

New combinations and two new central Queensland taxa in the *Dendrobium tetragonum* (Orchidaceae:Epidendroideae) complex

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Introduction

The *Dendrobium tetragonum* A.Cunn. complex (Orchidaceae: sect. *Dendrocoryne*) has attracted a number of proposals for taxonomic revision following the initial description of several varieties (Leaney 1934; Gilbert 1937, 1942; Nicholls 1942). Clements and Jones (1990) re-interpreted var. *giganteum* Leaney (Leaney 1934) and named *D. capitisyork* M.A.Clem. & D.L. Jones and *D. cacatua* M.A.Clem. & D.L. Jones, as well as describing *D. melaleucaphilum* M.A.Clem. & D.L. Jones as a new member of the complex (Clements 1989; Clements and Jones 1990). They later proposed the genus *Tetrabaculum* (Clements and Jones 2002) to include all members of the *D. tetragonum* complex as separate species. Other authors have chosen to reject these proposals and continue to recognise the four entities at varietal rank (Dockrill 1992; Lavarack *et al.* 2000; Adams *et al.* 2006; Wood 2006). Molecular studies (Burke *et al.* 2008) and morphological analysis (Adams *et al.* 2006) do not provide evidence for either *Tetrabaculum* or the elevation of the varieties to specific rank. Previous morphological analysis (Adams *et al.* 2006) indicated that *D. tetragonum* has considerable variation which is not accounted for by recognising four taxa, and that more extensive sampling is required.

The term 'complex' or 'species complex' is used in the literature with different meanings and requires further definition. 'Species complex' is interpreted here as a group of variants that are closely related and identifiable as one species and not sufficiently and consistently distinctive in qualitative characters to be considered as separate species (Adams *et al.* 2006; Burke *et al.* 2008; Adams *et al.* 2007). This applies to *D. tetragonum* and other species in section *Dendrocoryne*, *D. speciosum* Sm. and *D. kingianum* Bidwell ex Lindl.

Clements and Jones (1990) stated that they examined hundreds of collections of *D. tetragonum* throughout its range, showing only four

Abstract

Two new taxa of *Dendrobium tetragonum*, *D. tetragonum* subspecies *cataractarum*, and subspecies *tetragonum* var. *serpentis*, are described from remote areas of central Queensland. A new classification of the *D. tetragonum* complex is presented on the basis of distribution, morphology and published molecular analyses, establishing northern, central and southern subspecies, with a total of six varieties. A neotype is assigned for *D. tetragonum* var. *giganteum* Leaney, the earliest described taxon of the complex in northern Australia.

Keywords: *Dendrocoryne*, classification, taxonomy, species complex, Australian orchids

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'distinct segregates' based on consistent floral features. Field exploration and discovery in remote parts of central Queensland by the author and associates between 1991 and 2009 have indicated that there are further variations in the *D. tetragonum* complex which warrant description and interpretation as part of the complex.

Two new taxa with geographical distributions separate from the other varieties are now described and discussed. The taxonomy of var. *giganteum* is revised, with assignment of a neotype for *D. tetragonum* var. *giganteum* Leaney.

Taxonomy

Dendrobium tetragonum subsp. *tetragonum* var. *serpentis* P.B.Adams var. nov.

Flores sub anthesi virides postea lutei, segmenta angusta delicata. Labellum conspicuum lobo mediano cordiformi, a latere viso concavo, apex recurvatus, callus demissus 3-costatus, pili et projecturae labelli absenti.

Flowers at opening green, later yellow, segments narrow delicate. Labellum conspicuous, midlobe heart shaped, concave when viewed from the side, apex recurved, callus low, 3-ridged. Hairs and projections of the labellum absent.

Type: Queensland. Leichhardt District: Blackdown Tableland, 30/6/2010, P.B.Adams 23 (holo: MEL; iso: BRI)

Plants epiphytic, forming clumps attached to the host by thin wiry branching roots; *pseudobulbs* (canes) few c. 40, variously directed, not radiating perpendicularly, tetragonal except at the base where fusiform and tapering, up to 24 cm long × 8.5–10.5 mm wide, with 2–7 narrow segments proximally, 1–1.5 mm diameter at the base, and 2–3 expanded segments distally, narrowing via short internodes at the apex, pale green, covered in thin silvery velum when young; *leaves* 1–4, sessile via a short sheathing base, 4.2–7.8 cm long × 2.0–2.8 cm wide, narrow to broadly ovate with acute apices, rigid and recurving, often at approximately a right angle to canes, green with gentle undulations of margins, only the median vein prominent; *racemes* 1–3 per cane, produced at or near the apex and very rarely from any other nodes; *flower buds* twisting almost 360° in the distal half; *flowers* 2–5 per raceme, arising in the angle of a scarious orange-brown bract c. 6 mm long × 1 mm wide, at about 90° to the rachis, porrect,

6.3–8.0 cm long × 2.4–3.5 cm wide, clustered on a short raceme, showy and widely expanded with dorsal and lateral sepals tending to reflex strongly, tepals opening pale green and becoming pale yellow before senescing, some plants with pale orange colouration on distal half of sepals, but without red-brown sepal colouration except for occasional fine lines on some margins (visible with 10× magnification); *peduncle* c. 1.0–1.3 cm long × 0.8–1.2 mm wide, linear, green-yellow surrounded by several brown bracts c. 8 mm long × 2–3 mm wide, with acuminate apices; *pedicel and ovary* c. 1.4–2.0 cm long × c. 1–2 mm wide, gently curved, pale yellow; *ovary* c. 7 mm long × 2 mm wide, linear, pale yellow with a few fine purple spots; *dorsal sepal* 25–43 mm long × 4.5–5 mm wide, erect, initially linear and angulating slightly at 1 or 2 points along the length, apices long-acuminate; *lateral sepals* 23–41 mm long × 4–6 mm wide, falcate, wide (dilated) at base then subulate, apices long-acuminate, often reflexing and angulating laterally and asymmetrically; *petals* 16–25 mm long × 1.0–1.2 mm wide at base, held at an angle of c. 45° to dorsal sepal and recurving along length, divergent, linear, narrowing to acuminate apices; *labellum* very prominent, 14.5–16 mm long × 7.5–9.5 mm wide, trilobed on short claw, narrow at base and broad anteriorly, lateral lobes incurved to form an open channel 4–5 mm wide forwards of the column and not enclosing it, width less than midlobe when flattened c. 7.5–9 mm; midlobe directed forwards at c. 45°, white-pale cream with purple barring and spots, very flat and broad, presentation width 8–10 mm, apex small, apiculate and held forward, recurving with age; *callus* with 3 ridges, fused at base, very low in profile, the central one most prominent, extending a short distance on to the midlobe; *mentum* c. 7 mm × 4 mm, curved, pale yellow with faint dull purple streaks; *column* c. 7 mm × 3 mm, curved, porrect, pale yellow-green with a prominent purple-brown patch centrally below stigmatic cavity, and purple spotted and a deeper yellow at the base; *anther* white, becoming yellow with age, enclosing pollinia; *stigma* concave, apical, wet, oval shaped; *capsule* green c. 22 mm × 12 mm (Figs. 1,2).

Distribution and habitat: Gorges and creeks of the northern part of the Blackdown Tableland, central Queensland, restricted, extent uncertain. Sheltered

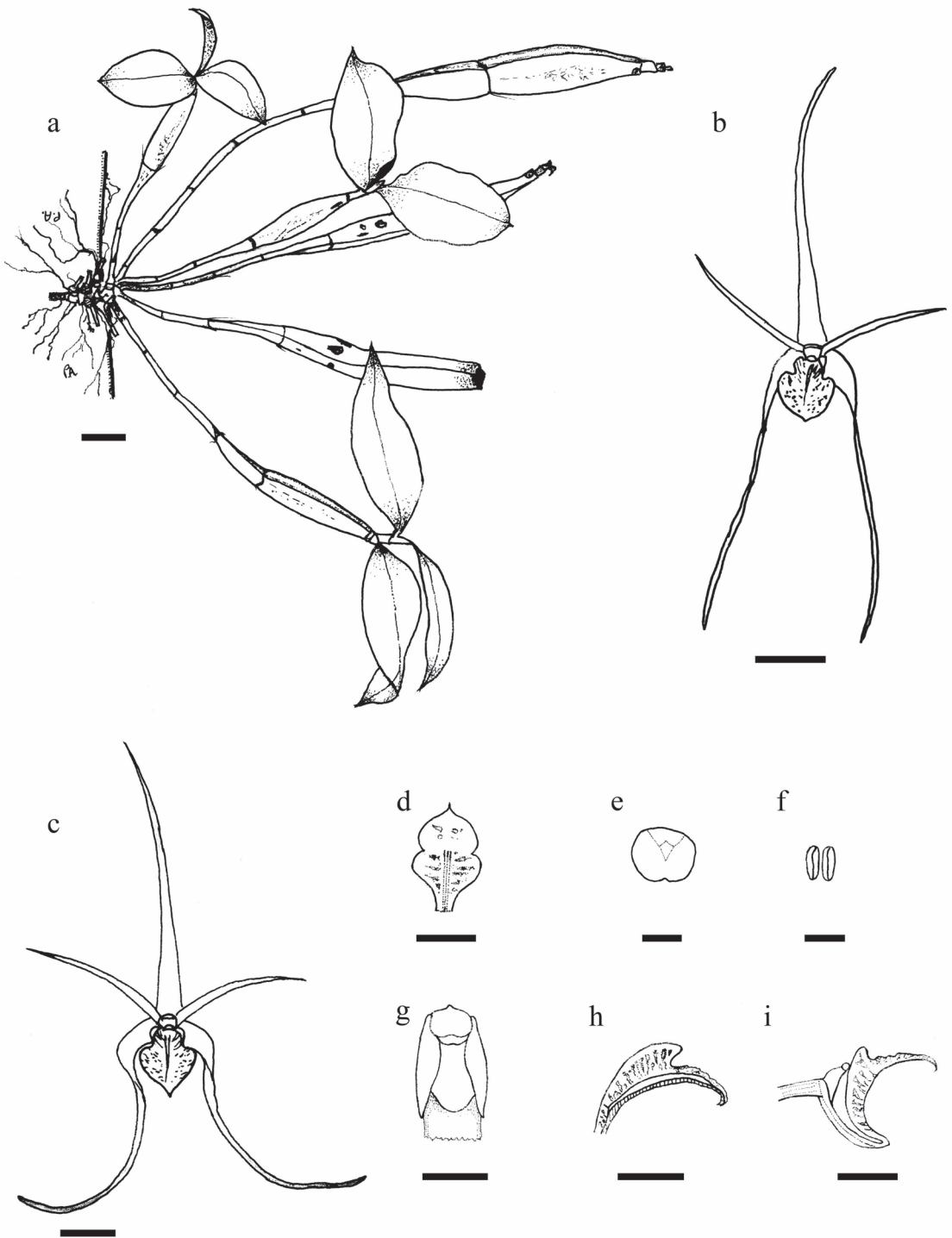


Figure 1. Habit and floral morphology of *D. tetragonum* subsp. *tetragonum* var. *serpentis*. **a.** plant, scale bar = 10 mm; **b.** flower from front, scale bar = 8 mm; **c.** flower variant, scale bar = 8 mm; **d.** labellum flattened, scale bar = 9 mm; **e.** anther, front view, scale bar = 0.75 mm; **f.** pollinia, scale = 1 mm; **g.** column from front, scale bar = 8 mm; **h.** labellum longitudinal section, scale bar = 7 mm; **i.** column and labellum from side, scale bar = 7 mm.

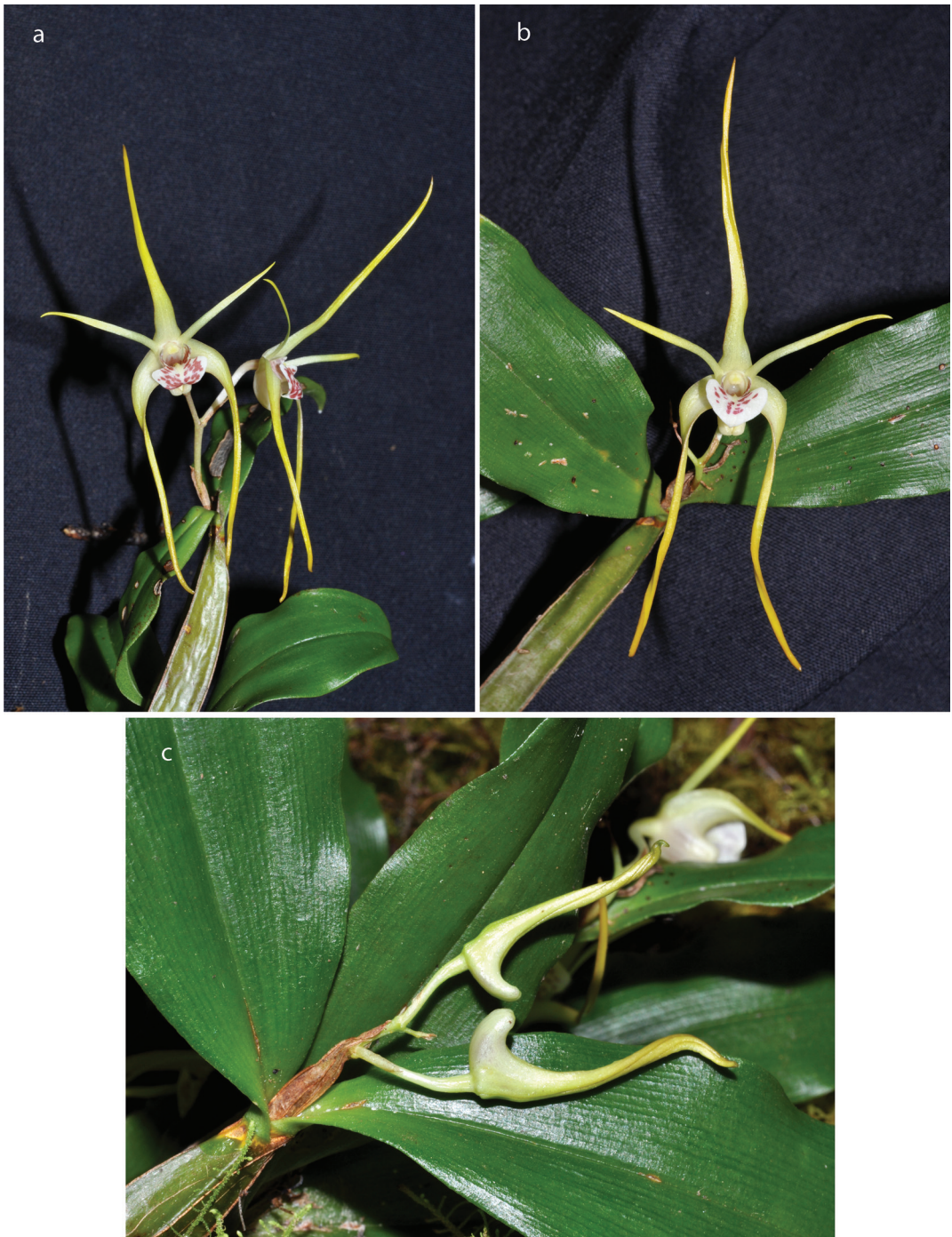


Figure 2. Photograph 2. *D. tetragonum* subsp. *tetragonum* var. *serpentis* **a.** flower ; **b.** another floral form; **c.** advanced buds showing prominent distal twisting

sandstone gorges and relictual rainforest with *Syzygium australe*, which is a favoured host.

Etymology: Named in reference to the Rainbow Serpent believed by the local indigenous people to inhabit Blackdown Tableland gorges.

Flowering period: August–September

Conservation status: *Dendrobium tetragonum* var. *serpentis* is conserved in national parks, in remote sites, but is very restricted and somewhat vulnerable to collection. It is protected by very dangerous and mostly inaccessible terrain, and has not been sufficiently surveyed to assign a coded conservation status.

Notes: Plants were studied using several collections made between 1991 and 2010. This variety has a distribution on the Blackdown Tableland, geographically separated by about 250 km from other described varieties. To the east, the nearest *D. tetragonum* is var. *melaleucaphilum* in the Berserker Range near Rockhampton. As in all varieties of the *D. tetragonum* complex, the differences from each other are quantitative. The small number of var. *serpentis* plants surveyed in a few remote populations show little variation between individuals in comparison with other varieties. There is a superficial resemblance to *D. tetragonum* var. *melaleucaphilum* but with the following significant differences.

The flower buds twist markedly in the distal half. There is a prominent and showy midlobe, flat and angled well forward away from the column and with an apex which protrudes as a visible point, reflexing only in some flowers with advanced age (early senescence). The flattened lateral lobes are not as wide as the presentation width of the midlobe (they are approximately equal in width in most specimens of var. *melaleucaphilum*). The flowers of var. *serpentis* are more elongate, with segment dimensions usually smaller than in var. *melaleucaphilum*, and there is a distinct colour change from green to pale yellow with age, and less variation between plants. The plants are small to moderate in size, consisting of up to 40 canes compared with var. *melaleucaphilum* with up to 100 canes (Clements and Jones 1990). Canes are not perpendicular and radiating out from the host as stated for var. *melaleucaphilum*, rather they are arranged in various directions including upwards and outwards (Fig.1)

Variety *serpentis* has no hairs or projections visible on the labellum at magnifications $\times 20$. Most populations of var. *melaleucaphilum* examined have pilose projections over the midlobe and some areas of the callus, visible at magnification $\times 10$.

Dendrobium tetragonum* subsp. *cataractarum
P.B.Adams, S.D.Lawson and G.A. Paterson
subsp. nov.

Flores virido-luteis, sepala margine purpureo-brunnea. Segmenta prope basin crassiuscula, relative lata distaliter. Labellum grandum, lobo mediano lato, prominentio, late ovato, a latere viso leniter concavo, apex acutus recurvatus, callus prominens 3-costatus, pili et projecturae labelli absentia.

Flowers yellow-green, sepals at the margin purple-brown. Segments near the base thickish, and relatively broad in distal half. Labellum large, with midlobe wide, very prominent, broadly ovate, when viewed from the side slightly concave, apex acute, recurved, callus prominent 3-ridged, hairs and projections of the labellum absent.

Type: Queensland. Port Curtis and South Kennedy districts; Connors Range, 1/8/1993. *P.B. Adams & S.D. Lawson 25* (holo: MEL; iso: BRI).

Plants epiphytic, forming clumps attached to hosts by thin wiry branching roots; *pseudobulbs* (canes) few to c. 15, variously directed, pale green, covered in silvery velum when young; fusiform at the base, tapering to tetragonal segments, up to 33 cm long \times 7.0–12.5 mm wide; with 2–9 narrow segments proximally, 1–1.5 mm diameter at the base, and 2–3 expanded segments distally, narrowing via short internodes at the apex; *leaves* 1–3, sessile via a short sheathing base, 4.8–11.5 cm long \times 1.8–3.5 cm wide, narrow to broadly ovate with acute apices, rigid, often at about a right angle to canes, green with undulations of margins, only the median vein prominent; *racemes* 1–3 per cane, produced at or near the apex, and rarely from any other nodes; *flower buds* slightly twisted towards the apex; *flowers* 1–6 per raceme, usually 2–4, arising in the angle of a scarious brown bract 7 mm long \times 1 mm wide, at about 90° to the rachis, porrect, 6.3 – 8.9 cm long \times 3.2 – 4.5 cm wide, clustered on a short raceme, showy, widely expanded with dorsal and lateral sepals of heavy substance and not reflexing, pale green to yellow with

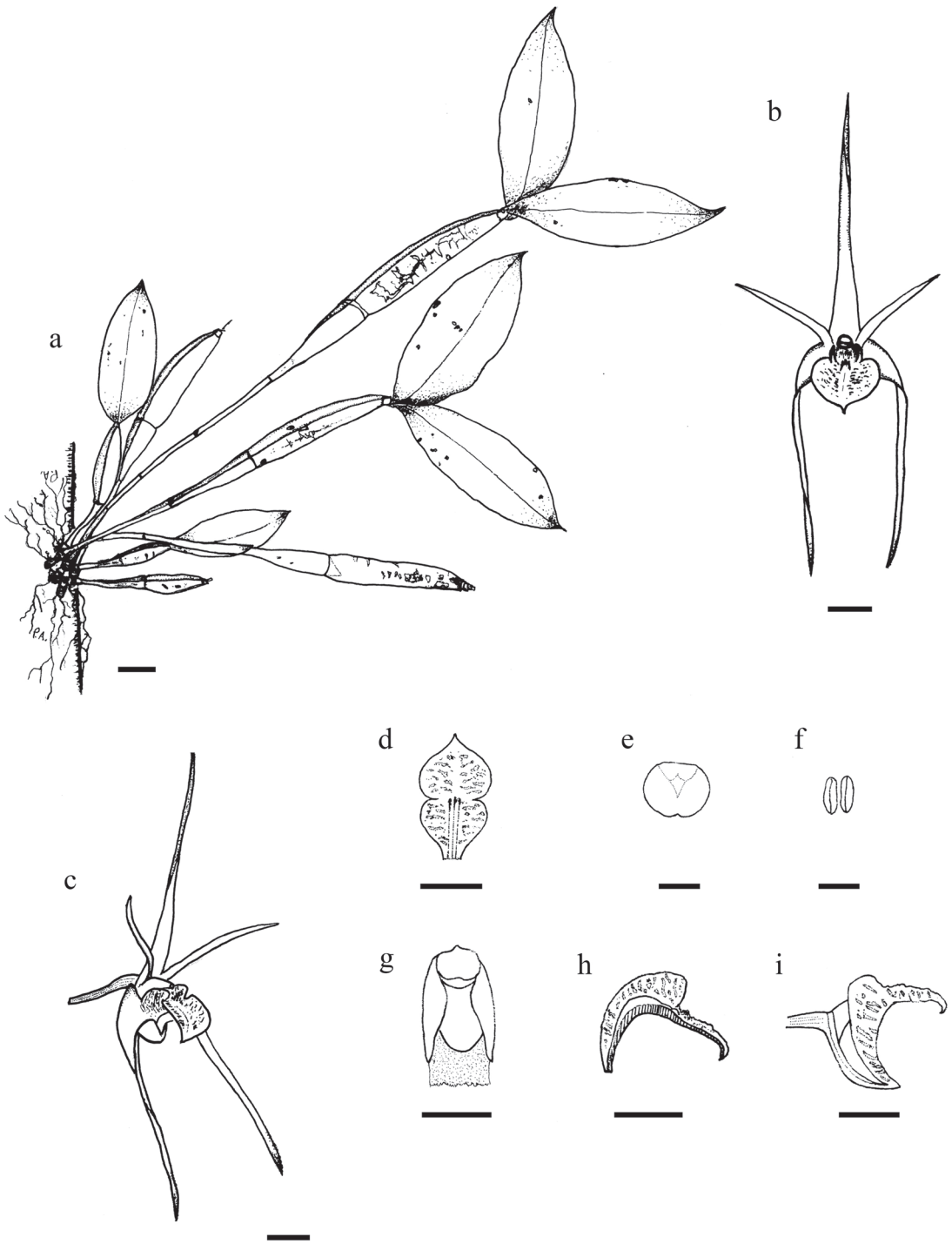


Figure 3. Habit and floral morphology of *D. tetragonum* subsp. *cataractarum*. **a.** plant scale, bar = 10 mm; **b.** flower from front, scale bar = 6.5mm; **c.** flower oblique view, scale bar = 6.5 mm; **d.** labellum flattened, scale bar = 10 mm; **e.** anther front view, scale bar = 0.75 mm; **f.** pollinia, scale bar = 1 mm; **g.** column from front, scale bar = 8 mm; **h.** labellum, longitudinal section, scale bar = 7 mm; **i.** column and labellum from side, scale bar = 7 mm.

prominent purple-brown on margins and distal areas; *labellum* very large and widely spreading, pale cream with red-purple spots and barring usually more intense on lateral lobes; *peduncle* c. 0.7–2.1 cm long × 0.8–1.2 mm wide, linear, green-yellow with several brown bracts c. 9 mm long × 2–3 mm wide, with acuminate apices; *pedicel and ovary* c. 1.2–2.3 cm long × 1 mm wide, curved, pale yellow-green; *ovary* c. 8 mm long × 2 mm wide, linear, yellow-green with a few fine purple-brown spots; *dorsal sepal* 40–63 mm long × 4.0–6.0 mm wide, erect, twisting once or nil, not angulating along the length, apices acuminate; *lateral sepals* 36–58 mm long × 4.0–7.5 mm wide, symmetrical, falcate, wide (dilated) at base then subulate, apices long-acuminate, usually twisting once and not angulated; *petals* 18–35 mm long × 1.2–1.7 mm wide, divergent, held at angles 45–80° to the dorsal sepal, not usually recurving, linear, narrowing to acuminate apices; *labellum* 13–19 mm long × 8.0–11 mm wide, trilobed on a short claw, narrow at base and very broad anteriorly, lateral lobes gently incurved to form a channel 4–6 mm wide, partially enclosing the column, width less than midlobe when flattened, c. 9.0–10 mm; *midlobe* angled forwards, flat, presentation width 9.5–12 mm, apex small, apiculate and slightly recurved; *callus* with 3 prominent ridges fused at base, extending a short distance onto midlobe, white-pale cream with fine purple-brown spots and bars; *mentum* c. 8 mm × 4 mm, curved, pale yellow; *column* c. 7 mm × 3 mm, curved, porrect, pale yellow; *anther* white-pale yellow, enclosing pollinia; *stigma* concave, apical, wet, oval shaped; *capsule* green c. 25 mm × 14 mm (Figs. 3,4).

Distribution and habitat: Restricted to Connors Range, central Queensland and very localised. Occurs along rainforest creeks, found in the canopy, on trunks and at bases of various small rainforest trees including *Austromyrtus*, *Ficus*, *Syzygium*, *Planchonella*, and *Euroschinus*.

Etymology: Named with reference to its occurrence, restricted to creeks with waterfalls.

Flowering period: August–September

Conservation status: 2V. Vulnerable due to extreme localization in very small populations. Plants occur in remote sites in mostly inaccessible terrain.

Notes: Plants were studied using several collections made between 1993 and 2010. *Dendrobium tetragonum* subsp. *cataractarum* is found at a few

very remote sites along creeks in the Connors Range between Marlborough and Carmila, at elevations of 30–400 m. The full extent of distribution and variation is approximately determined, as many parts of the area are inaccessible. Populations are small, and restricted to places where there is semi-permanent water and sufficient humidity. There is a wide range of small and larger rainforest tree hosts with plants growing at various levels, often low down and on their bases. There is no geographical overlap with other described varieties.

Compared to var. *serpentis*, the dimensions of the labellum, flower width, sepal length and width, and petal width tend to be greater, contributing to a more robust flower. The sepals are wide distally and usually do not reflex in the manner of var. *serpentis*. Most flowers have prominent brown-purple markings on the sepal margins and distal third.

This taxon differs from var. *melaleucaphilum* in having a very showy, wide and flat labellum that reflexes at the apex only to a small extent. The labellum only partially encloses the column, obscuring only a part of it in lateral view. Unlike var. *melaleucaphilum*, the flattened lateral lobes are not as wide as the flattened width of the midlobe. In subsp. *cataractarum* there are no hairs or projections on the labellum at magnification × 10. Like var. *serpentis*, the relatively small size of the plants and radiating habit of the pseudobulbs in various directions is likely to be the result of marginal habitat quality.

***Dendrobium tetragonum* A.Cunn. subsp. *giganteum* (Leaney) P.B.Adams stat. nov.**

Basionym: *Dendrobium tetragonum* A.Cunn. var. *giganteum* Leaney, *Orchidologia Zeylanica* 1: 73 (1934).

Neotype (here chosen): Queensland. Cook District: South of Atherton, 10/5/2010, P.B.Adams 27 (holo: MEL; iso: BRI).

Dendrobium tetragonum A.Cunn. var. *giganteum* P.A. Gilbert, *Australian Orchid Review* 7:36 (1942) (nom. illeg.). *Dendrobium capitisyork* M.A.Clem. & D.L.Jones, *Australian Orchid Research* 1:49 (1989), *syn. nov.*; *Tetrabaculum capitisyork* (M.A.Clem. & D.L.Jones) M.A.Clem. & D.L.Jones, *Orchadian* 13:485-497 (2002), *syn. nov.*



Figure 4. Photograph 1. *D. tetragonum* subspecies *cataractarum*. **a.** flower; **b.** another floral form; **c.** advanced buds showing slight distal twisting.

Brief neotype diagnosis:

Plants epiphytic; *pseudobulbs* (canes) tetragonal, except basally where fusiform and wiry; *racemes* with 1-4 stellate, large flowers (5.0-13.2 cm long × 2.4-7.1 cm wide), variously coloured yellow-green with few darker markings, or with prominent red-purple-brown spots and blotches, or with wide areas of brown and red-purple on tepals; *labellum* white with prominent red-purple markings and three callus ridges; *lateral lobes* forming a narrow to more commonly broad tunnel, narrow to very wide (0.6-1.85 cm when flattened); *midlobe* relatively small (0.45-0.75 cm) when flattened, and long, acuminate and reflexed at apex, with from inconspicuous to prominent filiform hairs.

Classification of the *Dendrobium tetragonum* A.Cunn. complex

The complex is classified as set out below, on the basis of detailed distribution studies, morphological characteristics of the six taxa and molecular analyses. Three subspecies are established, with northern, central and southern distributions.

Dendrobium tetragonum* A.Cunn. subsp. *tetragonum* var. *tetragonum

Basionym: *Dendrobium tetragonum* A.Cunn. in *Edwards Botanical Register* 25, misc. 33 (1839); *Callista tetragona* (Cunn.) Kuntze, *Revis Gen Pl* 2: 655 (1891); *Dendrocoryne tetragona* (Cunn.) Brieg., *Schlechter, Die Orchideen* 3: 716 (1981) (nom. invalid.); *Tropilis tetragona* (Cunn.) Butzin, *Willdenowia* 12: 250 (1982); *Tropilis tetragona* (Cunn.) Rauschert, *Feddes Repert* 94: 471 (1983) (nom.

illeg.); *Dendrobium tetragonum* Cunn. var. *hayesianum* P.A.Gilbert, P.A.Gilbert, *Australian Orchid Review* 2: 20 (1937); *Tetrabaculum tetragonum* (A. Cunn) M.A.Clem. & D.L.Jones, M.A. Clements & D.L. Jones, *Orchadian* 13: 485-497 (2002).

***Dendrobium tetragonum* A.Cunn. subsp. *tetragonum* var. *melaleucophilum* M.A.Clem. & D.L.Jones**

Basionym: *Dendrobium melaleucophilum* M.A.Clem. & D.L.Jones, *Australian Orchid Research* 1: 57 (1989); *Tetrabaculum melaleucophilum* (M.A.Clem. & D.L.Jones), M.A. Clements & D.L. Jones, *Orchadian* 13: 485-497 (2002).

Dendrobium tetragonum* A.Cunn. subsp. *tetragonum* var. *serpentis* P.B.Adams**Dendrobium tetragonum* A.Cunn. subsp. *catractarum* P.B.Adams, S.D.Lawson & G.A.Paterson*****Dendrobium tetragonum* A.Cunn. subsp. *giganteum* (Leaney) P.B.Adams var. *giganteum***

Basionym: *Dendrobium tetragonum* A.Cunn. var. *giganteum* Leaney, *Orchidologica Zeylanica* 1: 73 (1934); *Dendrobium tetragonum* A.Cunn. var. *giganteum* P.A. Gilbert, *Australian Orchid Review* 7: 36 (1942) (nom. illeg.); *Dendrobium tetragonum* A. Cunn. var. *tomentosum*, *Australian Orchid Review* 7: 40 (1942); *Dendrobium capitisyork* M.A.Clem. & D.L.Jones, *Australian Orchid Research* 1: 49 (1989); *Tetrabaculum capitisyork* (M.A.Clem. & D.L.Jones) M.A.Clem. & D.L.Jones, *Orchadian* 13: 485-497 (2002).

Key to subspecies of *Dendrobium tetragonum*

- 1 Midlobe of labellum much narrower than the lateral lobes, and usually sparsely-densely tomentose. Plants occurring from Carmila to Iron Range, Queensland **subspecies *giganteum***
- 1: Midlobe of labellum approximately the same width or greater than the lateral lobes, and not conspicuously tomentose. Plants occurring from Nowra, New South Wales, to just south of Carmila, Queensland **2**
- 2 Flowers yellow-green usually with red-purple-brown on sepal margins; sepals robust, thickened at base; labellum pale cream with red-purple markings; midlobe very large, 9-12 mm wide, flat, angled forwards, not recurving at apex until flowers age. Plants occurring spasmodically between Marlborough and North Clairview, Queensland **subspecies *catractarum***
- 2: Flowers yellow-green-pale bronze with red-purple markings, either star-like with pronounced red-purple sepal margins, or elongated with sepals tending to twist and reflex; labellum white to cream with red-purple markings; midlobe usually less than 9 mm wide, and strongly recurving at apex. Plants occurring south of Clairview, Queensland **subspecies *tetragonum***

***Dendrobium tetragonum* A.Cunn. subsp. *giganteum* (Leaney) P.B.Adams var. *cacatua* M.A.Clem. & D.L.Jones**

Basionym: *Dendrobium cacatua* M.A.Clem. & D.L.Jones, *Australian Orchid Research* 1: 48 (1989); *Tetrabaculum cacatua* (M.A.Clem. & D.L.Jones) M.A.Clem. & D.L.Jones, *Orchadian* 13: 485-497 (2002).

Discussion

The *Dendrobium tetragonum* complex has been interpreted as a group of closely related varieties that do not warrant specific status (Dockrill 1992; Lavarack *et al.* 2000; Adams *et al.* 2006; Burke *et al.* 2008). Variation is on the basis of size of parts and colour patterns. Further, internal transcribed spacer of nuclear DNA (ITS-DNA) studies do not provide any contributing evidence (Burke *et al.* 2008) for reclassification of the complex as a separate genus *Tetrabaculum* as proposed by Clements and Jones (2002). The DNA studies suggest a molecular similarity between the two northern varieties, var. *giganteum* and var. *cacatua*, which are morphologically distinct (see key), except for intermediates where the two taxa overlap at some locations between 700 and 850 m of altitude, e.g. in the Crediton area. Similarly var. *tetragonum* and var. *melaleucophilum* are also distinctive except where

the two co-exist and intermediate forms are seen (Adams *et al.* 2006), e.g. in the Coffs Harbour area. This is contrary to the notes of Clements and Jones (1990) that both occasionally grow together and hybrids are unknown, and that the four varieties are biologically and geographically distinct.

Two options were considered for assigning rank at infraspecific level. The first and simplest was to continue use of the taxon variety for all previously described taxa and for the two new variants. The second option was to use recently available molecular data and morphology, which lead to a more complex two ranked system of subspecies and varieties. The latter option was chosen, as it provides more information about relationships, without a change of established varietal names. The nomenclature may be abbreviated, except for subspecies *cataractarum*, to the simple use of varieties, old and new, providing ongoing stability. Distribution, morphological characters and molecular evidence support the establishment of three subspecies. Principal co-ordinate analysis (Adams *et al.* 2006) and ITS-DNA results (Burke *et al.* 2008) clearly indicate a northern lineage, subspecies *giganteum*, consisting of var. *giganteum* and var. *cacatua*, and a southern lineage, subspecies *tetragonum*, with three varieties. Midlobe labellar features separate the northern subspecies *giganteum* from the other

Key to varieties of *Dendrobium tetragonum* subspecies *giganteum*

- 1 Flowers with long filamentous, pale green segments, occasionally with a few red-purple fine markings; labellum white, usually with no markings; lateral lobes larger than midlobe, which ends in a short apiculum. Plants usually above 750m altitude **var. *cacatua***
- 1: Flowers usually strongly marked with red-purple-brown, occasionally yellow or green with very few, darker markings; labellum white with red-purple markings, lateral lobes usually huge compared with midlobe, which ends in a long apiculum. Plants usually below 750m altitude **var. *giganteum***

Key to varieties of *Dendrobium tetragonum* subspecies *tetragonum*

- 1 Flowers opening green, later turning yellow, tepals with few or no red-purple markings; segments filamentous; midlobe prominent, cordiform, white-pale cream with red-purple markings, and recurving with age. Flower buds markedly twisted in the distal half. Plants of Blackdown Tableland, Queensland **var. *serpensis***
- 1: Flowers and distribution not as above **2**
- 2 Flowers yellow-light green-light bronze, usually with reddish purple markings on sepals, not star-like, usually > 7.5 cm in vertical height; labellum cream-pale yellow with red- purple markings, broadly dilated and strongly recurving soon after opening **var. *melaleucophilum***
- 2: Flowers yellow-green-light bronze, usually with very deep red-brown sepal markings, starlike, usually < 7.5 cm in vertical height; labellum white with red-purple markings; midlobe not broadly dilated, recurving soon after opening **var. *tetragonum***

subspecies. The central subspecies *cataractarum* has robust floral features and an outstanding midlobe, the largest in the complex. The three southern varieties share similar labellar characteristics and differ mainly in flower size, colour and floral presentation, with significant overlap of characteristics in some parts of their ranges. A key separates the subspecies, but keys to the varieties require several characters and are not always successful, reflecting the interpretation that they should not be considered as separate species.

Descriptions at varietal level in a species complex such as *D. tetragonum* are difficult, with the possibility that examination of further specimens from the respective geographical ranges for these varieties may result in different quantitative ranges for characters. The sum total of the features described favours an interpretation of subgroups at infra-specific rank. This is consistent with the history of initial descriptions for *D. tetragonum* and provides a measure of nomenclatural stability. Horticulturalists and orchid growers may choose to continue the use of existing varietal names without reference to subspecies.

Unlike the other described varieties, subsp. *cataractarum* and var. *serpentis* have separate geographical ranges as far as can be determined. Each is fairly uniform in morphology, reflecting a relatively small distribution, and are not very variable at each site.

Variety *serpentis* is placed in the southern group (i.e. in subsp. *tetragonum*) on the basis of its distribution, affinities to var. *melaleucaphilum*, and DNA sequence which is almost identical with the other two other southern varieties (Burke unpublished). The morphological analysis of var. *serpentis* provides strong evidence for a taxon of varietal status with the same degree of subtle quantitative differences in characters as seen when comparing the other four varieties described. These are much more variable, as expected from their much greater distribution and wider variety of habitats. *Dendrobium tetragonum* subsp. *cataractarum* occupies a separate central distribution with no overlap with other varieties.

The north Queensland taxon *D. tetragonum* var. *giganteum* was originally described briefly by Leaney (1934) without a type specimen, and before the current requirements for describing new taxa. The taxonomy is historically confused. Leaney's description states "

D. tetragonum var. *giganteum*. This variety comes from the Northern part of Australia and has large flowers of much more substance which are almost honey-coloured. Petals and sepals twisted". Gilbert (1937) then also described var. *giganteum* without a type, and later added a Latin validation (1942). He did not refer to Leaney. Dockrill, in Harrison (1998), noted that one of the plants used by Gilbert was supplied by Dockrill himself and was definitely the same taxon as the other material used by Gilbert in his description. The illustration of Nicholls (1942), which he described as var. *tomentosum*, is clearly var. *giganteum*. Clements and Jones (1990) synonymized var. *giganteum* Leaney under their *D. cecatua* and considered var. *giganteum* P.A. Gilbert (which is a later homonym) to be a mixed entity, partly (as to the material supplied by Dockrill) referable to *D. cecatua* and partly to *D. capitisyork*. However, plants with the morphology of var. *cecacua* were not known to Dockrill in the 1930s and 40s, and were not in cultivation. I regard Leaney's original description as referring to var. *giganteum* as here interpreted and typified, of which *D. capitisyork* is a synonym, and do not agree with the interpretation of the taxon as being a synonym of *D. cecatua*, which was evidently based on a questionable interpretation of the nonspecific term "honey-coloured". Honey ranges in colour from light straw to almost black, with brown the most usual connotation, this being the colour of some darker var. *giganteum* flowers, but not seen in var. *cecacua*. Leaney's description is supported by recent discoveries of lowland plants with pale yellow tepals and very few purple markings, and with other features typical of var. *giganteum*. Therefore I have recognized Leaney's taxon name *giganteum* at the rank of subspecies, and assigned a neotype, with *D. cecatua* classified as a variety of *D. tetragonum* subsp. *giganteum*.

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References

- Adams, P.B., Burke, J.M., and Lawson S.D. (2006). Systematic analysis of *Dendrobium* Swartz section *Dendrocoryne* in the Australian region. *Plant Systematics and Evolution* **260**, 65-80.
- Adams, P.B., Burke, J.M. and Lawson, S.D. (2007). Understanding the *Dendrobium speciosum* Sm. complex: variation, distribution, approaches to taxonomy, evolution, conservation, culture and judging. In: *Dendrobium speciosum and other Australian orchid icons: A symposium and showcase*. Edit. P. Adams. ANOS (Melbourne Suburbs) Group: Bayswater, Australia.
- Burke, J.M., Bayly M., Adams P.B., and Ladiges P.Y. (2008). Molecular phylogenetic analysis of *Dendrobium* (Orchidaceae) with emphasis on the Australian section *Dendrocoryne*, and implications for generic classification. *Australian Systematic Botany* **21**, 1:1-14.
- Clements, M.A. (1989). *Catalogue of Australian Orchidaceae. Australian Orchid Research Vol. 1*, Australian Orchid Foundation: Essendon, Victoria.
- Clements, M.A. and Jones, D.L. (1990). Recently named Australian orchid taxa - 1: *Dendrobium. Lindleyana* **5**, 235-243.
- Clements, M.A. and Jones, D.L. (2002). Nomenclatural changes in the Dendrobieae (Orchidaceae) 1: the Australasian region. *Orchadian* **13**, 485-497.
- Dockrill, A.W. (1992). *Australian Indigenous Orchids* 2nd ed. Surrey Beatty and Sons: New South Wales.
- Gilbert, P.A. (1937). *Dendrobium tetragonum* A. Cunn. *Australian Orchid Review* **2**, 19-20, 26.
- Gilbert, P.A. (1942). *Dendrobium tetragonum*. *Australian Orchid Review* **7**, 36.
- Harrison, M. (1998). The *Dendrobium tetragonum* complex. *Orchadian* **12**, 353-373.
- Lavarack, P. Harris, W. and Stocker, G. (2000). *Dendrobium and its Relatives*. Timber Press: Oregon.
- Leaney, R.F. (1934). *Dendrobiums of Australia. Orchidologia Zeylanica* **1**, 70-74.
- Nicholls W.H. (1942) Three interesting orchids (new varieties of old – established forms). *Australian Orchid Review* **7**, 38, 40.
- Wood, H. (2006). *The Dendrobiums*. ARG. Gantner Verlag: Ruggell/Lichtenstein.