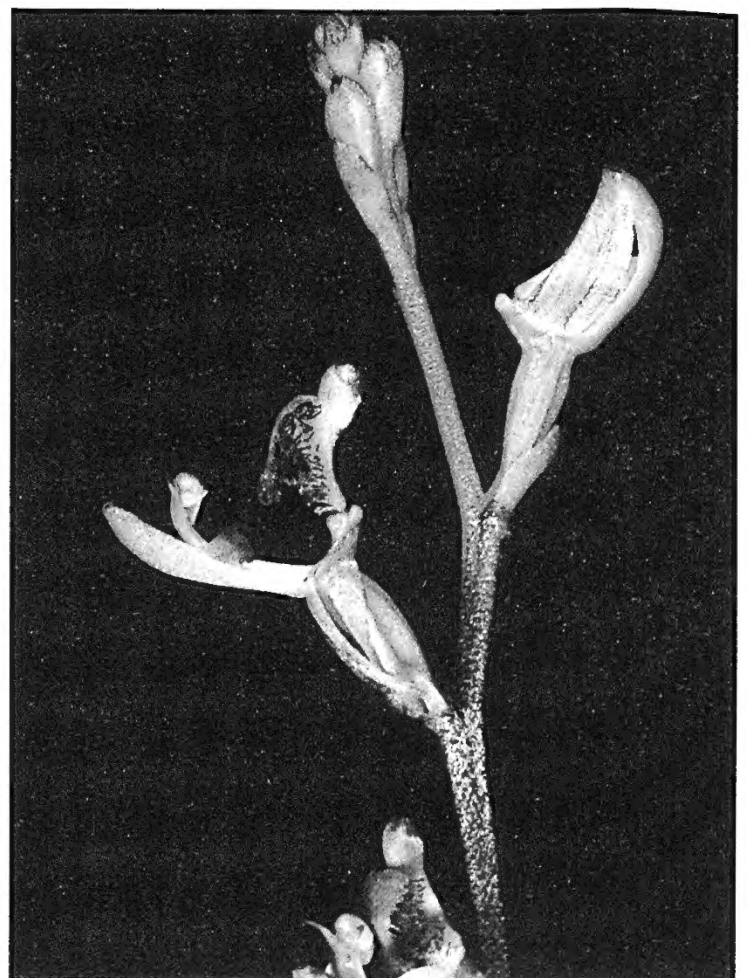
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*Megastylis gigas*  
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M.A. Clements

*Paracaleana minor*  
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M.A. Clements

*Phoringopsis dockrillii*  
from north of Little Forks, Queensland



# Nomenclatural Notes Arising from Studies into the Tribe Diurideae (Orchidaceae)

a 200386

David L. Jones<sup>1</sup>, Mark A. Clements<sup>1</sup>, Ish K. Sharma<sup>1</sup>,  
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## Abstract

One new subfamily (Codonorchidoideae), one new tribe (Coilochilideae), five new subtribes (Achlydosinae, Adenochilidinae, Eriochilidinae, Spuriacianthinae, Townsoniinae), eleven new genera (*Achlydosa*, *Acianthopsis*, *Anzybas*, *Gastrosiphon*, *Hydrorchis*, *Microtidium*, *Molloybas*, *Nemacianthus*, *Phoringopsis*, *Singularibas*, *Thynninorchis*), three reinstated genera (*Calcearia*, *Corysanthes*, *Nematoceras*) and necessary nomenclatural transfers are proposed to accommodate anomalies identified during analysis of nuclear DNA sequence data and associated morphological and biological studies of the Diurideae. Also *Caleana* is accepted as distinct from *Paracaleana* and the subgenus *Tanychila* is established; the recently established genus *Spuriacianthus* is accepted and a new combination for *Simpliglottis* is made at subgeneric rank. New combinations for recently described taxa from Western Australia are made in the genera *Arachnorchis*, *Calonema* and *Drakonorchis*.

## Introduction

In the traditional sense the tribe Diurideae is comprised of 10 subtribes and 38 genera (Dressler 1993). Recently this has been modified by the reinstatement of *Leptoceras* and the erection of two new genera in the Caladeniinae (Hopper and Brown 2000); the placement of *Codonorchis* into its own tribe (Cribb and Kores 2000); the elevation of *Acianthus* section *Univiscidiatus* to generic rank (Szlachetko 2001); the erection of *Spuriacianthus* (Szlachetko and Margonska 2001) and *Simpliglottis* (Szlachetko 2001); and, again in the Caladeniinae, the erection of four new genera (*Arachnorchis*, *Glycorchis*, *Stegostyla* and *Pheladenia*), the reinstatement of *Petalochilus* and the elevation of *Caladenia* section *Calonema* and subgenus *Drakonorchis* to generic rank (Jones *et al* 2001).

The majority of genera and species in the Diurideae are centred on the Australasian region and have been the focus of morphological studies by us over many years. Some of these studies have resulted in the reinterpretation of existing genera (Jones and Clements 1987, 1989), and the erection of new genera such as *Pyrorchis* (Jones and Clements 1994) and *Waireia* (Jones *et al* 1997). Additionally a supportive morphological study was published in conjunction with a thesis on reproductive biology

(Clements 1995). Further morphological studies, as yet unpublished, show considerable discontinuities within some genera, including the existence of several readily-recognisable natural groups. The various species, which form each natural group, share a number of morphological characters, suggesting that, as a group, they could be recognised infragenerically or at a higher rank. Studies based on morphology are ongoing, but extra evidence to support the ranking given to these natural groups has been obtained from molecular studies.

Analysis of DNA sequence data from the internal transcribed spacer of nuclear ribosomal DNA (nrITS), and in part combined with morphological data (Clements *et al*, in press), supports the view that the current interpretation of genera and subtribes within the Diurideae requires some adjustments. New genera, reinstated genera, a new subfamily, a new tribe and new subtribes that need to be erected, are the subject of this paper. The generic changes are well supported by a substantial number of base pair changes indicating them to be an end point of an ancient divergence. Certain existing genera, which are in need of recircumscription, will be dealt with in separate treatments.

## Materials and Methods

This study is based on the examination of fresh plant material and dried and spirit herbarium specimens from AD, AK, BM, BRI, CANB, E, HO, K, L, LINN, MEL, NSW, P, W and WELT. Wherever possible all pertinent types, or photographs thereof, have been examined. Representative taxa, comprising c. 360 species, including those from all major taxonomic lines within the Diurideae, were used in the molecular study. The choice of outgroups was based on results of molecular analyses of the Diurideae (Clements *et al*, in press). Fresh leaf samples from plants of known provenance were used where possible or rarely material was sampled from herbarium specimens or from floral dissection cards. All collections were vouchered, the majority being deposited at the Australian National Herbarium (CANB) or at the Landcare Research Herbarium, Lincoln (CHR). The methods used for DNA extraction and sequencing are outlined (Clements *et al*, in press). This paper also includes details of the vouchers used in the study.

## Results and Discussion

An overall assessment of the subfamily Orchidoideae centered on the Diurideae was undertaken through a cladistic analysis of 108 species, these being representative of all taxonomic groups including the outgroups *Apostasia*, *Cypripedium*, *Epidendrum* and *Vanilla*. Analysis of the manually aligned data set, with all gaps removed, from an alignment of 308 nucleotide sites of which 189 were potentially parsimony-informative, produced 240 equally parsimonious trees; tree length = 1773; consistency index (CI) = 0.2657; consistency index excluding uninformative characters = 0.2448; retention index (RI) = 0.6404; and rescaled consistency index (RC) = 0.1701.

The results show that subfamily Orchidoideae, as currently circumscribed, is paraphyletic, although well isolated from *Apostasia* (Aposatioideae), *Cypripedium* (Cypripedioideae) and *Vanilla* (Vanillioideae). *Coilochilus*, which hitherto has been treated as part of the Diurideae, within the Cryptostylidinae, aligns with *Epidendrum nocturnum* Jacq., the type of *Epidendrum* (Epidendroideae) (Fig. 1). Similarly *Codonorchis*, which was by previous authors (Schlechter, 1926; Dressler, 1981, 1993) treated as part of the subtribe Chloraeinae within the Diurideae, and recently (Cribb and

Kores, 2000) as the tribe Codonorchideae in subfamily Orchidoideae, is sister to the Epidendroideae or separated from it in a clade positioned nearer to the outgroup taxa. The removal of *Codonorchis* and *Coilochilus* from the Orchidoideae leaves that subfamily comprised of three main clades that equate broadly to the tribes Orchideae-Diseae, Cranichideae and Diurideae *sensu* Dressler (1993).

Examination of the arrangement of taxa within these three groups reveals a number of anomalies. Representatives of the subfamily Spiranthoideae (Dressler 1979, 1981, 1993; Stern *et al* 1993), viz. *Spiranthes*, *Odontorhynchus* (Spiranthinae); *Stenoptera* (Pescottiinae); *Lepidogyne*, *Zeuxine* (Goodyerinae) and *Pachyplectron* (Pachyplectroninae), are all deeply embedded within the Cranichideae, rendering that subfamily concept obsolete. With the removal of *Codonorchis*, the remaining elements of the Chloraeinae, representatives of the Pterostylidinae and *Megastylis glandulosa* align with representatives of the Cranichideae (Pescottiinae, Spiranthinae, Goodyerinae and Pachyplectroninae) on a well supported clade (97% bootstrap support) sister to the Orchideae.

These results also reveal a polyphyletic Diurideae *sensu* Dressler (1979, 1981, 1993). Sister to the Cranichideae and Diseae-Orchideae, are the remaining elements of a monophyletic Diurideae, comprising thirteen subtribes; Rhizanthellinae, Prasophyllinae, Cryptostylidinae, Drakaeinae, Thelymitrinae, Megastylidinae, *Eriochilus* ("Eriochilidinae"), *Acianthus atepalus* ("Spuriacianthinae"), *Townsonia* ("Townsoninae"), Acianthinae, Diuridinae, *Adenochilus* ("Adenochilidinae") and Caladeniinae.

Results obtained from ITS sequences reveal a number of disjunct monophyletic groups occurring within some genera in these subtribes, particularly *Acianthus*, *Arthrochilus*, *Microtis* and *Corybas*. We have chosen to treat these groups at generic rank in line with our recent treatment of the Caladeniinae (Jones *et al* 2001).



### Taxonomy

**SUBFAMILY:** Codonorchidoideae (P.J.Cribb) M.A.Clem. et D.L.Jones, *subfamily et stat. nov.*  
**Basionym:** Codonorchideae P.J.Cribb, *Lindleyana* 15: 169 (2000). Type: *Codonorchis* Lindl.

The position of *Codonorchis* outside the Orchidoideae and sister to the Epidendroideae, renders the Orchidoideae paraphyletic, necessitating a proposed change in status for the taxon.

### Distribution

A monogeneric subfamily endemic to southern South America.

**SUBFAMILY:** Epidendroideae Lindl.

**TRIBE:** Coilochilideae M.A.Clem. et D.L.Jones, *trib. nov.*; tribus aliis Orchidoidearum cataphyllae persistentibus scariosis ad apicem caulis; radicibus verrucosis; floribus minutis non-resupinatis, sepalis et petalis liberis subsimilibus; et alis columnae ruminatis vestigiali mitra formanti, distinguenda. Type: *Coilochilus* Schltr.

### Recognition

Distinguished by persistent scarious cataphylls at the stem apex; verrucose roots; minute, non-resupinate flowers with free, subsimilar sepals and petals; and ruminant column wings forming a vestigial mitra.

### Distribution

A monogeneric tribe endemic to New Caledonia.

**SUBFAMILY:** Orchidoideae Lindl.

**TRIBE:** Cranichideae Endl.

1. *Achlydosa* M.A.Clem. et D.L.Jones, *gen. nov.*  
 Affinis *Megastylis* (Schltr.) Schltr., sed trichomatibus glandularis maximam partem; sepalis lateralis basi conjunctis; petalis sepalis marginaliter conjunctis, quam sepalis lateralis multo majoribus; labello nectaro; callo constans ex taenia media incrassata inornata. Type species: *Lyperanthus glandulosa* Schltr. (*Megastylis glandulosa* (Schltr.) Schltr.).

### Recognition

Distinguished morphologically from *Megastylis* (Megastylidinae), with which it was formerly included, by the presence of glandular trichomes on most floral segments; the lateral sepals being fused in the proximal half; the petals being much larger than the lateral sepals

and with their margins fused to the sepals; the labellum with nectar; and, the callus consisting of a simple thickened central band which lacks any associated calli.

### Distribution

A monotypic genus endemic in New Caledonia.

### Etymology

Derived from the Greek *a*, without, lacking and *chlidos*, embellishment, ornament, decoration, in reference to the unadorned labellum callus.

### New Combination:

*Achlydosa glandulosa* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Lyperanthus glandulosus* Schltr., *Bot. Jahrb. Syst.* 39: 44 (1906).

*Megastylis glandulosa* (Schltr.) Schltr., *Bot. Jahrb. Syst.* 45: 379 (1911).

**Subtribe:** Achlydosinae M.A.Clem. et D.L.Jones, *subtrib. nov.*; subtribus aliis Achlydosinarum foliis corneis coriaceis; sepalis et petalis lateralibus marginibus eorum conjunctis; disci taeniae centrali tumida sine callis; polliniis duobus; et viscidio absentibus; distinguenda. Type: *Achlydosa* M.A.Clem. et D.L.Jones.

### Recognition

Distinguished by hard coriaceous leaves; lateral sepals and petals fused along their margins; disc lacking calli, consisting of a thickened central band; two pollinia; and, viscidium absent.

**TRIBE:** Diurideae Endl.

**SUBTRIBE:** Acianthinae Schltr.

This subtribe is comprised of two main alliances.

### The *Acianthus* Alliance

A group of seven genera, two newly erected here. See Table 2 for selected diagnostic characters of the genera.

## 2. *Acianthus* R.Br., *Prod.* 321 (1810).

Type species: *Acianthus exsertus* R.Br.

### Recognition

Recognised by sepals with a distinct linear-terete apical extension; unlobed labellum with entire or denticulate, revolute margins; fleshy, papillate callus dominating the labellum lamina with two prostrate, tonsil-like, basal glands and a narrow, reticulate longitudinal channel; an unwinged column; pollinia bilobed, attached to hemiviscidia; and pollen waxy.

### Distribution

A genus of eight species endemic in Australia and New Zealand.

### Etymology

Derived from the Greek *akis*, point and *anthos*, flower, in reference to slender apices on the sepals.

3. *Acianthopsis* M.A.Clem. et D.L.Jones, *gen. nov.* Affinis *Aciantho* R.Br., sed sepalis amplitudinibus et formis dissimilibus et sine extensionibus apicalibus; petalis grandibus, 3-5-costatis, saepe sigmoideis; et callo constanti lamina mediali vestigiali vel columine humile, sine canale medio. Type species: *Acianthus cymbalariifolius* F.Muell. et Kraenzl.

*Acianthus* subgenus *Univisciadatus* section *Macropetalus* Kores, *Allertonia* 7(3): 149 (1995). Type species: *Acianthus cymbalariifolius* F.Muell. et Kraenzl.

*Univisciadatus* section *Macropetalus* (Kores) D.L.Szlachetko, *Polish J. Bot.* 46(1): 21 (2001).

### Recognition

Recognised by relatively large, ascending flowers; dorsal sepal and lateral sepals dissimilar in shape and size; petals proportionately broad, oblong, obovate or lanceolate, 3-5-veined petals, often sigmoid; sepal tips lacking linear-terete extensions; labellum with or without a single erect basal gland; and, callus consisting of a vestigial medial plate or low ridge, without a central channel.

### Distribution

A genus of about eight species endemic in New Caledonia.

### Etymology

From *Acianthus*, another genus of orchid and *-opsis*, resemblance.

### New Combinations:

*Acianthopsis bracteatus* (Rendle) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus bracteatus* Rendle, *J. Linn. Soc.* 45: 254, pl.13, f.1 (1921).

*Acianthopsis corniculatus* (Rendle) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus corniculatus* Rendle, *J. Linn. Soc. Bot.* 45: 255, pl. 13, f. 2 (1921).

*Acianthopsis cymbalariifolius* (F.Muell. et Kraenzl.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus cymbalariifolius* F.Muell. et Kraenzl. *Oesterr. Bot. Z.* 44: 209 (1894).

*Acianthopsis grandiflorus* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus grandiflorus* Schltr., *Bot. Jahrb. Syst.* 39: 39 (1906).

*Acianthopsis halleanus* (Kores) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus halleanus* Kores, *Allertonia* 7(3): 149 (1995).

*Acianthopsis oxyglossus* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus oxyglossus* Schltr., *Bot. Jahrb. Syst.* 39: 40 (1906).

*Acianthopsis tenuilabris* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus tenuilabris* Schltr., *Bot. Jahrb. Syst.* 39: 42 (1906).

*Acianthopsis veillonis* (N.Hallé) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Acianthus veillonis* N.Hallé, *Fl. Nouv.-Caléd. Et Depend.* 8: 427, pl.174(1-5) (1978).

4. *Nemacianthus* D.L.Jones et M.A.Clem., *gen. nov.* Affinis *Aciantho* R.Br., sed sepalis extensionibus apicalibus longis attenuato-filiformibus; callis basalibus erectis; columna alis vestigialibus; et polliniis reniformibus, polline farinaceo. Type species: *Acianthus caudatus* R.Br.

*Acianthus* subgenus *Acianthus* section *Caudatus* Kores, *Allertonia* 7(3): 194 (1995). Type species: *Acianthus caudatus* R. Br.



### Recognition

Recognised by sepals with a long filiform-attenuate apical extension; unlobed labellum with entire margins; fleshy, papillate callus dominating the labellum lamina, with two erect columnar basal glands and a narrow, reticulate longitudinal channel; a weakly winged column; reniform pollinia; and, mealy pollen.

### Distribution

A monotypic genus endemic in Australia.

### Etymology

From the Greek, *nema*, thread and *Acianthus*, another genus of Orchidaceae; in reference to the long, filiform-attenuate extension on the sepals.

### New Combination:

*Nemacianthus caudatus* (R.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Acianthus caudatus* R.Br., *Prod.* 321 (1810).

5. *Stigmatodactylus* Maxim. ex Makino, *Illust. Flora Japan* 1(7): 70, pl. 43 (1891). Type species: *Stigmatodactylus sikokianus* Maxim. ex Makino.

*Pantlingia* Prain, *J. Asiat. Soc. Bengal*, pt 2, *Nat. Hist.* 65(2): 107 (1896).

### Recognition

Characterised by slender roots with or without lateral tubers; posterior margin of the stigma with a prominent dactyliform appendage; callus prominent, consisting of a well-developed ridge or plate, often with accessory ridges and keels; column with an anterior appendage and often also with a fleshy projecting basal appendage.

### Distribution

A genus of about eleven species distributed from the Himalayas south-east to Indonesia, Borneo, New Guinea and the Solomon Islands.

### Etymology

Derived from the Greek, *stigmatos*, stigma and *dactylos*, finger, in reference to a dactyliform appendage on the lower stigma margin.

### New combination

*Stigmatodactylus lamrii* (J.J.Wood et C.L.Chan) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Pantlingia lamrii* J.J.Wood et C.L.Chan, *The Plants of Mount Kinabalu* 2: 274, f.46 (1993).

6. *Univiscidiatus* (Kores) Szlachetko, *Polish Bot. J.* 46(1): 20 (2001).

Type species: *Acianthus elegans* Rchb.f.

*Acianthus* R.Br. subgenus *Univiscidiatus* section *Univiscidiatus* Kores, *Allertonia* 7(3): 163 (1995).

### Recognition

Recognised by small, green or greenish flowers; dorsal sepal and lateral sepals similar in shape and size; narrowly linear, straight petals; sepal tips which lack linear-terete extensions; labellum lacking basal glands, although sometimes with enlarged basal parts of the callus ridges; callus consisting of a weak medial ridge or plate without a central channel; and, subentire pollinia attached to a single viscidium.

### Distribution

A genus of about seven species distributed in Australia, (two endemic species), and New Caledonia.

### Etymology

Derived from the Latin, *uni*, single and *viscidium*, sticky gland, in reference to the single viscidium.

### New Combination:

*Univiscidiatus sublestus* (Dockrill) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Acianthus sublestus* Dockrill, *North Queensland Naturalist* 23(110): f. (1956).

### Other Australian Species:

*Univiscidiatus amplexicaulis* (F.M.Bailey) Szlachetko, *Polish Bot. J.* 46(1): 21 (2001). Basionym: *Microstylis amplexicaulis* F.M.Bailey, *Bot. Bull. Dept. Agric. Queensland* 3: 18 (1891).

Key to genera of the *Acianthus* alliance (including *Townsonia* and *Spuriacianthus*)

1. Roots lacking tubers 2  
 1: Roots with tubers 3
2. Leaf lamina erect; flowers lacking petals; callus with a weak central plate; column lacking any anterior appendage *Spuriacianthus*  
 2: Leaf lamina horizontal; flowers with petals; callus with an enlarged central plate, often with accessory keels and ridges; column with an anterior appendage and often also with a fleshy projecting basal appendage *Stigmatodactylus*
3. Leaves multiple; lamina erect; column winged throughout *Townsonia*  
 3: Leaf solitary: lamina horizontal; column unwinged or with vestigial wings at the apex 4
4. Callus with a narrow, reticulate, central longitudinal channel 5  
 4: Callus without a central channel 6
5. Sepals ending in linear-terete structures; column wings absent; pollen waxy *Acianthus*  
 5: Sepals with long linear-attenuate extensions, never linear-terete; column wings vestigial; pollen mealy *Nemacianthus*
6. Tubers lateral; posterior margin of the stigma with a prominent dactyliform appendage; callus prominent, consisting of a well-developed ridge or plate, often with accessory ridges and keels; column with an anterior appendage and often also with a fleshy projecting basal appendage *Stigmatodactylus*  
 6: Tubers terminal; posterior margin of stigma smooth; callus poorly developed or vestigial, consisting of a smooth central plate or low ridge; column usually lacking an anterior appendage, never with a fleshy projecting basal appendage 7
7. Flowers small; sepals similar in shape and size; petals narrow, 1-veined *Univiscidiatus*  
 7: Flowers moderately sized; dorsal sepal dissimilar in shape and size to the lateral sepals; petals broad, 3-5-veined *Acianthopsis*

The *Corybas* Alliance

The Australian and New Zealand *Corybas* segregate morphologically into six groups which are supported by molecular studies (Clements *et al*, in press) and are formally segregated here into six genera, two reinstated and three newly erected. Studies into the Malesian taxa are continuing as material comes to hand but the majority of taxa fit into *Corybas*, *Calcearia* or *Gastrosiphon*, the former reinstated and the latter newly raised here to generic rank. This makes a total of eight genera in the *Corybas* alliance.

See Table 1 for selected diagnostic characters of the Australian and New Zealand genera.

7. *Anzybas* D.L.Jones et M.A.Clem., *gen. nov.* Affinis *Corybas* Salisb., sed sepalo dorsali longi-unguiculato, labello omnino tubuliformi apertione apicali, auriculis labelli apertis, callis acicularibus serialis pagina ventrali labelli, columna elongata pulvinum ventralem tumidum

deficienti differt. Type species: *Corybas unguiculatus* (R.Br.) Rchb.f.

*Corybas* Salisb. section *Steleocorys* (Endl.) P.Royen in *Phanerogamarum Monographiae* Tomus XVI: 20 (1983). Type species: *Corybas unguiculatus* (R.Br.) Rchb.f.

*Corysanthes* R.Br. section *Steleocorys* Endl., *Gen. Pl.* 218 (1837).

*Corybas* Salisb. section *Auriculata* P.Royen, *Alp. Fl. New Guinea* 2: 69 (1978).

*Corybas* Salisb. subgenus *Steleocorys* (Endl) Szlachetko, *Polish. Bot. J.* 46(1): 22 (2001).

## Recognition

This genus has affinities with *Corybas* Salisb. but with a long-clawed dorsal sepal; labellum tubular throughout, the upper margins fused, with an apical opening subtended by a beak-like platform; open-ended labellum auricles; multiseriate acicular calli in one or more rows on the ventral surface of the labellum; and, an elongate column, lacking a swollen ventral pad.



### Distribution

A genus of about six species occurring in Australia and New Zealand.

### Etymology

Derived from the acronym for Australia and New Zealand (ANZ) and the last four letters of *Corybas*, a closely allied genus of orchids.

### New Combinations

*Anzybas abditus* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas abditus* D.L.Jones, *Austral. Orch. Res.* 2: 44, f. 55 (1991).

*Anzybas carsei* (Cheesem.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corysanthes carsei* Cheesem., *Trans. & Proc. New Zealand Inst.* 44: 162 (1912). *Corybas carsei* (Cheesem.) Hatch, *Trans. & Proc. Roy. Soc. New Zealand* 75: 367 (1945).

*Anzybas fordhamii* (Rupp) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corysanthes fordhamii* Rupp, *Victorian Naturalist* 58: 83-4, f. (1941). *Corybas fordhamii* (Rupp) Rupp, *Victorian Naturalist* 59: 61 (1942).

*Anzybas montanus* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas montanus* D.L.Jones, *Austrobaileya* 2(5): 547-9, f. 1A&B (1988).

*Anzybas rotundifolius* (J.D.Hook.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Nematoceras rotundifolia* J.D.Hook., *Fl. Nov.-zel.* 1: 251 (1853). *Corysanthes matthewsii* Cheesem., *Trans. & Proc. New Zealand Inst.* 31: 351 (1899). *Corybas matthewsii* (Cheesem.) Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 19: 23 (1923).

*Anzybas unguiculatus* (R.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corysanthes unguiculata* R.Br., *Prod.* 328 (1810). *Corybas unguiculatus* (R.Br.) Rchb.f., *Beitr. Syst. Pflanzenk.* 43 (1871).

8. *Calcearia* Blume, *Bijdr.* 417 (20 Sept.- 7 Dec. 1825). Type species: *Calcearia picta* Blume.

### Recognition

Recognised by the porrect to obliquely erect, long, filiform lateral sepals and petals; short, closed labellum spurs; and, short column lacking a swollen ventral pad.

### Distribution

A genus of c. 70 species widely distributed from the Himalayas and China to Malesia, and to Samoa and Tahiti in the Pacific Ocean.

### Etymology

Derived from the Latin *calceus*, shoe or slipper, in reference to the shape of the labellum of some species.

### New Combinations

*Calcearia acuta* (J.Dransf. et J.B.Comber) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas acutus* J.Dransf. et J.B.Comber, *Kew Bull.* 41(3): 595, t. 3C, f. 7 (1986).

*Calcearia albipurpurea* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas albipurpureus* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 70-72,74, f. 15 (1983).

*Calcearia amabilis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas amabilis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 33-34, f. 3 (1983).

*Calcearia amungwiwensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas amungwiwensis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 98-100, f. 26 (1983).

*Calcearia arachnoidea* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes arachnoidea* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 20-21 (1911).

*Calcearia aristata* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes aristata* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 20 (1911).

*Calcearia bancana* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes bancana* J.J. Sm., *Bull. Jard. Bot. Buitenzorg* (ser. 3), 2: 18 (1920).

*Calcearia betchei* (F.Muell.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes betchei* F.Muell., *Sth Sci. Rec.* 1(2): 171 (1881).

*Calcearia betsyi* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas betsyi* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 83-84, f. 20 (1983).

*Calcearia boridiensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas boridiensis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 60, 62, f. 13 (1983).

*Calcearia bryophila* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas bryophilus* J.J.Sm., *Mitt. Inst. Bot. Hamburg* 37: 15 (1927).

*Calcearia calcicola* (J.Dransf. et G.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas calcicolus* J.Dransf. et G. Sm., *Kew Bull.* 41(3): 608-610, t. 5A (1986).

*Calcearia callifera* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes callifera* J.J.Sm., *Bull. Dépt. Agric. Néerl.* 19: 12 (1918).

*Calcearia calopeplos* (J.Dransf. et G.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas calopeplos* J.Dransf. et G. Sm., *Kew Bull.* 41(3): 584-6, f.3 (1986).

*Calcearia carinata* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes carinata* J.J. Sm., *Bull. Dépt. Agric. Néerl.* 13: 8 (1907).

*Calcearia carinulifera* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes carinulifera* Schltr., *Repert. Spec. Nov. Regni Veg.* 16: 42 (1919).

*Calcearia caudata* (Holttum) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas caudatus* Holttum, *Gard. Bull. Singapore* 11: 278 (1947).

*Calcearia compta* (J.Dransf. et G.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas comptus* J.Dransf. et G. Sm., *Kew Bull.* 41(3): 606, t. 4D, f.12 (1986).

*Calcearia crenulata* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas crenulatus* J.J.Sm., *Mitt. Inst. Bot. Hamburg* 7: 16 (1927).

*Calcearia cymatilis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas cymatilis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 64-66, f. 14 (1983).

*Calcearia ecarinata* (K.Anker et Seidenf.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas ecarinatus* K.Anker et Seidenf., *Nordic J. Bot.* 20(5): 557-559, f.1-2 (2000).

*Calcearia epiphytica* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes epiphytica* J.J.Sm., *Bull. Jard. Bot. Buitenzorg* (ser. 2), 11: 1 (1911).

*Calcearia erythrocarpa* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas erythrocarpus* J.J. Sm., *Nova Guinea* 18: 11, t. 111, 2 (1935).

*Calcearia geminigibba* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas geminigibbus* J.J. Sm., *Mitt. Inst. Bot. Hamburg* 37: 13 (1927).

*Calcearia gemmata* (P.J.Cribb et B.Lewis) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas gemmatus* P.J.Cribb et B.Lewis, *Orch. Solomon Isl. & Bougainville* 52 (1991).

*Calcearia himalaica* (King et Pantl.)M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes himalaicus* King et Pantl., *J. Ass. Soc. Bengal* 55: 128 (1876).

*Calcearia holttumii* (J.Dransf. et G.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas holttumii* J.Dransf. et G. Sm., *Kew Bull.* 41(3): 590-92, t. 2C, f. 6 (1986).

*Calcearia insulifloris* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas insulifloris* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 27-30, f.1 (1983).



*Calcearia kinabaluensis* (Carr) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas kinabaluensis* Carr, *Gard. Bull. Strait. Settlements* 8: 173 (1935).

*Calcearia koresii* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas koresii* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 86-89, f. 21 (1983).

*Calcearia lacerata* (L.O.Williams) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas laceratus* L.O. Williams, *Bot. Mus. Leaflet* 15: 54 (1937).

*Calcearia ledermannii* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes ledermannii* Schltr., *Bot. Jahrb. Syst.* 58: 53 (1923).

*Calcearia leucotyle* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes leucotyle* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 23-24 (1911).

*Calcearia longipedunculata* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas longipedunculatus* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 124, 126-128, f. 35 (1983).

*Calcearia longipetala* (Ridl.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes longipetala* (as "*longipetalus*") Ridl., *Trans. Linn. Soc. London, Bot.* (ser. 2), 9: 207 (1916).

*Calcearia mammillifera* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas mammilliferus* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 76, 78, f. 18 (1983).

*Calcearia mankiensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas mankiensis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 54, 56, f. 11A (1983).

*Calcearia merrillii* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes merrillii* Ames, *Orch.* 1: 65 (1905).

*Calcearia minuta* (Drake) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Liparis minuta* Drake, *Fl. Ins. Mar. Pacif.* 306 (1892).

*Calcearia mirabilis* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes mirabilis* Schltr., *Bull. Herb. Boiss.* (ser. 2), 6: 296 (1906).

*Calcearia monti-stellaris* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas monti-stellare* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 74, f. 16 (1983).

*Calcearia nana* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas nanus* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 48-50, f. 9 (1983).

*Calcearia naviculisepala* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas naviculisepalus* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 92, 94, f. 24 (1983).

*Calcearia pilifera* (J.Dransf.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas piliferus* J.Dransf., *Kew Bull.* 41(3): 588-90, t. 2F, f. 5 (1986).

*Calcearia ponapensis* (Hosok. et Fukuy.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes ponapensis* Hosok. et Fukuy., *Trans. Nat. Hist. Soc. Formosa* 25: 17 (1935).

*Calcearia porphyra* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas porphyrus* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 80-82, f. 19 (1983).

*Calcearia praetermissa* (J.Dransf. et J.B.Comber) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas praetermissus* J.Dransf. et J.B. Comber, *Kew Bull.* 41(3): 592-3, t. 2E (1986).

*Calcearia puberula* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes puberula* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 21-22 (1911).

*Calcearia ridleyana* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas ridleyanus* Schltr., *Repert. Spec. Nov. Regni Veg.* 19: 20 (1923).

*Calcearia rosea* (Janch.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes rosea* Janch., *Oester. Bot. Zeitsch.* 79: 353-354 (1930).

*Calcearia saprophytica* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes saprophytica* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 25 (1911).

*Calcearia selangorensis* (J.Dransf. et G.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas selangorensis* J.Dransf. et G.Sm., *Kew Bull.* 41(3): 606-8, t. 5C, f.13 (1986).

*Calcearia serpentina* (J.Dransf.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas serpentinus* J.Dransf., *Kew Bull.* 41(3): 604-5, t. 5B, f.11 (1986).

*Calcearia sinii* (T.Tang et C.W.Wang) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas sinii* T.Tang et C.W.Wang, *Acta Phytotax. Sinica* 1: 186 (1951).

*Calcearia solomonensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas solomonensis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 123-124, f. 34 (1983).

*Calcearia speculum* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes speculum* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 22-23 (1911).

*Calcearia striata* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes striata* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 21 (1911).

*Calcearia taiwanensis* (T.P.Lin et S.Y.Lu) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas taiwanensis* T.P.Lin et S.Y.Lu, *Taiwania* 20(2): 162 (1975).

*Calcearia taliensis* (T.Tang et C.W.Wang) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas taliensis* T.Tang et C.W.Wang, *Acta Phytotax. Sinica* 1: 185 (1951).

*Calcearia torricellensis* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes torricellensis* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 23 (1911).

*Calcearia umbonata* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes umbonata* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 24 (1911).

*Calcearia umbrosa* (J.Dransf. et J.B.Comber) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas umbrosus* J.Dransf. et J.B.Comber, *Kew Bull.* 41(3): 580-582, f. 2 (1986).

*Calcearia villosa* (J.Dransf. et G.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas villosus* J.Dransf. et G. Sm., *Kew Bull.* 41(3): 599, t. 4A,B,C, f.9 (1986).

*Calcearia vinosa* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes vinosa* J.J. Sm., *Bull. Jard. Bot. Buitenzorg (ser. 3)*, 3: 234 (1921).

9. *Corybas* Salisb. *Parad. Lond.* t.83 (1807).  
Type species: *Corybas aconitiflorus* Salisb.

*Corybas* section *Corybas*, P.Royen, *Phanerogamarum Monographiae Tomus XVI*: 19 (1983).

### Recognition

Recognised by a greatly enlarged, sessile to subsessile dorsal sepal which encloses most of the labellum; much reduced, auriculate lateral sepals and petals; labellum reduced, strongly folded or convolute between the tube and the shortly expanded lamina; column squat, the anterior base expanded into a swollen, fleshy ventral pad; and, labellum base with a pair of deflexed closed spurs.

### Distribution

A genus of about twelve species distributed in Australia, New Zealand, New Caledonia, Papua New Guinea and Indonesia.

### Etymology

Referring to a corybant or dancing priest of the goddess Cybele in Phrygia.



10. *Corysanthes* R.Br., *Prod.* 328 (1810).  
Type species: *Corysanthes fimbriata* R.Br.

#### Recognition

Recognised by a greatly enlarged, sessile to clawed dorsal sepal; much reduced, auriculate lateral sepals and petals; labellum which is proximally tubular with the upper margins overlapping and distally flared into a greatly expanded lamina; short, squat column with a greatly swollen, fleshy ventral pad; and, labellum base with a pair of open-ended, tubular auricles.

#### Distribution

A genus of about eleven species endemic in Australia.

#### Etymology

Derived from the Greek *corys*, helmet and *anthos*, flower, in reference to the distinctive, helmet-like flowers.

#### New Combinations:

*Corysanthes dentata* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas dentatus* D.L.Jones, *Austral. Orch. Res.* 2: 45, f.56 (1991).

*Corysanthes despectans* (D.L.Jones et R.C.Nash) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas despectans* D.L.Jones et R.C.Nash, *Muelleria* 3(3): 165-168, f.1 (1976).

*Corysanthes expansa* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas expansus* D.L.Jones, *Austral. Orch. Res.* 2: 45-46, f.57 (1991).

*Corysanthes hispida* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas hispidus* D.L.Jones, *Victorian Naturalist* 90: 96, t.1, f.1 (1973).

*Corysanthes incurva* (D.L.Jones et M.A.Clem.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas incurvus* D.L.Jones et M.A.Clem., *Kew Bull.* 43(1): 135-137, f.1B,D,F-H (1988).

*Corysanthes limpida* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas limpida* D.L.Jones, *Austral. Orch. Res.* 2: 46, f.58 (1991).

*Corysanthes X miscella* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas X miscellus* D.L.Jones, *Austral. Orch. Res.* 2: 47, f.59 (1991).

*Corysanthes recurva* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas recurvus* D.L.Jones, *Austral. Orch. Res.* 2: 47-48, f.60 (1991).

11. *Gastrosiphon* (Schltr.) M.A.Clem. et D.L.Jones, *gen. et stat. nov.*

Basionym: *Corysanthes* R.Br. section *Gastrosiphon* Schltr., *Repert. Spec. Nov. Regni. Veg. Beih.* 1: 18 (1911). Type species: *Corysanthes gastrosiphon* Schltr. (= *Gastrosiphon schlechteri* M.A.Clem. et D.L.Jones).

*Corybas* Salisb. subgenus *Corybas* section *Gastrosiphon* (Schltr.) D.L.Szlachetko, *Polish Bot. J.* 46(1): 22 (2001), *comb. et stat. inval.*, no type cited.

#### Recognition

Recognised by very short lateral sepals and petals; short, closed labellum spurs; and, an erect labellum with a long tube which is prominently swollen on the ventral side.

#### Distribution

A genus of c. 20 species distributed between Malaysia and Papua New Guinea.

#### Etymology

Derived from the Greek *gaster*, belly, and *siphon*, tube, in reference to swollen labellum tube.

#### New Combinations:

*Gastrosiphon aduncus* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes adunca* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 19-20 (1911).

*Gastrosiphon arfakensis* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes arfakensis* J.J. Sm., *Repert. Spec. Nov. Regni Veg.* 19: 23, f. 29 (1923).

*Gastrosiphon aundensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas aundensis* P.Royen, *Alpine Fl. New Guinea* 2: 75-76, f. 44 (1979).

*Gastrosiphon ekuamensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas ekuamensis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 114-116, f. 31 (1983).

*Gastrosiphon fenestratus* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas fenestratus* P.Royen, *Alp. Fl. New Guinea* 2: 85-87, f. 49 (1979).

*Gastrosiphon fornicatus* (Blume) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Calcearia fornicata* Blume, *Bijdr. T.* 32 (1825).

*Gastrosiphon gibbiferus* (Schltr.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes gibbifera* (as "gibbiferum") Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 19 (1911).

*Gastrosiphon karkarensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas karkarensis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 46-48, f. 8 (1983).

*Gastrosiphon klossii* (Ridl.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes klossii* Ridl., *Trans. Linn. Soc. London, Bot.* (ser. 2), 9: 207 (1916).

*Gastrosiphon paleariferus* (J.J.Sm.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes palearifera* (as "paleariferus") J.J.Sm., *Med. Herb. Leiden* 23: 1 (1915).

*Gastrosiphon ramosianus* (J.Dransf.) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas ramosianus* J.Dransf., *Kew Bull.* 41(3): 606, t. 4D, f.12 (1986).

*Gastrosiphon royenii* (Kores) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas royenii* Kores, *Blumea* 24: 459 (1978).

*Gastrosiphon schlechteri* M.A.Clem. et D.L.Jones, *nom. nov.* Basionym: *Corysanthes gastrosiphon* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 1: 18-19 (1911).

*Gastrosiphon subalpinus* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas subalpinus* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 112, f. 30 (1983).

*Gastrosiphon urikensis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas urikensis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 39-40, f. 5 (1983).

*Gastrosiphon ventricosus* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corysanthes ventricosa* J.J.Sm., *Bull. Dépt. Agric. Néerl.* 19: 13 (1908).

*Gastrosiphon vespertilionis* (P.Royen) M.A.Clem. et D.L.Jones, *comb. nov.* Basionym: *Corybas vespertilionis* P.Royen, *Phanerog. Mono. Tomus XVI; The Genus Corybas (Orchidaceae)* 116-119, f. 32 (1983).

12. *Molloybas* D.L.Jones et M.A.Clem., *gen. nov.*; *Nematoceras* Hook.f. affinis sed foliis et chlorophyllo absentibus; petalis quam sepalis longioribus; et marginibus labelli profunde laciniatibus, differt. Type species: *Corybas cryptanthus* Hatch.

### Recognition

This genus has affinities with *Nematoceras* Hook.f., but the plants are entirely leafless, completely lacking any chlorophyll and with a translucent, whitish ghostly appearance. Additionally the petals are longer than the lateral sepals (reverse of *Nematoceras*) and the labellum has deeply lacinate margins.

### Distribution

A monotypic genus occurring in New Zealand (North and South Island).

### Etymology

Named in honour of Brian Peter John Molloy (1930-), eminent New Zealand botanist who has carried out pioneering studies into many plant groups, including orchids, and the last letters of *Corybas*, a related genus.

### New Combination:

*Molloybas cryptanthus* (Hatch) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas cryptanthus* Hatch, *Trans. & Proc. Roy. Soc. New Zealand* 83: 577 (1956).

13. *Nematoceras* Hook.f., *Fl. Nov. zel.* 1: 249 (1853). Type species: *Nematoceras macrantha* Hook.f. (here designated).

#### Recognition

Recognised by the relatively narrow dorsal sepal; long, filiform lateral sepals and petals which are often held erect; short, broad, open-ended labellum auricles; and, short squat straight column lacking a swollen ventral pad.

#### Distribution

A genus of about twenty species endemic in New Zealand, with one occurring on Macquarie Island.

#### Etymology

Derived from the Greek *nema*, thread and *ceras*, horn, in reference to the long lateral sepals and petals.

#### New Combinations:

*Nematoceras acuminata* (M.A.Clem. et Hatch) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas acuminatus* M.A.Clem. et Hatch, *New Zealand J. Bot.* 23: 491-494, f.2 (1985).

*Nematoceras dienema* (D.L.Jones) D.L.Jones, M.A.Clem. et Molloy, *comb. nov.* Basionym: *Corybas dienemus* D.L.Jones, *Fl. Austral.* 50: 572 (1993).

*Nematoceras hypogaea* (Colenso) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corysanthes hypogaea* Colenso, *Trans. & Proc. New Zealand Inst.* 16: 336-337 (1884).

*Nematoceras iridescens* (Irwin & Molloy) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas iridescens* Irwin et Molloy, *New Zealand J. Bot.* 34(1): 1-5, f.1 (1996).

*Nematoceras longipetala* (Hatch) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas macranthus* (Hook.f.) Rchb.f. var. *longipetalus* Hatch, *Trans. & Proc. Roy. Soc. New Zealand* 76: 580, t.60(1) (1947).

*Nematoceras orbiculata* (Colenso) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corysanthes orbiculata* Colenso, *Trans. & Proc. New Zealand Inst.* 23: 389-390 (1891); *Corybas orbiculatus* (Colenso) L.B.Moore, *Fl. New Zealand* 2: 118 (1970).

*Nematoceras pandurata* (Cheesem.) Molloy, D.L.Jones et M.A.Clem., *comb. et stat. nov.* Basionym: *Corysanthes rotundifolia* (Hook.f.) Hook.f. var. *pandurata* Cheesem., *Man. New Zealand Fl.* 366 (1925).

*Nematoceras papa* (Molloy & Irwin) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas papa* Molloy & Irwin, *New Zealand J. Bot.* 34(1): 5-7, f.1 (1996).

*Nematoceras papillosa* (Colenso) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corysanthes papillosa* Colenso, *Trans. & Proc. New Zealand Inst.* 16: 337-338 (1884).

*Nematoceras rivularis* (A.Cunn.) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Acianthus rivularis* A.Cunn., *Compan. bot. mag.* 2: 376 (1837). *Nematoceras rivularis* Hook.f., *pro parte*, *Fl. Nov. zel.* 1: 251 (1853).

14. *Singularybas* Molloy, D.L.Jones et M.A.Clem., *gen. nov.* Affinis *Nematoceras* Hook.f. sed foliis membranaceis; bracta florali persistenti marginibus undulatis; apice labelli apiculo corniculato projecto; marginibus labelli profunde eroso-laciniatis; et columna incurva multo longiora quam latiora, differt. Type species: *Corybas oblongus* Hook.f.

#### Recognition

This genus has affinities with *Nematoceras* Hook.f., but with membranous leaves, often purplish beneath and with purplish veins; a large, persistent floral bract with undulate margins; labellum apex with a long, projecting tusk-like apiculus; labellum margins deeply erose/lacinate; and, incurved column much longer than wide with a swollen ventral pad.

#### Distribution

A genus of two or three species (one named) occurring in New Zealand (North and South Island, including Stewart Island, Auckland Island and Chatham Island).

#### Etymology

Derived from the Latin *singularis*, solitary, different, and the last four letters of *Corybas*, a closely allied genus of orchids.

#### New Combination:

*Singularybas oblongus* (Hook.f.) Molloy, D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Corybas oblongus* Hook.f., *Fl. nov.-zel.* 1: 250, t.57B (1853). *Corysanthes oblonga* (Hook.f.) Hook.f., *Handb. New Zealand Fl.* 266 (1864).



Key to Australian and New Zealand Genera of the *Corybas* alliance

- |   |                     |
|---|---------------------|
| 1. Plants leafless; labellum margins deeply laciniate   | <i>Molloybas</i>    |
| 1: Plants with a leaf, if absent labellum margins not laciniate   | 2                   |
| 2. Labellum tube with basal closed spurs  | <i>Corybas</i>      |
| 2: Labellum tube with basal open-ended auricles   | 3                   |
| 3. Base of labellum narrowly clawed; labellum tubular throughout, the upper margins fused; labellum with a medial ridge adorned with multiseriate acicular calli  | <i>Anzybas</i>      |
| 3: Base of labellum subsessile or shortly tapered to a broad claw; labellum tubular at base only, the upper margins overlapping, not usually fused; labellum lacking a medial ridge and multiseriate acicular calli (ventral lamina often adorned with uniseriate papillae) | 4                   |
| 4. Lateral sepals and petals much shorter than the dorsal sepal, often almost vestigial   | <i>Corysanthes</i>  |
| 4: Lateral sepals and petals as long as or longer than the dorsal sepal   | 5                   |
| 5. Leaf coriaceous; labellum apex and anterior margins entire or denticulate; column straight, about as long as wide  | <i>Nematoceras</i>  |
| 5: Leaf membranous; labellum apex with a projecting tusk-like apiculus; anterior margins deeply erose/lacinate; column incurved, much longer than wide  | <i>Singularibas</i> |

**SUBTRIBE: Adenochilidinae** M.A.Clem. et D.L.Jones, *subtrib. nov.*; subtribus aliis Diuridearum rhizomibus longo-repentibus habitis, ad puncta augmentorum amplificata; tuberibus absentibus; alis columnae omnino conjunctis, apibus latis, dentatis, pro mitra insuper anthera extendenti; polliniis octo; viscidio absentis, distinguenda.

Type: *Adenochilus* Hook.f.

**Recognition**

Distinguished by long-creeping fleshy rhizomes without tubers, enlarged at each growing point; column wings fused throughout with broad, toothed apices extending above the anther as a mitra; eight pollinia, not formed into a pollinarium; and, viscidium absent.

**Distribution**

A monogeneric subtribe endemic to eastern Australia and New Zealand.

**SUBTRIBE: Caladeniinae** Pfitzer

In a recent publication on the Caladeniinae, Hopper and Brown (2001) proposed a neolectotypification of *Caladenia* sect. *Calonema* Lindl., rejecting the earlier lectotypification by Jones (2001) of *C. filifera* Lindl. and selecting in its place *C. longicauda* Lindl. Under the title of "Notes added in proof" Hopper and Brown (2001) corrected their earlier mistake of citing Bentham (1873) and not Lindley (1840a) as the

author of the sectional name *Calonema*; noted that *C. patersonii* R.Br. could not be the type for *Calonema* because it was not included in Lindley's original protologue; and selected *C. longicauda* as the new lectotype against *C. filifera*. They argued that the choice of *C. filifera* was in conflict with the protologue "in not having fimbriate labellum margins" and because their choice "best matches the protologue among the five species cited, and it is the only species illustrated by Lindley (1840)".

*Caladenia filifera* was chosen by us as a lectotype for *Caladenia* sect. *Calonema* after taking into consideration all things relevant to the original description including: (1) the appropriateness for the application of the name *Calonema*, which means "pretty threads", as both *C. filifera* and *C. denticulata* characteristically have filiform thread-like sepals and petals adorned with prominent colourful glands; (2) the consistent placement of *C. filifera* by Lindley (1840a,b) as the first species listed in his treatments of *Calonema*; and (3) the interpretation of what was stated in the protologue, notably the "labellum entire margins often fringed". Since all five species listed by Lindley have some form of marginal fringe on the labellum, it is incorrect of Hopper and Brown (2001) to suggest that the choice of *C. filifera* as the lectotype was in conflict with the protologue. Hopper and Brown also argue that

*Caladenia longicauda* was the only species illustrated and therefore should have been selected as the type, but this is not a criterion of the botanical code and there are other examples where the only illustrated species in a generic description has not been chosen as the lectotype, e.g. *Pedilonum* (Seidenfaden 1985). Hopper and Brown also mention "traditional useage" for the concept of *Calonema* but it is more correctly traditional mis-useage since the common interpretation of *C. patersonii* being the type of *Calonema* is clearly wrong as this taxon was not included by Lindley (1840a) in his protologue. This mistake is based on a long-held misinterpretation that would appear to have originated from Pfitzer (1889).

On balance we see no sound scientific reason to overturn the choice by Jones (2001) of *C. filifera* as the lectotype for *Calonema* and we reject the neolectotypification proposal by Hopper and Brown (2001). The following transfers of recently described taxa are necessary to conform with our generic interpretation of the Caladeniinae and provide a basis for nomenclatural choice.

15. *Arachnorchis* D.L.Jones et M.A.Clem., *Orchadian* 13(9): 391 (2001). Type: *Caladenia patersonii* R.Br. (= *Arachnorkis patersonii* (R.Br.) D.L.Jones et M.A.Clem.).

*Phlebochilus* (Benth.) D.L.Szlachetko, *Polish Bot. J.* 46(1): 14 (2001), *pro parte, nom. illeg.* *Caladenia* subgen. *Calonema sensu* (Lindl.) Hopper et A.P.Br., *Nuytsia* 14: 43 (2001).

#### New combinations:

*Arachnorchis applanata* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia applanata* Hopper et A.P.Br. subsp. *applanata*, *Nuytsia* 14(1/2): 43-46, f. 2A-F, 3B (2001).

*Arachnorchis applanata* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem. subsp. *erubescens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia applanata* Hopper et A.P.Br. subsp. *erubescens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 46-48, f. 2G-J, 3A (2001).

*Arachnorchis arenicola* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia arenicola* Hopper et A.P.Br., *Nuytsia* 14(1/2): 48-50, f. 2K-Q, 3C (2001).

*Arachnorchis arrecta* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia arrecta* Hopper et A.P.Br., *Nuytsia* 14(1/2): 50-51, f. 2R-W, 3D (2001).

*Arachnorchis attingens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia attingens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 51-54, f. 4A-D, 5A (2001).

*Arachnorchis attingens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem. subsp. *gracillima* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia attingens* subsp. *gracillima* Hopper et A.P.Br., *Nuytsia* 14(1/2): 54-56, f. 4E-K, 5A (2001).

*Arachnorchis brownii* (Hopper) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia brownii* Hopper, *Nuytsia* 14(1/2): 56-57, f. 4L-R, 5B (2001).

*Arachnorchis bryceana* (R.S.Rogers) D.L.Jones et M.A.Clem. subsp. *cracens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia bryceana* R.S. Rogers subsp. *cracens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 197-199, f. 44H-K, 41D (2001).

*Arachnorchis busselliana* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia busselliana* Hopper et A.P.Br., *Nuytsia* 14(1/2): 57-59, f. 5C (2001).

*Arachnorchis christineae* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia christineae* Hopper et A.P.Br., *Nuytsia* 14(1/2): 59-60, f. 5D (2001).

*Arachnorchis citrina* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia citrina* Hopper et A.P.Br., *Nuytsia* 14(1/2): 60-61, f. 4S-W, 6A (2001).

*Arachnorchis cruscula* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia cruscula* Hopper et A.P.Br., *Nuytsia* 14(1/2): 61-65, f. 7, 6B (2001).

*Arachnorchis decora* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia decora* Hopper et A.P.Br., *Nuytsia* 14(1/2): 65-67, f. 8A-E, 6C (2001).

*Arachnorchis excelsa* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia excelsa* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 68-71, f. 8L-R, 9A (2001).

*Arachnorchis exstans* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia exstans* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 71-72, f. 8S-y, 9B (2001).

*Arachnorchis gardneri* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia gardneri* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 76-78, f. 10K-Q, 11A (2001).

*Arachnorchis georgei* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia georgei* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 78-79, f. 10R-W, 11B (2001).

*Arachnorchis granitora* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia granitora* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 79-81, f. 12A-G, 11C (2001).

*Arachnorchis harringtoniae* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia harringtoniae* Hopper et A.P.Br.,  
*Nuytsia* 14(1/2): 81, 83-84, f. 11D (2001).

*Arachnorchis heberleana* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia heberleana* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 85-87, f. 12H-M, 13A (2001).

*Arachnorchis hirta* (Lindl.) D.L.Jones et  
M.A.Clem. subsp. *rosea* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia hirta* Lindl. subsp. *rosea* Hopper et  
A.P.Br., *Nuytsia* 14(1/2): 88-90, f. 12N-S, 13B  
(2001).

*Arachnorchis hoffmanii* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia hoffmanii* Hopper et A.P.Br. subsp.  
*hoffmanii*, *Nuytsia* 14(1/2): 90-92, f. 12T-Z, 13C  
(2001).

*Arachnorchis hoffmanii* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem. subsp. *graniticola*  
(Hopper et A.P.Br.) D.L.Jones et M.A.Clem.,  
*comb. nov.* Basionym: *Caladenia hoffmanii*  
Hopper et A.P.Br. subsp. *graniticola* Hopper et  
A.P.Br., *Nuytsia* 14(1/2): 92-93, f. 13C (2001).

*Arachnorchis interjacens* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia interjacens* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 98-101, f. 15O-S, 16C (2001).

*Arachnorchis lodgeana* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia lodgeana* Hopper et A.P.Br., *Nuytsia*  
14(1/2): 101-103, f. 17A-M, 16D (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et  
M.A.Clem. subsp. *albella* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia longicauda* Lindl. subsp. *albella*  
Hopper et A.P.Br., *Nuytsia* 14(1/2): 108-109, f.  
19A-F, 18A (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et  
M.A.Clem. subsp. *australora* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia longicauda* Lindl. subsp. *australora*  
Hopper et A.P.Br., *Nuytsia* 14(1/2): 109-111, f.  
18A (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et  
M.A.Clem. subsp. *borealis* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia longicauda* Lindl. subsp. *borealis*  
Hopper et A.P.Br., *Nuytsia* 14(1/2): 111-112, f.  
18B (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et  
M.A.Clem. subsp. *calcigena* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia longicauda* Lindl. subsp. *calcigena*  
Hopper et A.P.Br., *Nuytsia* 14(1/2): 112-113, f.  
19G-L, 18C (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et  
M.A.Clem. subsp. *clivicola* (Hopper et A.P.Br.)  
D.L.Jones et M.A.Clem., *comb. nov.* Basionym:  
*Caladenia longicauda* Lindl. subsp. *clivicola*  
Hopper et A.P.Br., *Nuytsia* 14(1/2): 113-114, f.  
19M-S, 18B (2001).



*Arachnorchis longicauda* (Lindl.) D.L.Jones et M.A.Clem. subsp. *crassa* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia longicauda* Lindl. subsp. *crassa* Hopper et A.P.Br., *Nuytsia* 14(1/2): 114-115, f. 19T, 18B (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et M.A.Clem. subsp. *eminens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia longicauda* Lindl. subsp. *eminens* (Domin) Hopper et A.P.Br., *Nuytsia* 14(1/2): 115-117, f. 18C (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et M.A.Clem. subsp. *merrittii* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia longicauda* Lindl. subsp. *merrittii* Hopper et A.P.Br., *Nuytsia* 14(1/2): 117-118, f. 18B (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et M.A.Clem. subsp. *redacta* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia longicauda* Lindl. subsp. *redacta* Hopper et A.P.Br., *Nuytsia* 14(1/2): 118-120, f. 20, 18C (2001).

*Arachnorchis longicauda* (Lindl.) D.L.Jones et M.A.Clem. subsp. *rigidula* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia longicauda* Lindl. subsp. *rigidula* Hopper et A.P.Br., *Nuytsia* 14(1/2): 120-122, f. 18A (2001).

*Arachnorchis longifimbriata* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia longifimbriata* Hopper et A.P.Br., *Nuytsia* 14(1/2): 125-127, f. 23, 24A (2001).

*Arachnorchis lorea* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia lorea* Hopper et A.P.Br., *Nuytsia* 14(1/2): 127, 129-130, f. 21E-I, 22B (2001).

*Arachnorchis nivalis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia nivalis* Hopper et A.P.Br., *Nuytsia* 14(1/2): 131-133, f. 21M-R, 22D (2001).

*Arachnorchis paludosa* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia paludosa* Hopper et A.P.Br., *Nuytsia* 14(1/2): 133-135, f. 25A-D, 24B (2001).

*Arachnorchis pholcoidea* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem. subsp. *angustaensis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia pholcoidea* Hopper et A.P.Br. subsp. *angustaensis* Hopper et A.P.Br., *Nuytsia* 14(1/2): 139-141, f. 26, 27B (2001).

*Arachnorchis pholcoidea* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia pholcoidea* Hopper et A.P.Br. subsp. *pholcoidea*, *Nuytsia* 14(1/2): 137-139, f. 25K-O, 27A (2001).

*Arachnorchis procera* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia procera* Hopper et A.P.Br., *Nuytsia* 14(1/2): 141-143, f. 24D (2001).

*Arachnorchis speciosa* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia speciosa* Hopper et A.P.Br., *Nuytsia* 14(1/2): 145, 147-148, f. 28G-L, 29A (2001).

*Arachnorchis splendens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia splendens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 148-150, f. 28M-R, 29B (2001).

*Arachnorchis starteorum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia starteorum* Hopper et A.P.Br., *Nuytsia* 14(1/2): 150-151, f. 29C (2001).

*Arachnorchis thinicola* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia thinicola* Hopper et A.P.Br., *Nuytsia* 14(1/2): 152-153, f. 29D (2001).

*Arachnorchis uliginosa* (A.S. George) D.L.Jones et M.A.Clem. subsp. *candicans* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia uliginosa* A.S. George subsp. *candicans* Hopper et A.P.Br., *Nuytsia* 14(1/2): 156, f. 30F-G, 31B (2001).

*Arachnorchis uliginosa* (A.S. George) D.L.Jones et M.A.Clem. subsp. *patulens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia uliginosa* A.S. George subsp. *patulens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 156-158, f. 31C (2001).

*Arachnorchis viridescens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia viridescens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 158-159, f. 28S-X, 31D (2001).

*Arachnorchis williamsiae* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia williamsiae* Hopper et A.P.Br., *Nuytsia* 14(1/2): 303-304, f. 78D (2001).

*Arachnorchis winfieldii* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia winfieldii* Hopper et A.P.Br., *Nuytsia* 14(1/2): 159-160, f. 32, 33A (2001).

16. *Calonema* (Lindl.) D.L.Jones et M.A.Clem., *Orchadian* 13(9): 400 (2001).

Basionym: *Caladenia* section *Calonema* Lindl. in *Edwards's Bot. Reg.* 1-23: *Swan Riv. Append.* lii (1840). Type species: *Caladenia filifera* Lindl., *fide* Jones (2001), *nec* Hopper et A.P.Br. (2001).

*Calonema* (Lindl.) D.L.Szlachetko, *Polish Bot. J.* 46(1): 15 (2001), *nom. illeg.* Type species: not indicated.

*Jonesiopsis* D.L.Szlachetko, *Polish Bot. J.* 46(1): 14 (2001), *nom. illeg.*

*Phlebochilus* (Benth.) D.L.Szlachetko, *Polish Bot. J.* 46(1): 14 (2001), *pro parte, nom. illeg.*

#### New combinations:

*Calonema abbreviatum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia abbreviata* Hopper et A.P.Br., *Nuytsia*, 14: 187-189, f. 40, 41A (2001).

*Calonema cleistogamum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. et stat. nov.* Basionym: *Caladenia bicallata* R.S.Rogers subsp. *cleistogama* Hopper et A.P.Br., *Nuytsia* 14(1/2): 192, f. 42A-G, 43B (2001).

*Calonema brevisurum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia brevisura* Hopper et A.P.Br., *Nuytsia* 14(1/2): 192-196, f. 43, 41C (2001).

*Calonema caesareum* (Domin) D.L.Jones et M.A.Clem. subsp. *maritimum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia caesarea* (Domin) M.A.Clem. et Hopper subsp. *maritima* Hopper et A.P.Br., *Nuytsia* 14(1/2): 201-203, f. 44L-Q, 45A (2001).

*Calonema caesareum* (Domin) D.L.Jones et M.A.Clem. subsp. *transiens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia caesarea* (Domin) M.A.Clem. et Hopper subsp. *transiens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 203, f. 44R-V, 45A (2001).

*Calonema chapmanii* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia chapmanii* Hopper et A.P.Br., *Nuytsia* 14(1/2): 206-207, f. 46E-K, 45C (2001).

*Calonema dimidium* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia dimidia* Hopper et A.P.Br., *Nuytsia* 14(1/2): 213-215, f. 48, 47B (2001).

*Calonema dundasiae* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia dundasiae* Hopper et A.P.Br., *Nuytsia* 14(1/2): 219-221, f. 50, 51A (2001).

*Calonema elegans* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia elegans* Hopper et A.P.Br., *Nuytsia* 14(1/2): 221-2224, f. 52, 51B (2001).

*Calonema erythrochilum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia erythrochila* Hopper et A.P.Br., *Nuytsia* 14(1/2): 224-225, f. 51C (2001).

*Calonema evanescens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia evanescens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 225-226, f. 49M-R, 51D (2001).

*Calonema exilis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia exilis* Hopper et A.P.Br. subsp. *exilis*, Hopper et A.P.Br., *Nuytsia* 14(1/2): 226-229, f. 49S-W, 53A (2001).

*Calonema exilis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem. subsp. *vanleeuwenii* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia exilis* Hopper et A.P.Br. subsp. *vanleeuwenii* Hopper et A.P.Br., *Nuytsia* 14(1/2): 229-231, f. 54, 53A (2001).

*Calonema footeanum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia footeana* Hopper et A.P.Br., *Nuytsia* 14(1/2): 233-234, f. 56A-H, 53C (2001).

*Calonema fuscolutescens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia fuscolutescens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 234, 236-237, f. 56I-M, 53D (2001).

*Calonema hiemalis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia hiemalis* Hopper et A.P.Br., *Nuytsia* 14(1/2): 237-239, f. 56N-S, 57A (2001).

*Calonema horistes* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia horistes* Hopper et A.P.Br., *Nuytsia* 14(1/2): 239-241, f. 56T-Y, 57B (2001).

*Calonema incensum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia incensa* Hopper et A.P.Br., *Nuytsia* 14(1/2): 241-243, f. 58, 57C (2001).

*Calonema incrassatum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia incrassata* Hopper et A.P.Br., *Nuytsia* 14(1/2): 243-246, f. 59A-G, 57D (2001).

*Calonema luteolum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia luteola* Hopper et A.P.Br., *Nuytsia* 14(1/2): 246-248, f. 59H, 60A (2001).

*Calonema melanemum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia melanema* Hopper et A.P.Br., *Nuytsia* 14(1/2): 248-249, f. 59I-O, 60B (2001).

*Calonema meridionalis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia meridionalis* Hopper et A.P.Br., *Nuytsia* 14(1/2): 249-250, f. 59P-U, 60C (2001).

*Calonema microchilum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia microchila* Hopper et A.P.Br., *Nuytsia* 14(1/2): 250-253, f. 61A-F, 60D (2001).

*Calonema nobilis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia nobilis* Hopper et A.P.Br., *Nuytsia* 14(1/2): 253-256, f. 61G-M, 62A (2001).

*Calonema occidentalis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia occidentalis* Hopper et A.P.Br., *Nuytsia* 14(1/2): 256-257, f. 62B (2001).

*Calonema pachychilum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia pachychila* Hopper et A.P.Br., *Nuytsia* 14(1/2): 257-259, f. 61N-R, 62C (2001).

*Calonema paradoxum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia paradoxa* Hopper et A.P.Br., *Nuytsia* 14(1/2): 259-260, f. 62D (2001).

*Calonema pendens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia pendens* Hopper et A.P.Br., *Nuytsia* 14(1/2): 261-262, f. 57S-V, 63A (2001).

*Calonema pendens* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem. subsp. *talbotii* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia pendens* Hopper et A.P.Br. subsp. *talbotii* Hopper et A.P.Br., *Nuytsia* 14(1/2): 264, f. 64A-K, 63A (2001).



*Calonema polychromum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia polychroma* Hopper et A.P.Br., *Nuytsia* 14(1/2): 264-268, f. 65A-F, 63B (2001).

*Calonema posteum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia postea* Hopper et A.P.Br., *Nuytsia* 14(1/2): 268-269, f. 66, 63C (2001).

*Calonema pulchrum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia pulchra* Hopper et A.P.Br., *Nuytsia* 14(1/2): 269-273, f. 67, 63D (2001).

*Calonema remotum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia remota* Hopper et A.P.Br. subsp. *remota*, *Nuytsia* 14(1/2): 273-274, f. 68, 69A (2001).

*Calonema remotum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem. subsp. *parvum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia remota* Hopper et A.P.Br. subsp. *parva* Hopper et A.P.Br., *Nuytsia* 14(1/2): 274-277, f. 69A (2001).

*Calonema ultimum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia ultima* Hopper et A.P.Br., *Nuytsia* 14(1/2): 277-279, f. 70, 69B (2001).

*Calonema voigtii* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia voigtii* Hopper et A.P.Br., *Nuytsia* 14(1/2): 279-280, f. 65G-L, 69C (2001).

*Calonema vulgatum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia vulgata* Hopper et A.P.Br., *Nuytsia* 14(1/2): 280-282, f. 65M-S, 69D (2001).

*Calonema xanthum* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia xantha* Hopper et A.P.Br., *Nuytsia* 14(1/2): 282-283, f. 65T-W, 71A (2001).

17. *Drakonorchis* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *Orchadian* 13(9): 404 (2001).

Basionym: *Caladenia* subgenus *Drakonorchis* Hopper et A.P.Br., *Lindleyana* 15(2): 124 (2000). Type species: *Caladenia barbarossa* Rchb.f.

#### New combinations:

*Drakonorchis barbarella* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia barbarella* Hopper et A.P.Br., *Nuytsia* 14(1/2): 162-166, f. 34A-F, 35A (2001).

*Drakonorchis drakeoides* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia drakeoides* Hopper et A.P.Br., *Nuytsia* 14(1/2): 168-171, f. 36, 35C (2001).

*Drakonorchis mesocera* (Hopper et A.P.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Caladenia mesocera* Hopper et A.P.Br., *Nuytsia* 14(1/2): 171-172, f. 37, 35D (2001).

*Caladenia multiclavia* Rchb.f. var. *brevicuspis* Benth., *Fl. Austral.* 6: 380 (1873), *syn. nov.*

#### SUBTRIBE: Drakaeinae

The subtribe contains eight genera, two of which are new.

#### The *Arthrochilus* Alliance

A small group of three genera, two newly erected here. See Table 3 for selected diagnostic characters of the genera.

18. *Arthrochilus* F.Muell., *Fragm.* 1: 242 (1858). Type species: *Arthrochilus irritabilis* F.Muell.

*Drakaea* Lindl. section *Akaedra* Schltr., *Bot. Jahrb.* 45: 383 (1911). Type species: *Drakaea irritabilis* Rchb.f. Lectotype here designated.

#### Recognition

Recognised by 2-6 leaves arranged spirally in 1-3 rosettes which arise laterally from the base of the scape after anthesis, rarely basally sheathing the scape at anthesis (*A. rosulatus*); flowers with dense columnar papillae on the tepaline bases and column foot; labellum hinge attached at the underside of the column foot; labellum with a peltately attached supporting stalk; and the callus thickened and ornamented with warts and clavate calli.

**Distribution**

A genus of seven species endemic in Australia.

**Etymology**

Derived from the Greek *arthron*, joint and *cheilos*, lip, in reference to the jointed labellum.

**19. *Phoringopsis* D.L.Jones et M.A.Clem., *gen. nov.*** Affinis *Arthrochilo* F.Muell., sed scapo florali foliis uno duobusve basi subtendis et inflorescentis effectis; pede columnae et basibus tepalorum laevibus epapillatis; labello in centro pedis columnae cardinato; callus calli additiciis penicillatis.

Type species: *Arthrochilus byrnesii* Blaxell.

**Etymology**

Derived from the Greek, *phoringes*, truffles and *-opsis*, resemblance, in reference to the fungoid labellum callus.

**Recognition**

Distinguished from *Arthrochilus* by one or two elongate distichously arranged leaves basally sheathing the scape; the inflorescence produced as the leaf or leaves develop; flowers with smooth, non-papillate tepalline bases and column foot; the labellum hinge attached in the centre of the column foot; the labellum lacking a peltately attached supporting stalk; and, the callus markedly swollen and fungiform, ornamented with penicillate accessory calli.

**Distribution**

A genus of two or three species occurring in northern Australia and southern New Guinea.

**New Combinations:**

*Phoringopsis byrnesii* (Blaxell) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Arthrochilus byrnesii* Blaxell, *Contr. New South Wales Natl. Herb.* 4: 278 (1972).

*Phoringopsis dockrillii* (Lavarack) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Arthrochilus dockrillii* Lavarack, *Proc. Roy. Soc. Queensland* 86(25): 155, f.1 (1975).

**20. *Thynninorchis* D.L.Jones et M.A.Clem., *gen. nov.***; Affinis *Arthrochilo* F.Muell. sed saprophytum aphyllum tuberibus vestigialibus protocormoideis; pede columnae et basibus tepalorum epapillatis; capitata bilobissimo, lobo uterque extremitate turgida, capitata; cellulis calli longis multistratosi caudiformis utraque cellula distaliter libera; polliniis bilobissimis ad viscidium affixum. Type species: *Drakaea huntiana* F.Muell. (*Arthrochilus huntianus* (F.Muell.) Blaxell).

**Recognition**

Highly specialised leafless saprophytic orchids with vestigial protocorm-like tubers and flowers similar to *Arthrochilus* but differing by the bases of tepals and column foot being smooth and non-papillate; with the labellum held out like a dangling lure on the end of a long, rod-like column foot; the main head of the callus deeply bifurcate and each lobe ending in a swollen, knob-like structure; with long, multilayered barbed caudiform callus cells having the proximal half of each cell adnate and the distal half of each cell free; and, deeply bilobed pollinia attached to a viscidium.

**Distribution**

A genus of two species endemic in south-eastern Australia.

**Etymology**

A name derived from *thynnine* wasp, the pollinator of these orchids and *Orchis*, another genus of Orchidaceae but also used generally for any orchid.

**New Combinations:**

*Thynninorchis huntianus* (F.Muell.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Drakaea huntiana* F.Muell., *Victorian Naturalist* 5: 174 (1889).

*Thynninorchis nothofagicola* (D.L.Jones) D.L.Jones et M.A.Clem. *comb. et stat. nov.* Basionym: *Arthrochilus huntianus* (F.Muell.) Blaxell subsp. *nothofagicola* D.L.Jones, *Austral. Orch. Res.* 3: 4 (1998).

### Key to genera of the *Arthrochilus* alliance

1. Plants leafless; column foot much longer than the column, its apex entire; main head of callus deeply bilobed, each lobe ending in a swollen knob-like structure; callus adorned with long, multilayered, barbed caudiform structures *Thynninorchis*
  
- 1: Plants with leaves basal on the scape or on one or more lateral rosettes (often appearing after anthesis); column foot much shorter than the column, its apex swollen; main head of callus entire or shallowly emarginate; callus adorned with clavate or penicillate structures 2
  
2. Leaves 1 or 2, subtending the base of the scape; length:width ratio of leaves 15-25:1; column foot and bases of tepals lacking papillae; labellum without a peltately attached supporting stalk; callus adorned with penicillate structures *Phoringopsis*
  
- 2: Leaves 2-6, attached to scape by lateral shoots, rarely subtending the base of the scape; length:width ratio of leaves 6-10:1; column foot and bases of tepals with columnar papillae; labellum with a peltately attached supporting stalk; callus adorned with clavate structures *Arthrochilus*

### The *Caleana* Alliance

Blaxell (1972), erected the genus *Paracaleana*, as distinct from *Caleana* - which has *C. major* as the type, based on morphological characters including a verrucose labellum. This generic interpretation has been controversial (Clements 1989; Hopper and et Brown in Hoffman and et Brown 1992, 1998). In our ITS results the four *Caleana-Paracaleana* species tested fall into a single highly supported clade (100% bootstrap support) deeply embedded within the Drakaeinae and either generic interpretation is possible. Since there is high support for the clade containing those species that have been attributed to *Paracaleana*, and it is sister to *Caleana* that is on a long branch, and each is distinctive morphologically, we have recognized them as separate genera.

21. *Caleana* R.Br., *Prod.* 329 (1810). Type species: *Caleana major* R. Br.  
*Caleyia* R. Br. in W. Aiton et W.T. Aiton, *Hort. Kew.* (ed. 2) 5: 204 (1813) (orth. var.).

#### Distribution

A single monospecific genus in eastern Australia.

#### Etymology

Named after George Caley, 18<sup>th</sup> and 19<sup>th</sup> century botanist and explorer in Australia.

22. *Paracaleana* Blaxell, *Contr. New South Wales Natl. Herb.* 4: 281 (1972).

Type species: *Caleana minor* R.Br.

#### Distribution

A genus of c. 10 species (4 described) in southern and eastern Australia and the North Island of New Zealand.

#### Etymology

From the Latin *para*, near and *Caleana*, another genus of Orchidaceae.

#### Infrageneric taxa

A genus of two subgenera, one new:-

*Paracaleana* subgenus *Paracaleana*.  
Characterised by linear leaves and an ovate labellum lamina.

*Paracaleana* subgenus *Tanychila* D.L.Jones et M.A.Clem., subgen. nov.: A *Paracaleana* sub. *Paracaleana* folio ovato vel ovato-lanceolato, et lamina labelli elongata ovato-oblongo distinguenda. Type species: *Paracaleana nigrita* (J.Drummond ex Lindl.) Blaxell.

#### Recognition

Characterised by ovate to ovate-lanceolate leaves and an elongate, ovate-oblong labellum lamina.



### The *Chiloglottis* Alliance

Morphological studies by the authors of taxa within the *Chiloglottis* alliance initially suggested that the large-flowered group with a delicately hinged labellum, as exemplified by *C. gunnii* Lindl. and *C. valida* D.L.Jones, was worthy of recognition at some level. This group was in fact recently accorded generic rank with the name *Simpliglottis* (Szlachetko 2001). Molecular studies show *Simpliglottis* is embedded within *Chiloglottis* and its recognition at generic rank is rejected, however it is here recognised at subgeneric level.

#### 23. *Chiloglottis* R.Br., *Prod.* 322 (1810).

A genus of two subgenera:-

*Chiloglottis* subgenus *Chiloglottis*

Type species: *Chiloglottis diphylla* R.Br.

#### Recognition

Recognised by relatively small, usually porrect flowers; spreading to reflexed petals; more or less obovate/rhombiform, more or less fixed labellum; variable calli in a complex insectiform arrangement; and narrow column wings.

#### Distribution

A genus of c. 15 species distributed throughout eastern Australia and the North Island of New Zealand.

#### Etymology

Derived from the Greek *cheilos*, lip and *glottis*, mouth of the windpipe, in reference to the resemblance of the labellum and its callus to the human windpipe.

#### New combination:

*Chiloglottis* subgenus *Simpliglottis* (D.L.Szlachetko) D.L.Jones et M.A.Clem., *comb. nov.*

Basionym: *Simpliglottis* D.L.Szlachetko, *Polish Bot. J.* 46(1): 13 (2001).

Type species: *Chiloglottis valida* D.L.Jones.

#### Recognition

Recognised by relatively large, erect flowers; spreading to incurved petals; more or less ovate tremulous labellum; simple, often columnar calli; and broad column wings.

#### Distribution

A subgenus of about nine species distributed in southeastern Australia and New Zealand, including most subantarctic islands.

### Etymology

From the Latin *simplici* simple, and the Greek *glottis* tongue, in reference to the presence of simple calli on the labellum surface.

**Subtribus: Eriochilidinae M.A.Clem. et D.L.Jones, *subtrib. nov.***; subtribus aliis Diuridearum in scapo bractea sterili nulla; labello lobis lateralibus vestigialibus et medi-lobo tumido; in labello trichomis fastigiatis uniseriatis; polliniis octo, in duo hemipollinaria formata; rostello biloba, distinguenda. Type: *Eriochilus* R.Br.

#### Recognition

Distinguished by the absence of a sterile bract on the scape; labellum with vestigial lateral lobes and a thickened mid-lobe; clustered uniseriate trichomes on the labellum; pollinia eight, formed into two pollinaria; and, rostellum bilobed.

#### Distribution

A monogeneric tribe endemic to southern Australia.

#### SUBTRIBE: Prasophyllinae Schltr.

This subtribe contains six genera, one reinstated and two newly erected here, in two loose alliances.

#### *Genoplesium* R.Br. and *Corunastylis* Fitzg.

Fresh material of *Genoplesium baueri*, required for molecular studies, proved to be extremely elusive until the 2001 flowering season when samples were obtained at two sites. The molecular data, which shows that *Genoplesium* is monotypic, forced a new morphological examination of the group as a whole. The results confirm, contrary to our earlier thinking (Jones and Clements 1989), that *Genoplesium* is indeed monotypic and *Corunastylis* Fitzg. should be recognised for the majority of species in the group. Formal nomenclatural transfers are made here. A full synonymy will be presented separately in a revisionary treatment of the two genera.

24. *Corunastylis* Fitzg., *Austral. orch.* 2(3): t.1 (1888).

Type species: *Corunastylis apostasioides* Fitzg., *Anticheirostylis* Fitzg., *Austral. orch.* 2(3): back cover (Mar. 1888). Type species: *Corunastylis apostasioides* Fitzg., superfluous substitute name for *Corunastylis*.

*Genoplesium* R.Br. sect. *Plesiogenum* D.L.Szlachetko, *Polish Bot. J.* 46(1): 12 (2001). Type species: *Genoplesium citriodorum* D.L.Jones et M.A.Clem.

### Recognition

Recognised by paired entire tubers one of which is replaced annually; presence of well-developed lateral roots, including one or two apogeotrophic (mycorrhizal) roots; presence of a multilayered fibrous sheath extending from the tuber to the soil surface; autotrophic habit; and, column wings erect, bifid, forming anterior and posterior lobes which are often of different shape and ornamentation.

### Distribution

A genus of about sixty species distributed in Australia, New Zealand and New Caledonia.

### Etymology

Derived from the Greek *koryne*, club and *stylos*, column or pillar; the style of the type species is thickened or somewhat clubbed.

### New Combinations:

*Corunastylis acuminata* (R.S.Rogers) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum acuminatum* R.S.Rogers, *Trans. & Proc. Roy. Soc. South Australia* 51: 291-2 (1927).

*Corunastylis alticola* (D.L.Jones et B.Gray) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium alticolum* D.L.Jones et B.Gray, *Austral. Orch. Res.* 2: 66, f. 86 (1991).

*Corunastylis archeri* (Hook.f.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum archeri* Hook.f., *Fl. Tasman.* 2: 14, t.113, fig.B (1858).

*Corunastylis arrecta* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium arrectum* D.L.Jones, *Austral. Orch. Res.* 2: 66-67, fig.87, t. (1991).

*Corunastylis bishopii* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium bishopii* D.L.Jones, *Orchadian* 13: 227-231, fig.1, t. (2000).

*Corunastylis brachystachya* (Lindl.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum brachystachyum* Lindl., *Gen. sp. orchid. pl.* 513 (1840).

*Corunastylis ciliata* (Ewart et B.Rees) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum ciliatum* Ewart and B.Rees, *Proc. Roy. Soc. Victoria (new ser.)* 25: 111, f. d-g, t.6 (1912).

*Corunastylis citriodora* (D.L.Jones et M.A.Clem.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium citriodorum* D.L.Jones et M.A.Clem., *Austral. Orch. Res.* 2: 67, f. 88 (1991).

*Corunastylis conferta* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium confertum* D.L.Jones, *Austral. Orch. Res.* 2:68, f. 89 (1991).

*Corunastylis cranei* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium cranei* D.L.Jones, *Orchadian* 13: 102-104, f.1, t. (2000).

*Corunastylis despectans* (Hook.f.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum despectans* Hook.f., *Fl. Tasman.* 2: 13, fig.A, t.113 (1858).

*Corunastylis ectopa* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium ectopum* D.L.Jones, *Orchadian* 12: 570-573, fig. t. (1999).

*Corunastylis eriochila* (Fitzg.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum eriochilum* Fitzg., *J.Bot.* 23: 135 (1885).

*Corunastylis filiformis* (Fitzg.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum filiforme* Fitzg., *J. Bot.* 23: 137 (1885).

*Corunastylis fimbriata* (R.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum fimbriatum* R.Br. *Prod.* 319 (1810).

*Corunastylis firthii* (L.Cady) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum firthii* L.Cady, *Orchadian* 4: 8, fig.9, A-K (1971).

*Corunastylis formosa* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium formosum* D.L.Jones, *Orchadian* 13: 293-4, fig.1, t. (2001).

*Corunastylis insignis* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium insigne* [*insignis*] D.L.Jones, *Orchadian* 13: 295-297, fig. 2 (2001).

*Corunastylis littoralis* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium littorale* [*littoralis*] D.L.Jones, *Orchadian* 13: 299-301, fig. 4, t. (2001).

*Corunastylis morina* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium morinum* D.L.Jones, *Austral. Orch. Res.* 2: 68-9, fig. 90 (1991).

*Corunastylis morrisii* (Nicholls) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum morrisii* Nicholls, *Victorian Naturalist* 48: 108, 111, fig.d-g,i,j,n,o,r,s. (1931).

*Corunastylis nigricans* (R.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum nigricans* R.Br., *Prod.* 319 (1810).

*Corunastylis nuda* (Hook.f.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum nudum* Hook.f., *Fl. nov.-zel.* 1: 242 (1853).

*Corunastylis nudiscapa* (Hook.f.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum nudiscapum* Hook.f., *Fl. Tasman.* 2: 13 (1858).

*Corunastylis oligantha* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium oliganthum* D.L.Jones, *Orchadian* 13: 299-301, fig. 4, t.(2001).

*Corunastylis ostrina* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: D.L.Jones, *Orchadian* 13: 301-303, fig. 5, t. (2001).

*Corunastylis parvicalla* (Rupp) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum parvicallum* Rupp, *Queensland Naturalist* 12: 52-53, fig. (1943).

*Corunastylis pedersonii* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium pedersonii* D.L.Jones, *Austral. Orch. Res.* 2:69, fig. 91, t. (1991).

*Corunastylis plumosa* (Rupp) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum plumosum* Rupp, *Victorian Naturalist* 59: 127-128, fig.G, 1-3 (1947).

*Corunastylis psammophila* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium psammophilum* D.L.Jones, *Austral. Orch. Res.* 2:69-70, fig. 92 (1991).

*Corunastylis pumila* (Hook.f.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum pumilum* Hook.f., *Fl. nov.-zel.* 1: 242 (1853).

*Corunastylis rhyolitica* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium rhyoliticum* D.L.Jones, *Austral. Orch. Res.* 2: 70, fig. 93 (1991).

*Corunastylis rufa* (R.Br.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum rufum* R.Br., *Prod.* 319 (1810).

*Corunastylis rupprii* (R.S.Rogers) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum rupprii* R.S.Rogers, *Trans. & Proc. Roy. Soc. South Australia* 51: 292-3 (1927).

*Corunastylis sagittifera* (Rupp) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum sagittiferum* Rupp, *Victorian Naturalist* 59: 125-126, fig.B, 1-2 (1942).

*Corunastylis sigmoidea* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium sigmoideum* D.L.Jones, *Austral. Orch. Res.* 2: 70-71, f.94 (1991).

*Corunastylis simulans* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium simulans* D.L.Jones, *Austral. Orch. Res.* 71-72, fig. 95, t.(1991).



*Corunastylis superba* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium superbum* D.L.Jones, *Austral. Orch. Res.* 2: 72, fig. 96, t. (1991).

*Corunastylis systema* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium systemum* D.L.Jones, *Austral. Orch. Res.* 2: 72-73, fig.97, t.(1991).

*Corunastylis tasmanica* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium tasmanicum* D.L.Jones, *Austral. Orch. Res.* 3: 90-91, fig 5.1, t.(1998).

*Corunastylis tecta* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium tectum* D.L.Jones, *Austral. Orch. Res.* 2: 73-74, fig. 98 (1991).

*Corunastylis tepperi* (F.Muell. ex Tepper) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum tepperi* F.Muell. ex Tepper, *Trans. & Proc. Roy. Soc. South Australia* 3: 32-33 (1880).

*Corunastylis turfosa* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium turfosum* D.L.Jones, *Austral. Orch. Res.* 2: 74, fig. 99, t.(1991).

*Corunastylis valida* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium validum* D.L.Jones, *Austral. Orch. Res.* 2:74-75, fig. 100, t.(1991).

*Corunastylis vernalis* (D.L.Jones) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Genoplesium vernale* [vernal] D.L.Jones, *Orchadian* 13: 305-307, fig. 7, t. (2001).

*Corunastylis woollsii* (F.Muell.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Prasophyllum woollsii* F.Muell., *Fragm.* 5: 100 (1865).

25. *Genoplesium* R.Br., *Prod.* 319 (1810).  
Type species: *Genoplesium baueri* R.Br.

#### Recognition

Recognised by single perennial bifurcate tuber; complete absence of roots, including specialised apogotrophic (mycorrhizal) roots; absence of a multilayered fibrous sheath between the tuber and the soil surface; saprophytic habit; and, unlobed, prominently decurved column wings.

#### Distribution

A monotypic genus endemic in central New South Wales.

#### Etymology

Derived from the Greek *genos*, race and *plesios*, near, in reference to its affinity with *Prasophyllum*.

#### The *Microtis* Alliance

A small group of three genera, two newly erected here.

26. *Hydrorchis* D.L.Jones et M.A.Clem., *gen. nov.* Affinis *Microtis* R.Br., sed foliis solidis, inflorescentia per cavitatem internam folii frangenti, lamina libera apicali rigidi brevi, pedunculo folioque pro parte maxima omnino coalito, inflorescentia per folium frangenti post productionem sectionis apicalis brevis pedunculi differt. Type species: *Microtis orbicularis* R.S.Rogers.

*Microtis* R.Br. subgen. *Holocrotis* Szlachetko, *Polish Bot. J.* 46(1): 12 (2001). Type species: *Microtis orbicularis* R.S.Rogers.

#### Recognition

This genus has affinities with *Microtis* R.Br. but differs by flowers often being reddish; a solid leaf with an internal cavity where the inflorescence breaks through the leaf; a short, stiff, apical free lamina on the leaf; the peduncle and leaf completely fused together over most of their length; the inflorescence breaking through the leaf after elongation of a short apical section of the peduncle; and, labellum more or less orbicular, unadorned. It also has affinities with the following new genus which has tiny yellowish flowers and an oblong-elliptic labellum adorned with rows of micropapillae.

#### Distribution

A monotypic genus endemic in Australia.

#### Etymology

Derived from the Greek *hydor*, water and *Orchis*, another genus of orchid, but also used generally for an orchid.

#### New Combination:

*Hydrorchis orbicularis* (R.S.Rogers) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Microtis orbicularis* R.S.Rogers, *Trans. & Proc. Roy. Soc. South Australia* 31: 63 (1907).

27. *Microtidium* D.L.Jones et M.A.Clem., *gen. nov.* Affinis *Microtis* R.Br. sed plantae parvulae, lutescentes; flores minimae; labello oblongo-elliptico, superficie micropapillis serialibus; et basi labelli callo grande conjugato, differt. Type species: *Microtis atrata* Lindl.

#### Recognition

This genus has affinities with *Microtis* R.Br. but differs by very small yellowish-green plants; tiny flowers; a solid leaf with an internal cavity where the inflorescence breaks through the leaf; a short, stiff, apical free lamina on the leaf; the peduncle and leaf completely fused together over most of their length; the inflorescence breaking through the leaf after elongation of a short apical section of the peduncle; and, labellum oblong-elliptic, the ventral surface adorned with rows of micropapillae. It also has affinities with *Hydrorchis* which has a more or less orbicular, completely unadorned labellum.

#### Distribution

A monotypic genus endemic in Australia.

#### Key to genera of the *Microtis* alliance

- |    |  |                    |
|----|--|--------------------|
| 1. | Leaf hollow; in flowering plants the leaf and peduncle separate; labellum with distal calli and/or clusters of callus cells                | <i>Microtis</i>    |
| 1: | Leaf solid; in flowering plants the leaf and peduncle fused into a single unit; labellum lacking distal calli and clusters of callus cells | 2                  |
| 2. | Labellum orbicular, unadorned  | <i>Hydrorchis</i>  |
| 2: | Labellum oblong-elliptic, with rows of micropapillae   | <i>Microtidium</i> |

SUBTRIBE: Spuriacanthinae M.A.Clem. et D.L.Jones, *subtrib. nov.*; ceteris subtribibus Diuridearum sed radicibus longis, sine tuberibus; floribus apetalis; labello orbiculari sine glandibus basalibus. Type: *Spuriacanthus* Szlachetko et Margonska.

#### Distribution

A monogeneric tribe endemic to New Caledonia.

#### Recognition

Distinguished by the long fleshy roots which lack tubers, the flowers lacking petals and an orbicular labellum lacking basal glands.

#### Etymology

Derived from the genus *Microtis* and the diminutive suffix *idium*.

#### New Combination:

*Microtidium atratum* (Lindl.) D.L.Jones et M.A.Clem., *comb. nov.* Basionym: *Microtis atrata* Lindley in *Edwards's, Bot. Reg.* 1-23: Swan Riv. Append. liv. (1840).

28. *Microtis* R.Br., *Prod.* 230 (1810).

Type species: *Microtis rara* R.Br.

*Goadbyella* R.S.Rogers, *Trans. & Proc. Roy. Soc. South Australia* 51: 294 (1927).

#### Recognition

Recognised by a hollow terete leaf which develops fully, long before the inflorescence grows up through the centre of the leaf and emerges through a fistula; the peduncle and leaf never fused over any of their length; a long, loose, apical free lamina on the leaf; and labellum rectangular or cordate, adorned with calli.

#### Distribution

A genus of about twenty species distributed in east Asia, Polynesia, Melanesia, New Caledonia, New Zealand and Australia.

29. *Spuriacanthus* D.L.Szlachetko et Margonska, *Polish Bot. J.* 46(1): 29 (2001).

Type species: *Acianthus atepalus* Rchb.f. (*Spuriacanthus atepalus* (Rchb.f) D.L.Szlachetko et Margonska).

#### Recognition

This genus has some affinities with *Acianthus* but is readily distinguished by the long fleshy roots, which lack tubers, leaves with an erect rather than horizontal lamina, the flowers lacking petals, an orbicular labellum lacking basal glands and the callus consisting of a weak central plate without a central channel.

**Distribution**

A monotypic genus endemic to New Caledonia.

**Etymology**

Derived from the Latin, *spurii*, false and *Acianthus*, another genus of Orchidaceae.

**SUBTRIBE: Townsoniinae** M.A.Clem. et D.L.Jones, *subtrib. nov.*; ceteris subtribibus Diuridearum tuberibus radicibus biennibus stolonoideis concatenatis; foliis una vel duobus erectis; lamina folii venatione sparsa; glandibus basalis labelli absentibus; et columna omnino alata, distinguenda. Genus: *Townsonia*

**Conclusion**

A summary of the proposed higher classification of taxa involved in this part of the family Orchidaceae is provided below.

**Proposed new classification of the study taxa but in particular subfamily Orchidoideae, tribes Cranichideae and Diurideae.**

Family: Orchidaceae

Subfamily: Apostasioideae. *Apostasia*

Subfamily: Cypripedioideae. *Cypripedium*

Subfamily: Vanillioideae. *Vanilla*

Subfamily: Codonorchidoideae. *Codonorchis*

Subfamily: Epidendroideae

Tribe: Coelochilideae. *Coelochilus*

Tribe: Epidendreae. *Epidendrum*

Subfamily: Orchidoideae

Tribe: Orchideae (including Disae).

Subtribe: Disperisinae. *Disperis*

Subtribe: Orchidinae. *Cooktownia*, *Cynorkis*, *Disa*, *Habenaria*, *Hemiphilia*, *Herschelianthe*, *Satyrium*, *Serapias*, *Stenoglottis*

Tribe: Cranichideae

Subtribe: Achlydosinae. *Achlydosa*

Subtribe: Chloraeinae. *Chloraea*, *Gavilea*

Subtribe: Cranichidinae. *Cranichis*, *Stenoptera*

Subtribe: Goodyerinae. *Lepidogyne*, *Zeuxine*

Subtribe: Pachyplectroniinae. *Pachyplectron*

Subtribe: Pterostylidinae. *Pterostylis*.

Subtribe: Spiranthinae. *Odontorhynchus*, *Spiranthes*

Tribe: Diurideae

Subtribe: Acianthinae. *Acianthus*, *Acianthopsis*, *Anzybas*, *Calcearia*, *Corybas*, *Corysanthes*, *Cyrtostylis*, *Gastrosiphon*, *Molloybas*, *Nemacianthus*, *Nematoceras*, *Singularybas*, *Stigmatodactylus*, *Univiscidiatus*

Subtribe: Adenochilidinae. *Adenochilus*

Subtribe: Caladeniinae. *Arachnorchis*, *Caladenia*, *Calonema*, *Cyanicula*, *Drakonorchis*, *Elythranthera*, *Glossodia*, *Glycorchis*, *Leptoceras*, *Petalochilus*, *Pheladenia*, *Praecoxanthus*, *Stegostyla*.

Subtribe: Cryptostylidinae. *Cryptostylis*

Subtribe: Diuridinae. *Diuris*, *Orthoceras*

Subtribe: Drakaeinae. *Arthrochilus*, *Caleana*, *Chiloglottis*, *Drakaea*, *Paracaleana*, *Phoringopsis*, *Spiculaea*, *Thynninorchis*

Subtribe: Eriochilidinae. *Eriochilus*

Subtribe: Megastylidinae. *Aporostylis*, *Burnettia*, *Leporella*, *Lyperanthus*, *Megastylis*, *Pyrorchis*, *Rimacola*, *Waireia*

Subtribe: Rhizanthellinae. *Rhizanthella*

Subtribe: Prasophyllinae. *Corunastylis*, *Genoplesium*, *Hydrorchis*, *Microtidium*, *Microtis*, *Prasophyllum*.

Subtribe: Spuriacanthinae. *Spuriacanthus*

Subtribe: Thelymitrinae. *Calochilus*, *Epiblema*, *Thelymitra*

Subtribe: Townsoniinae. *Townsonia*

Cheesem.

**Recognition**

Distinguished by the tubers being linked by biennial stolonoid roots extant over more than one season; one or two erect leaves arising from each tuber; membranous leaf lamina with sparse venation not anastomosing at the apex; absence of basal labellum glands; blunt sepals; and, column winged throughout.

**Distribution**

A monogeneric tribe endemic to Tasmania and New Zealand.



**Table 1. Comparison of selected diagnostic characters of Australian and New Zealand genera in the *Corybas* Alliance.**

<b>Character</b>	<b><i>Corybas</i></b>	<b><i>Corysanthes</i></b>	<b><i>Nematoceras</i></b>	<b><i>Molloybas</i></b>	<b><i>Singularybas</i></b>	<b><i>Anzybas</i></b>
<b>Dorsal sepal</b>	Broadly elliptic, sessile, enclosing two-thirds of the labellum lamina	Obovate-spathulate, subsessile, enclosing less than half the labellum lamina	Narrowly spathulate, subsessile, enclosing less than a third of labellum lamina	Narrowly spathulate, subsessile, enclosing less than a third of labellum lamina	Narrowly spathulate, subsessile, enclosing less than a third of labellum lamina	Ovate-elliptic, narrowed suddenly to a long basal claw, enclosing about quarter of labellum lamina
<b>Lateral sepals and petals</b>	Almost vestigial, much shorter than labellum lamina	Almost vestigial, much shorter than labellum lamina	Well developed, as long as or much longer than labellum lamina; lateral sepals longer than petals	Well developed, as long as or much longer than labellum lamina; petals longer than lateral sepals	Well developed, as long as or much longer than labellum lamina	Well developed, about half as long as labellum lamina
<b>Labellum basal tube</b>	Short	Moderately long	Moderately long	Moderately long	Moderately long	Absent
<b>Labellum lamina</b>	Strongly folded/convolute, margins spreading, recurved	Sharply recurved, margins spreading, incurved	Sharply recurved, apex entire, margins entire to denticulate	Recurved, margins deeply lacinate	Recurved, apex with a long, projecting, tusk-like mucro, margins deeply erose/lacinate	Tubular throughout with an apical orifice subtended by a rostrate platform
<b>Dorsal margins of labellum tube/lamina</b>	Tube adnate, lamina free	Tube adnate, lamina free	Tube adnate, lamina free	Tube adnate, lamina free	Tube adnate, lamina free	Dorsal margins fused throughout
<b>Labellum auricles/spurs</b>	Closed spurs	Open auricles	Open auricles	Open auricles	Open auricles	Open auricles
<b>Column</b>	About as long as wide, with a ventral pad	About as long as wide, with a ventral pad	About as long as wide, without a ventral pad	About as long as wide, without a ventral pad	Much longer than wide, with a ventral pad	Much longer than wide, without a ventral pad

**Table 2. Comparison of selected diagnostic characters of genera in the *Acianthus* Alliance (including *Townsonia* and *Spuriacianthus*)**

<b>Character</b>	<b><i>Acianthus</i></b>	<b><i>Univiscidiatus</i></b>	<b><i>Acianthopsis</i></b>	<b><i>Spuriacianthus</i></b>	<b><i>Nemacianthus</i></b>	<b><i>Stigmatodactylus</i></b>	<b><i>Townsonia</i></b>
<b>Root system</b>	Replacement tuber present, daughter tubers and stolonoid roots present	Replacement tuber present, daughter tubers and stolonoid roots sometimes present	Replacement tuber present, daughter tubers and stolonoid roots absent	Tubers absent, fleshy roots present	Replacement tuber present, daughter tubers and stolonoid roots present	Tubers present or absent	Tubers present, linked by biennial stolonoid roots
<b>Leaf</b>	Single, geotropic	Single, geotropic	Single, geotropic	Single, erect	Single, geotropic	Single, geotropic	One - two, erect
<b>Sepal tips</b>	Linear-terete	Acute - acuminate	Acute - acuminate	Filiform - attenuate	Filiform - attenuate	Acute - acuminate	Obtuse
<b>Petals</b>	Present	Present	Present	Absent	Present	Present	Present
<b>Basal labellum glands</b>	Two prostrate, tonsil-like	Absent	Single basal gland present or absent	Absent	Two erect, columnar	Absent	Absent
<b>Labellum callus</b>	Narrow, reticulate longitudinal channel	Medial ridge or plate	Medial ridge or plate	Medial plate	Narrow, reticulate, longitudinal channel	Medial ridge or plate often with accessory ridges and keels	Narrow, thickened medial band
<b>Anterior column appendage</b>	Absent	Absent	Ligulate, hastate or lamellate	Absent	Absent	Alate or dactyliform	Absent
<b>Column wings</b>	Absent	Absent	Weakly to strongly winged	Absent	Weakly winged	Weakly winged	Winged throughout

**Table 3. Comparison of selected diagnostic characters of genera in the *Arthrochilus* Alliance**

<b>Character</b>	<b><i>Arthrochilus</i></b>	<b><i>Phoringopsis</i></b>	<b><i>Thynniorchis</i></b>
<b>Root system</b>	Replacement tuber absent, daughter tubers and stolonoid roots present	Replacement tuber absent, daughter tubers and stolonoid roots present	Reduced protocorm-like tuber present, replacement tuber present, daughter tubers and stolonoid roots absent
<b>Leaf arrangement</b>	Lateral rosettes from the base of the scape, rarely encircling the scape base.	Basally sheathing the scape, distichously arranged	Leaves absent
<b>Surface of tepal bases and column foot</b>	Papillate	Smooth	Smooth
<b>Column foot</b>	Short	Short	Long and rod-like
<b>Labellum hinge attachment</b>	Underside of column foot	Centre of column foot	Underside of column foot
<b>Labellum lamina attachment</b>	Attached to hinge via a peltate supporting stalk	Direct to hinge	Direct to hinge
<b>Callus</b>	Thickened, ornamented with warts and clavate calli	Swollen, fungiform, ornamented with penicillate calli	Deeply bifurcate, ornamented with partly adnate, barbed, caudiform calli
<b>Pollinarium</b>	Absent	Absent	Present
<b>Pedicels elongating in fruit</b>	Absent	Absent	Present

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## David Jones presented with the Australian Orchid Foundation "Award of Honour"

In October 2001, David Jones was presented with the Australian Orchid Foundation's prestigious "Award of Honour" for recognition of his enormous contribution to orchids in Australia and internationally. Previous recipients include such illustrious names as Alick Dockrill, Gerald McCraith, Hermon Slade, Wal Upton and Len Lawler. What follows is an edited version of the successful nomination that was compiled by Mark Clements, Gerald McCraith and Helen Richards, which was passed unanimously by the ten independent referees appointed by the directors of the AOF.

David Lloyd Jones was born in Victoria in 1944 and has had a deep interest in Australian flora including orchids since his boyhood. He attended Burnley Horticultural College where he obtained his Diploma of Horticulture, being dux of the college in his final year. He went on to Melbourne University, graduating with a Bachelor of Agricultural Science degree. He was employed as a professional horticulturalist by the Victorian Department of Agriculture at the Knoxfield Horticultural Research Institute for 14 years. There he was instrumental in implementing many innovative programs in the study of Australian plants, especially in relation to their nutrient requirements.

His extensive knowledge of orchids was recognised when in 1968 he was asked to co-edit, with Mr Bruce Muir, the publication by Thomas Nelson (Australia) Ltd of the complete collection of W.H. Nicholls' water-colours and manuscripts, resulting in the publication of *Orchids of Australia* in time for the World Orchid Conference held in Sydney in 1969. Around this time he became deeply involved in the study of the pollination of native orchids.

In 1968, the Victorian Group of the Australasian Native Orchid Society was formed. David was a foundation member and foundation committee member. He was later honoured with life-membership.

David and his wife, Barbara (who also obtained her Diploma of Horticulture at Burnley) opened a nursery called 'Geewan Ferns', adjacent to the large Australian plants nursery 'Austraflora' at Montrose, where they propagated and sold Australian ferns and orchids during the late 1960s and into the 1970s.

In 1973, David described his first orchid, *Corybas hispidus*, publishing it in the Victorian Naturalist. The family moved to the Currumbin Valley area of south Queensland in 1978, where

they established a nursery, supplying plants to the Gold Coast for many years. During this time, David continued studying orchids, making contact with many of the local enthusiasts and searching the countryside with them. By then he was becoming a prolific author of books on many subjects relating to plants. *Native Orchids of Australia*, a major reference book on all known species at that time was published in 1988.

In 1987, David and family moved to Canberra where he took up the position of Horticultural Research Officer in the research section of the Australian National Botanic Gardens. After a year during which time he evaluated the viability of the 40 or more horticultural projects being undertaken at the ANBG, he approached management and proposed a change of direction for him, namely to refocus his research on the taxonomy of various Australian plant groups, but particularly orchids.

With official approval, David set about expanding areas of research into orchids by undertaking field work and focusing on the collection of particular groups in need of study, increasing the National Herbarium reference collection of orchids and introducing new techniques necessary for the study of these plants. These included the floral dissection cards, facilitating the general understanding and recording of the biodiversity of the Australian orchid flora. A significant part of his work involved the setting up of a network of professional and amateur botanists throughout Australia with whom he set up a liaison in order to obtain additional fresh orchid material for study. By this means he significantly expanded and sped up the process of searching and studying orchids throughout the country. In addition to receiving and identifying many new species of orchids, David undertook the botanical drawing of many of these plants and now has in excess of 2000 illustrations.

Many of these have been used in the description of new species and in various other botanical publications.

As a direct result of his work and the publication of various articles on Australian orchids, David has been invited by other professional botanists to be involved in many cooperative projects throughout Australia. These include:

Study of Tasmanian orchids with Hans Wapstra and others in the Tasmanian National Parks and Wildlife Service;

Study of orchids in south west Western Australia;

Flora treatments of the orchids of New South Wales and Victoria;

Treatment of the Diurideae in 'Genera Orchidacearum' for the Royal Botanic Gardens, Kew, England.

A major contributor to the *Flora of Australia*.

Since his arrival in Canberra, firstly at the ANBG until 1994 and then as a Research Scientist in the Orchid Research Group at the Centre for Plant Biodiversity Research (a cooperative between the ANBG /Environment Australia Department and Plant Industry, CSIRO), David has undertaken numerous field trips to study orchids first hand as well as to collect material for research. On many occasions, he has undertaken one-day trips or sometimes trips for several days to specifically obtain fresh material of a particular species or group of orchids. His energy, experience and ability in the field are astounding. Areas where he has undertaken field trips include: Australian Capital Territory, Tasmania (most of the state), Victoria (most of the state) Kangaroo Island, Eyre and York Peninsula, the Flinders Ranges, southeast of South Australia, much of the eastern half of New South Wales, the south west of Western Australia and much of eastern and north eastern Queensland. Additionally, he has travelled overseas to Christchurch, New Zealand, New Caledonia, and the Torricelli Mountains in Papua New Guinea.

Since commencement of his research on orchids in Canberra, David has recognised, described, named, renamed and illustrated over 300 species and several genera of orchids, both separately and in conjunction with various colleagues. He has taken us to a new level of understanding of the Australian orchid flora, having contributed directly or indirectly to the recognition of over 1300 species in Australia

(many yet to be described) effectively doubling the number recognised before he started in 1986.

David has been a member of the Australian Orchid Foundation since its inception 25 years ago. He has been a member of the Research Committee since it was established and its Chairman for the last 15 years, during which time he has diligently and conscientiously carried out the responsibilities of that position.

Finally, colleague Mark Clements comments on his association with David.

"I have known and worked with David Jones for the past 25 years. David first came to my attention during my formative years back in South Australia. In 1969, the family was given a copy of *Orchids of Australia* by W.H. Nicholls, edited by Bruce Muir and David Jones. It was during an Australian Orchid Foundation meeting held at the then Canberra Botanic Gardens in 1975, that I first met David and we have been good friends and colleagues ever since.

David Jones is without doubt one of the outstanding botanists of our time. His generalist knowledge in horticulture and field experience of Australian plants, plant communities and associated natural history is second to none in this country and the like of which we may never see again. This knowledge is not just confined to Australian plants, with his interests extending world wide to groups such as cycads, ferns and bulbous plants providing a basis for the publication of numerous extremely well researched and presented reference books (over 25) on a whole range of subjects. It is however the study of orchids, particularly Australian species, where David has excelled and made an immense contribution. His knowledge and understanding of the subject is astounding. Despite working closely with David over the past 15 years, his knowledge and work on these plants never ceases to amaze me.

His overall contribution to the general knowledge of Australian orchids may never be equalled or surpassed."

Congratulations David, on behalf of all the members of the Australasian Native Orchid Society.



## Ira Butler Trophy Winners for 2001

Roslyn Capell  
 Hon. Secretary, I.B.T.C.  
 P.O. Box 899, Willoughby, NSW, 2068

**THE WINNER OF THE GOLD IRA BUTLER TROPHY - 2001**  
 For The Champion Australian Native Orchid Hybrid of the Year is  
*Dendrobium Groster x Dendrobium kingianum*

This year's winner was Champion Orchid at the Casino & District Orchid Society Show. The show marshal's description was that the plant was very floriferous with 16 upright inflorescences of beautifully presented, well rounded mauve/pink flowers of excellent texture with a very broad pale labellum speckled mauve to match the rest of the flower, with each raceme carrying up to 11 flowers displayed above the foliage.

This lovely orchid is owned by Stewart and Helen Penman of Kyogle, and it was bred by them. It comprises 62.5% *Dendrobium kingianum*, 15.625% *D. falcorostrum*, 12.5% *D. fleckeri*, 6.25% *D. speciosum*, and 3.125% *D. tetragonum*.

Of the runners up, a noteworthy competitor was Colin & Myrtle Manthey's fine plant of *Dendrobium* John's Charm 'Myrtle'. This *Dendrobium* sect. *Spatulata* hybrid recently received an Award of Merit from the Australian Orchid Council and Queensland Orchid Society.

Of the 30 nominations this year, 4 were from State societies, 16 from State or OSCOV affiliated societies, 8 from ANOS groups, 1 from NOSSA and 1 from the Dungog Show. 10 plants had received quality awards during the year. Again the overwhelming majority of entries were dendrobiums. There were no terrestrials.

The following ten "runners up" will receive Silver Ira Butler Trophies:

- *Dendrobium* Avril's Gold 'Christine' HCC/AOC-NSW - Grahame Beaton (Hybridiser Ray Hill)
- *Dendrobium* Class 'Windsor Downs' - Bernie Fletcher (Hybridiser David Butler)
- *Dendrobium* Glitter 'The Star' HCC/AOC-NSW - Norm & Kay Mitchell (Hybridiser John Purvis)
- *Dendrobium* John's Charm 'Myrtle' AM/AOC-QOS - Colin & Myrtle Manthey
- *Dendrobium* Rosella x *D. Sunglow* - David & Pat Harmer (Hybridiser John Purvis)
- *Dendrobium* Tie-Dye 'Magic Moment' - Norm & Kay Mitchell (Hybridiser DUNO)
- *Sarcochilus* Freckles - Bob & Helen Morton
- *Sarcochilus* Melba - David & Leanne Brown
- *Sarcochilus* Melody 'Bubbles' HCC/ANOS - Down Under Native Orchids (Hybridiser DUNO)
- *Sarcochilus* Weinhart 'Yannie's Jewel' HCC/OSCOV - David & Leanne Brown (Hybridiser DUNO)

The following will receive Ira Butler Certificates:

- *Dendrobium* Amber Banks 'Kate' - Ken Unsworth
- *Dendrobium* Bardo Rose 'Pink Delight' - Ros & Tom Fitzgerald
- *Dendrobium* Bellinger Surprise - Kay & Norm Mitchell
- *Dendrobium* Coote - Rick Winch
- *Dendrobium* Elegant Heart 'Diana' - HCC/OSCOV - Philip Grech
- *Dendrobium* Finlay 'Rippa' HCC/OSCOV - Philip Grech
- *Dendrobium* Grace Robson 'Sandy' - Henk van den Berg
- *Dendrobium* Hilda Poxon 'Gold Star' - Ros & Tom Fitzgerald
- *Dendrobium* Hilda Poxon 'Joean' - David & Pat Harmer
- *Dendrobium* Hilda Poxon 'Rekeity' - Kellie Stevens
- *Dendrobium* Jesmond Dazzler 'Burgundy Beauty' HCC/AOC-OCSA
- *Dendrobium* Karsun 'Kylie' - Henk van den Berg
- *Dendrobium* Kayla - Phil Barrett
- *Dendrobium* Star of Riverdene - B. Killen

- *Dendrobium* Star One 'Kym' HCC-CC/OSCOV - B & B Khann
- *Dendrobium* Stunning 'Speckles' HCC/AOC-NSW - Don Cruickshanks
- *Dendrobium* Visheen - Frank & Hanny Vernon
- *Sarcochilus* George Colthup - John Whitney
- *Sarcochilus* Melody 'Measels' - Col Brandon

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**THE WINNER OF THE BILL MURDOCH TROPHY - 2001**  
for The Champion Australian Native Orchid Species of the Year is  
*Dendrobium speciosum* subsp. *curvicaule* 'Daylight Moon' FCC/AOC-NSW

This magnificent orchid is owned by A.P. & J.L. Blewitt and was eligible for nomination by reason of having been awarded a First Class Certificate, the highest quality award that can be granted to an orchid.

The nomination form describes the plant as having had an excellent arrangement of flowers, with the colour excellent and flowers clean. The longest inflorescence had 118 flowers, the flowers widely opening for this variety and of

excellent shape. The plant had 7 inflorescences, with 714 flowers. There were 93 flowers on the inflorescence judged.

There were a total of 23 nominations for the Bill Murdoch Trophy this year, of which 5 were from State societies, 9 from State or OSCOV affiliated societies, 7 from ANOS groups and 1 from NOSSA. One other entry had also received a quality award during the year.

The following will receive **Bill Murdoch Certificates**:

- *Bulbophyllum bracteatum* 'Eliza' - Gerry Walsh
- *Caladenia catenata* - Barry Bush
- *Caladenia filamentosa* - Nesbitts Orchids
- *Corybas diemenicus* - Joyce Whan
- *Dendrobium kingianum* 'Cosmos' - Kay & Norm Mitchell
- *Dendrobium kingianum* 'Joan' HCC/OSCOV - Alan & Joan Tangey
- *Dendrobium kingianum* 'Monique' HCC-AD/NSW - Lorna Kerr
- *Dendrobium kingianum* 'The Bellinger' - Kay & Norm Mitchell
- *Dendrobium speciosum* ('Windermere' x self) - Lorraine & Bill Dobson
- *Dendrobium speciosum* ('Windermere' x self) - Rick Winch
- *Dendrobium speciosum* 'Little John' - Kay & Norm Mitchell
- *Dendrobium speciosum* 'National White' HCC/AOC - Peter Wise
- *Dendrobium speciosum* 'Rip Snorter' - Cedarvale Orchids
- *Dendrobium speciosum* subsp. *curvicaule* 'Bellingen Jazz' - Henk van den Berg
- *Dendrobium tetragonum* 'Drouin' - Neil & Fay Allison
- *Dockrillia linguiformis* - Peter G. Churchus
- *Dockrillia teretifolia* - Anthony Woodbine
- *Dockrillia teretifolia* - Bill & Ann Green
- *Pterostylis baptistii* 'Gosford' - Nesbitts Orchids
- *Pterostylis stricta* - Nesbitts Orchids
- *Sarcochilus falcatus* ('Clarrie' x 'Andrew') '#1' - Frank & Hanny Vernon
- *Sarcochilus hartmannii* 'Anurat' - Lloyd Perryman

Congratulations to all entrants in the 2001 Trophy competition, and good growing in 2002.





## Growing Terrestrial Orchids from Seed

Dick Thomson

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The Terrestrial Study Group of the Victorian Group of ANOS has been experimenting with growing terrestrial orchids from seed using asymbiotic techniques. We are succeeding with many species while some are proving challenging. Our aims are to increase the plant numbers for some threatened species and to make desirable orchids more readily available to orchid hobbyists. There is also potential for desirable hybrids to be developed.

The species we are growing from seed include *Caladenia*, *Diuris*, *Calochilus*, *Eriochilus*, *Glossodia*, *Lyperanthus*, *Microtis*, *Pterostylis* and *Thelymitra*. *Caladenia* and *Glossodia* are growing well in the flask but dying after deflasking. *Thelymitra* and *Pterostylis* seem to be the easiest to grow and deflask. Plants are deflasked about 18 months after sowing of the seed. Some *Pterostylis* have flowered the year of deflasking while other species seem to take about 3 years to flower.

The equipment we use is available in the home. The media is purchased from a commercial supplier, mixed in a blender and sterilized in a pressure cooker. Seed sowing and replating is carried out in a sterile box or cabinet. The flasks are then grown under fluorescent lights and deflasked into pots in a shade house.

We have relied on our understanding of the work of researchers including Kingsley Dixon and his staff at Kings Park, Mark Clements and subsequent work including that of Ruth Raleigh at the Herbarium in Melbourne and the work of Les Nesbitt, Andrew Paget and Kevin Western. It has been a team learning experience, one we will readily share with others who are interested.

### Pollination

Pollinate your flowers rather than leave it to the chance of nature. Most terrestrials are easy to pollinate. Study a good reference book to find the location of the pollinia and the sticky receptive pad. Allow the flower to be open for a couple of days. Then, using a sharp toothpick, lift the pollinia from the flower and place them on to the sticky pad of another flower. It is sometimes necessary to roll the toothpick in the fingers to get the pollinia to adhere to the sticky pad. *Pterostylis* pollination, which is more of a challenge as the pollen and sticky pad are usually hidden, is made easier if the top of the galea or part of the side of the flower is cut away using a new razor blade. It is good practice to transfer

pollen to flowers on a different plant and if the plant is multi-flowered to only pollinate a couple of flowers. Plants pollinated each year seem to weaken. Pollen may be stored by placing it in a small phial in the refrigerator.

### Seed Collection and Storage

Seed can be collected at either of two stages - while the pod is still green or as it dries. Green pods are collected once the pod is mature but before it begins to dry. Green pods should be used immediately. Most seed is collected as the pod dries. When the pod is changing colour from green to dry it should be cut from the flower stem. Cut it just before it develops tiny splits through which the seed escapes. The pod is then placed in a small paper envelope or folded paper and the name, provenance and date are written on it. The package is then placed into a jar in the refrigerator with a drying agent such as silica gel. If the seed is to be stored for a length of time it can be placed into a small phial and stored in the refrigerator.

While the viability of seed seems to vary from species to species most seed seems to last at least 5 years if stored in this manner. Some seed germinates best when fresh and again after storage of some months. This seems to apply to most *Diuris* seed.

To avoid loss of seed, should the pod split, it is possible to tie fine nylon material or a washed tea bag over the pod to retain the seed. If seed is to be sent through the post it must be packed in a box, which will not crush as crushed seed, will not germinate.

### **Sterilizing Agents**

Various concentrations of household bleach are used to clean work areas and to decontaminate seed. The concentrations listed within this article refer to White King. Other brands may have different concentrations of Sodium Hypochlorite. Household bleach weakens over time, thus its storage and freshness can be important. It is also important that a fresh dilute bleach solution is made up on each occasion. Methylated Spirits is used as a solution of 70% Methylated Spirits and 30% water. Concentrated Methylated Spirits can dehydrate fungi spores instead of killing them. Methylated Spirit solution is used to clean work areas; flask surfaces, hands and arms but is not used on seed or plant tissue. When using sterilizing agents it is important to give them time to kill the fungi and bacteria. Hydrogen Peroxide at 6% weight per volume, purchased from a pharmacy, can be used to kill a small fungal spot in a flask by dropping a few drops onto the spot.

### **Safety**

Growing orchids should be fun and not a health hazard. Bleach can be hazardous to our skin, eyes, and our breathing system. Methylated Spirits is flammable and poisonous and can remove oils from your skin making the skin more susceptible to penetration by chemicals. The contaminants, which may grow in flask, can be harmful if inhaled. Thus it is wise to use the materials safely and to re-sterilize contaminated flasks before opening them to remove the contaminated media.

### **Making a Sterile Work Area**

To be successful you need an area into which you can place the equipment and flasks that you need and keep them free of contamination while working. In its simplest form an open top plastic storage box with two-wrist size round hand holes cut into the side and a glass plate, as a lid, is effective as a work area. Books in orchid club libraries and web sites have more elaborate and user-friendly designs. If you are lucky you may be able to borrow a box or obtain the use of a laminar flow cabinet. If the sterile box is large enough an UltraViolet light can be used to assist sterilization. UV light burns the skin and damages the eyes. Wipe down the inside surfaces of the sterile box and lid with a solution of 20% White King and 80% sterile water. Gloves are important as it is difficult to effectively kill all the bugs on your hands. Placing them in an oven bag and 'cooking' them in the pressure

cooker can sterilize instruments. Some plastics collapse if heated in the pressure cooker. Between usage instruments can be placed into a jar of 10% White King and dipped into a jar of 1% White King prior to reuse. Metal instruments left in White King for a length of time may be damaged. Breeze or movement in the workroom causes air to flow in and out of the sterile environment contaminating it.

### **Flask and Media Preparation, Sterilisation and Storage**

We use glass jars with metal or plastic screw top lids as growing flasks. A small hole is drilled into the lid and a fungi and bacteria seal placed over the hole. These may be obtained from media suppliers or you can use small round band-aids that are bacteria proof.

We purchase our media from Western Orchid Laboratories in Adelaide as they have experience in growing terrestrial orchids from seed. The media comes in a dry pack to which we add an accurately measured amount of water. The media is mixed in a blender. To the replating or growing media we also add banana and sometimes coconut milk or unsweetened pineapple juice. About 1cm depth of media is needed in a seed flask and about 2cm depth in a growing flask. The media should be set firm but not hard. The media is 'cooked' in the pressure cooker for 15 minutes at 15 psi. Higher pressures and consequently temperatures damage the media. Easy to follow instructions for making up and sterilizing the media are provided. We then store the sterile flasks of media for about a week in closed boxes to check that effective sterilization has occurred. It is important to keep the flask upright at all times. When the flasks are to be used they are sprayed with the 70% methylated spirits solution and placed into the sterile area. It is important to spray into the jar-lid junction.

### **Seed Sterilisation and Seed Sowing**

A seed capsule can contain a lot of seed. Only a small amount may need to be used at a time. A mixture of 10% White King and 90% sterile water is used to sterilize seed. A small amount of the 10% White King is mixed with the seed in a small container and continuously shaken to wet all the seed. The White King contains a detergent that acts as a wetting agent. While the sensitivity of the seed to the bleach solution varies from species to species, a maximum of 6 minutes for the bleach to be in contact with the

seed is recommended. A sterilization time of less than 4 minutes seems to increase significantly the incidence of seed flask contamination. The seed is rinsed with sterile water and placed onto the agar in the flask. One technique we use is to place a piece of good quality, sterilized, paper towel into a sterile plastic funnel. Pour the seed and liquid into the filter paper in the funnel and, using an eyedropper, pour sterile water over the seed until the bleach is removed. The seed can then be lifted off with a fine spatula and placed onto the media. The paper towel containing seed can also be placed onto the media.

Green pods may be sterilized for much longer as the seed is safely inside its sterile and sealed environment. The pod is then rinsed and split with a sterile blade, the seed scraped out and placed onto the agar. Spare seed may be sown around parent plants.

#### Working with a flask

Once a flask is open it can become contaminated from the instruments, your hands or the air. To reduce the risk of contamination keep the flask open for as short a time as possible and do not move your hand over the flask. We hold the flask partly on its side to reduce the risk of contaminants falling in from the air. Instruments are held near the end to help keep hands away from the flask opening. Longer tweezers may be purchased from a vet supplier. Always assume there may be live fungal spores on the thread of the jar.

#### Looking after the Flask

Wrap the lid / flask junction with cling wrap to reduce the risk of infection. A roll of cling wrap can be cut into 5 cm wide rolls. Label the flask. Labels usually include the species name, date of flasking, the media used and an identification code. Use a pencil or pen that does not fade and is not soluble in methylated spirits. An added precaution is to place the flask into a ziplock plastic bag.

Keeping the flasks at an even temperature within the range of 18 to 22 C degrees seems to be important. Above 24 degrees seems to significantly increase contamination while below 18 degrees seem to slow germination and growth. Keep the flask in the dark until the seed germinates and then bring the flask into the light over a few weeks. Time in darkness varies with species but 4 weeks seems to be the minimum. Some seed, especially *Caladenia latifolia* calcifies

and does not grow if the flask is taken into the light too soon. Some seed can take many months to germinate. *Diuris* germination can be spasmodic with a few seed germinating regularly over a 12-month period.

Flasks with growing plants may be kept on a windowsill with good indirect light. Better growth is obtained by placing flasks under a fluorescent light for 16 to 18 hours a day in an area with even temperature and away from drafts. A grow light can be used but it seems to make the plastic lids of jars brittle. It is wise to keep a reference sheet for each seed pod. This allows you to track down faults in technique and improve success. Data includes the information on the label, the seed source, seed sterilization times, the number of flasks and subsequent action.

Initially you can expect a contamination rate of at least 20%. As your techniques improve you should reduce contamination to about 2%. Experience has taught us that if you decide to alter a technique, do it on a small scale and observe the effect.

#### Replanting

Once the seed has germinated and begun to grow leaves the plants are replanted onto a growing media. Spray the flasks, especially into the threaded area, with the 70% methylated spirits and then place them and the required instruments into the sterile work area. Lids are loosened and the two flasks held at an angle in one hand. The lids are then removed. Tweezers are then used to pick up the tiny plants and place them onto the new media. Up to 20 plants may be placed into a 70 mm diameter jar. While it is best to place the plants evenly across the media surface, it is not always possible to replant the plants singly and small group planting may be necessary. If a plant is dropped it is discarded or placed into a flask on its own.

#### Deflasking

Deflasking is best undertaken in the first autumn after the plants have formed tubers. If you leave them to the second year you will have two sets of tubers but the old ones do not grow. If they are deflasked before tubers have formed the plants need a higher level of care. Some "*rufa*" group *Pterostylis* appear to deflask satisfactorily during the first season if they are deflasked when the tuber dropper is growing.

It is important to consider the conditions under which the plants are growing in the flask and their needs once deflasked. Within the flasks the plants are in even temperature, high humidity and the stomata are not used to closing. Until the plants adjust to their new environment it is important to protect them from dehydration. We mainly deflask in late April and May when weather conditions are mild and the orchids are beginning their growth cycle. It also helps if you deflask when the tuber is just shooting a new leaf. By choosing a period when a few days of rain are forecast you reduce the risk of dehydration. We have found that the plants are brittle at the join of the leaves and the base and are likely to break during handling. It is important to wash all the media of the roots and tubers because once deflasked, fungi infests the old media and will also destroy the plant.

While further work needs to be undertaken on the best potting mix for deflasked plants we are having success with a mixture of half Perlite and half commercial, pine based, potting mix. The potting mix does not include a water retaining material and should be just damp. To deflask we open the flask, fill it with tepid water and allow to stand for a couple of hours. The flask is then carefully tipped into a strainer and the media washed off the plants. Sufficient water pressure is used to enable media to be removed while minimizing damage to the fine hairs on the roots. Plants are then carefully separated. Sometimes it is necessary to leave plants in small clumps. A dibbler such as a chopstick is used to make holes in the potting mix and the orchids planted and gently firmed down with a light water.

The pots are kept covered, sprayed with a fine spray several times a day, with the cover being opened over several weeks. The pots are kept in a cool, low light area of the shade house for several weeks and then moved into a more normal shade house environment.

The plants must be kept growing for the whole season to allow tubers maximum time to develop. As the new tubers are near the surface the plant is susceptible to drying off on warm days or to rotting if kept too wet.

### Hybridisation and Line Breeding

Already some excellent hybrids have been developed. There is potential for many more hybrids with desirable characteristics to be developed. There is also potential for better plants and flowers to be selected and developed. When one considers the developments made with dendrobiums and *Sarcochilus* we can envisage the possibilities with *Diuris*, *Caladenia* and *Thelymitra*. Well-grown flasks of terrestrial orchids are available from commercial growers including Nesbitts Orchids and Western Orchid Laboratories.

### Conservation Success Stories

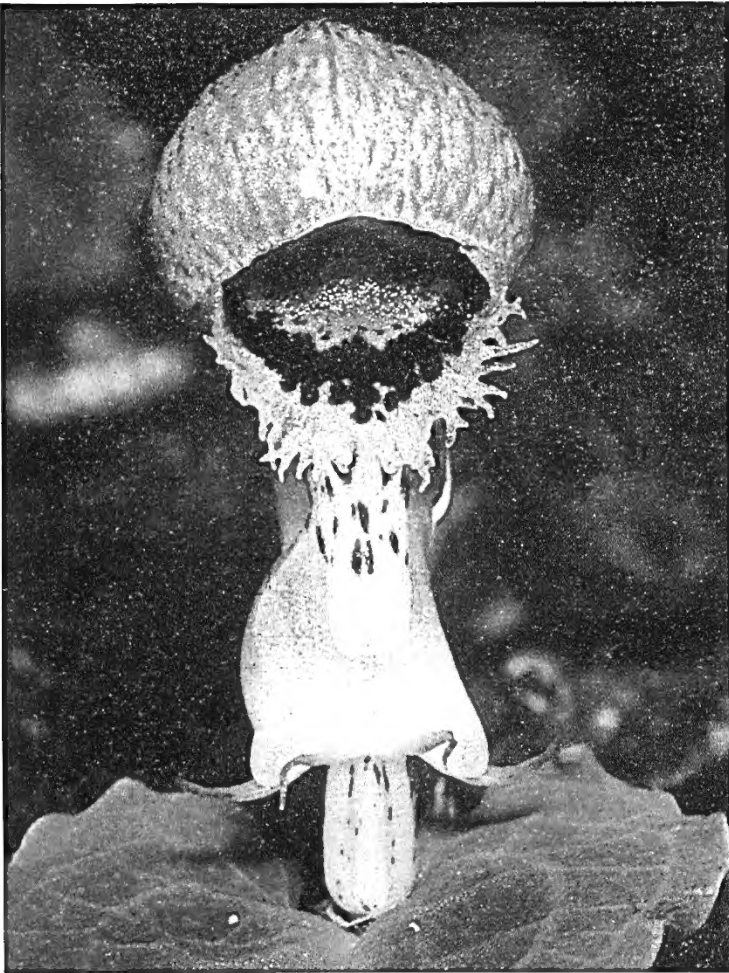
An important focus for the members of the ANOS Victorian Group is to work with appropriate authorities to improve the lot of wild orchids. *Diuris fragrantissima* was down to a handful of plants in the wild after work in the 1980's, to resurrect it, ran out of energy. We have been able to grow and deflask *Diuris fragrantissima* to build up a collection of plants for future release into at least three grasslands near Melbourne. *Pterostylis hians* appears to be extinct in the wild. We are successfully flasking and growing it, helping to build up sufficient numbers of plants, that have some genetic diversity, for future release by authorities back into appropriate land in New South Wales.

### Future directions

We are just beginning to develop skills in the collection and use of fungi for symbiotic seed culture. We are attempting to collect fungi by placing seed into a material envelope and putting it into the pot near a parent plant. The hope is that the fungi will infect the seed and we can use this fungus in an oatmeal media to germinate the seed and grow stronger plants. With luck we can then deflask *Caladenia* and other challenging species that will survive and grow. We also plan to develop skills which enable us to germinate and grow *Prasophyllum* as there are many threatened *Prasophyllum* species in Victoria that have low population numbers.



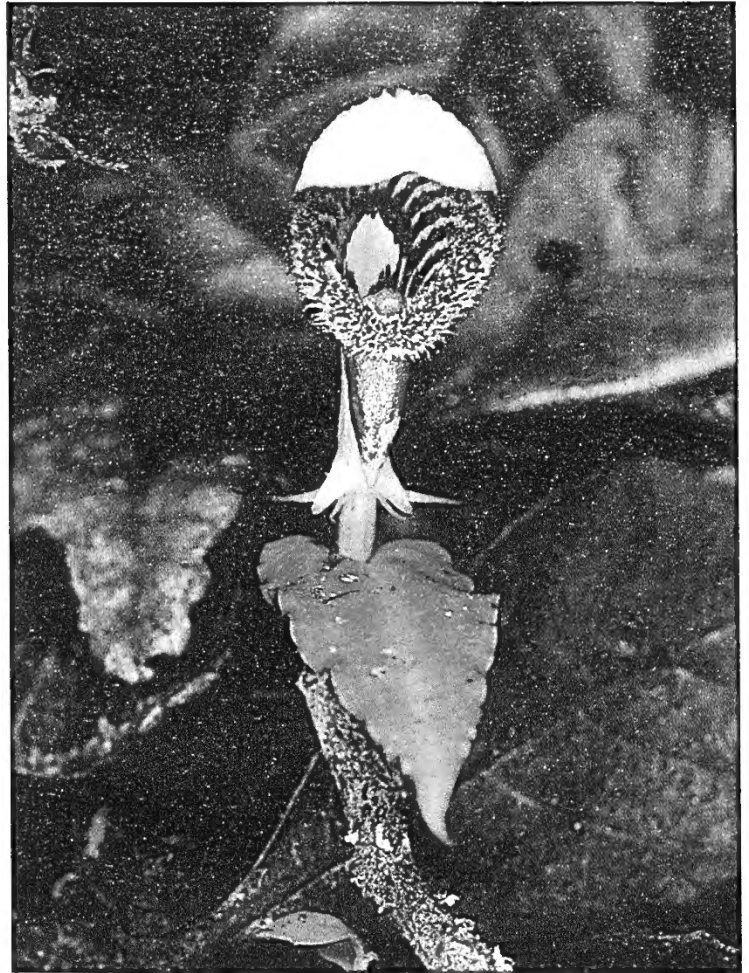




M.A. Clements

***Gastrostiphon subalpinus***

from Central Highlands, Papua New Guinea



M.A. Clements

***Gastrostiphon urikensis***

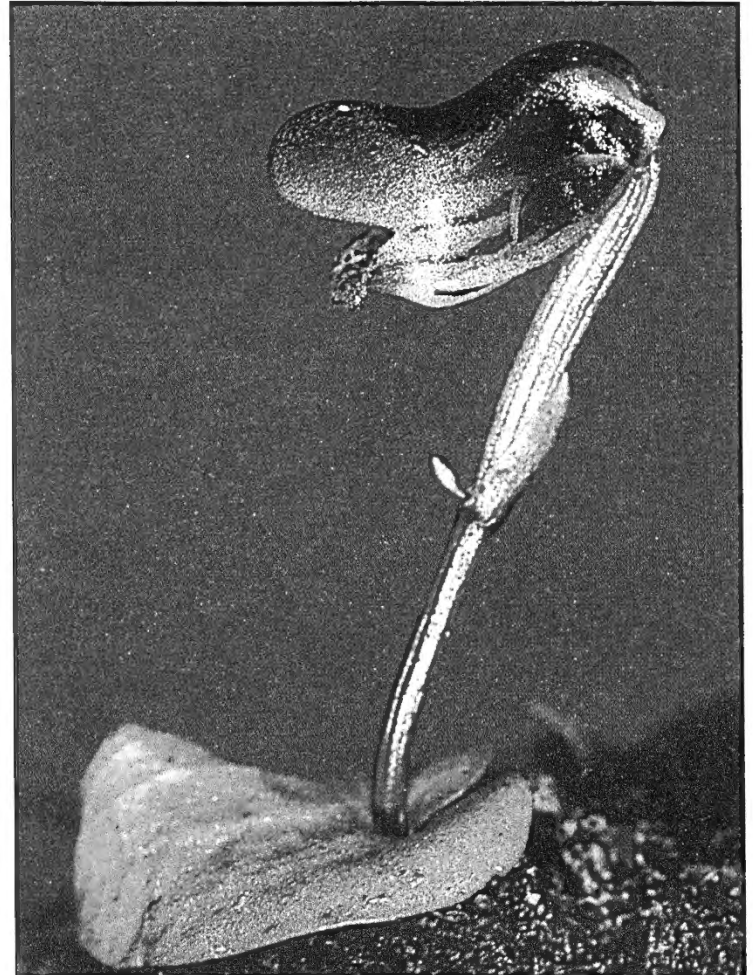
from Finisterre Range, Papua New Guinea



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***Nematoceras dienemus***

from Macquarie Island, south of Tasmania



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***Anzybas fordhamii***

from near Appin, New South Wales



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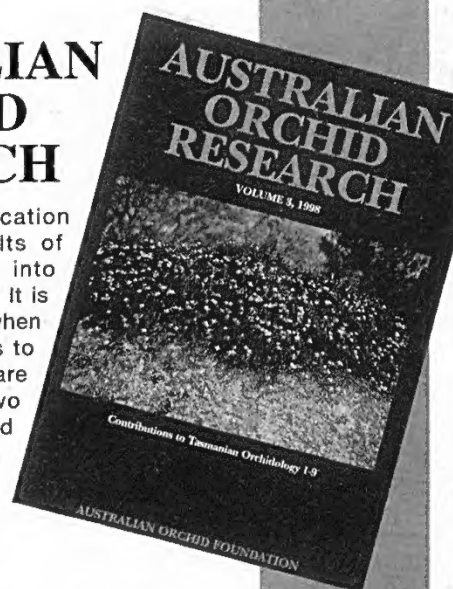
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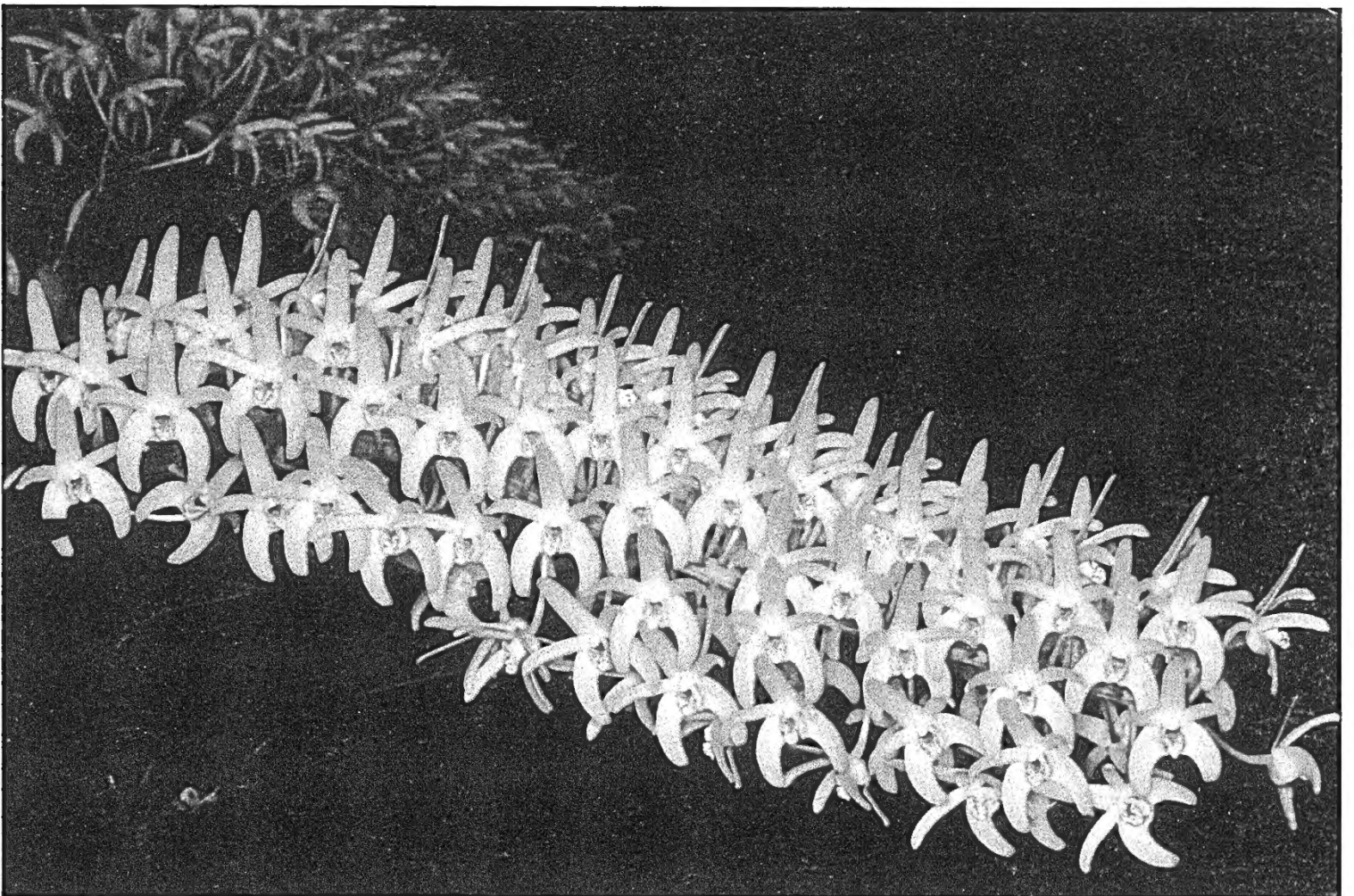
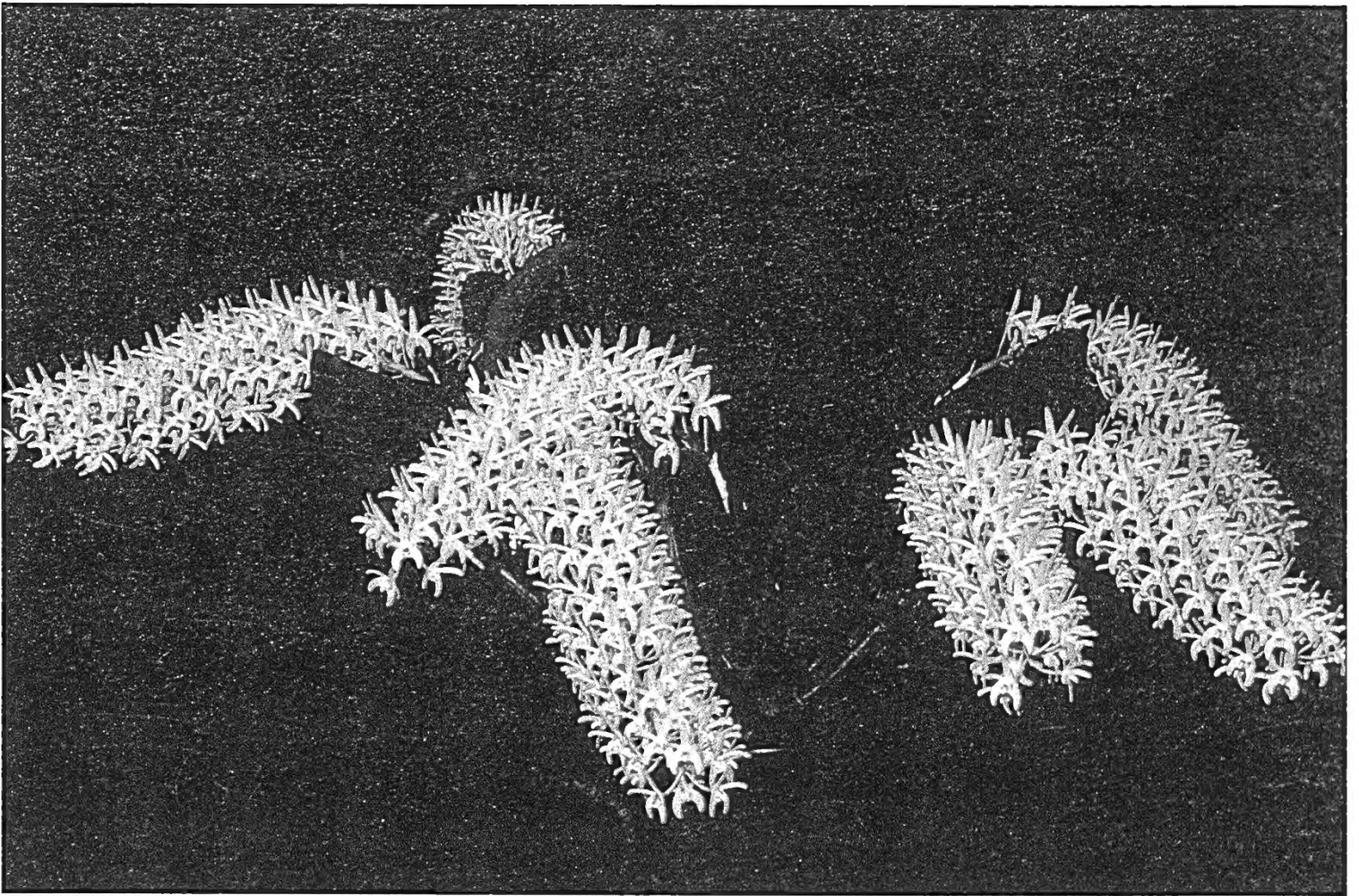
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