An intriguing Cape orchid

The distinctive forms of *Disa tenuis* Lindl.

by **William Liltved** and **Greig Russell**

Plant systematics is a fluid science that continually moves forward. It is fuelled by the various botanists involved therein and is dependent upon their specific talents, observational abilities and the techniques available to them. It can perhaps be considered as a long conversation, with researchers adding their own words to it over the passage of time. We now find ourselves in an era when we can all more easily inspect these words and the materials on which they are based, thanks to the exponential growth of the World Wide Web. Information can now be accessed on such platforms as the following: **biodiversitylibrary.org**, for the rarest literature of long ago; **plants.jstor.org**, which offers a range of material including correspondence, biographies and species descriptions; **data.gbif.org**, which presents a useful database; and many scanned herbarium specimens from herbaria such as Paris, Kew, Hamburg, Stockholm, the Linnean Society, and the Natural History Museum, London, are freely available online.

The contents of the recently published book, *The Cape Orchids: a regional monograph of the orchids of the Cape Floristic Region* (Liltved & Johnson 2012), have been developed over the past twenty years, with many of the species accounts undergoing major changes during this period, so that the final product barely reflects what appeared in early drafts. One such species account, which was rewritten even after the initial submission of the book to the printer, is that of *Disa tenuis*. Indeed, we are still researching this species now that printing of the book is a thing of the past.

Disa tenuis is an inconspicuous and little-known, reed-like species reaching 430 mm in height. Flowering occurs in burnt or mature fynbos, mainly from March to June. It was first discovered by Johann Drège on the flats at Wynberg near Cape Town and shortly afterwards described by John Lindley in 1838. The name '*tenuis*' refers to the one to five slender, grass-like, wiry-stalked leaves of up to 250 mm long. These are enclosed in a single basal sheath that sprouts from a large, irregularly shaped tuber (see figs d, i). Sonder described what he considered to be a different but related species, *Disa leptostachys*, in 1846. However, because of the distinctive single viscidium (see figs b, c) – a character that had escaped Lindley (owing to the absence of pollinaria in the specimen he had to hand) – Bolus (1884) believed that both species were 'no doubt' the 'same thing'. Conversely, within the genus *Amphigena*, which Rolfe (1913) erected (based on an earlier sectional name of Bolus) for these species, *D. leptostachys* Sond. was separated from *D. tenuis* Lindl. because of the crenulate margin of the median sepal and less prominent apiculi on the sepals (pointed and often needle-like tips). Most modern botanists have considered the two plants to be conspecific.

Disa tenuis: the form with smooth, greenish-brown flowers, which conforms to Lindley's type specimen. Southern Cape Peninsula. Inflorescence and floral detail clearly showing the single white viscidium, behind which are the yellow pollinia. Flower diameter 7–11 mm. Photos: W. Liltved, 22 May 2009 (a) and H. Stärker, 3 June 2011 and 21 May 2012 respectively (b and c).

Disa tenuis: the brown-striped, white-flowered form, with a serrate median sepal and petals, and thread-like apiculi of the lateral sepals. Near Constantia Nek, Cape Peninsula. Painting: Fay Anderson (d), photo: R. Geary-Cooke, March 1965 (e).

The flowers of *D. tenuis* are characterized by their typically prominent hair-like sepal tips or apiculae (particularly in Cape Peninsula plants), a very short spur and a single viscidium (the sticky rostellum gland that serves to attach the pollinia to the pollinator). As noted by Linder (1981), *D. tenuis* is variable. Recent observations, however, point to distinctive, separately recognizable variants, perhaps worthy of species status. On the Cape Peninsula, the earlier-flowering (February to early April) form has white flowers with purple-brown to greenish stripes; prominently apiculate sepals; the median sepal enclosing small white petals, both serrate; a broad serrate lip; and an indistinct spur (figs d, e). In the later-flowering (April to early June) greenish-brown Peninsula form, which conforms exactly to Lindley's type, the median sepal and long narrow lip are usually smooth; petals exserted from the median sepal; and the short spur upcurved (figs a–c). In the rosy-purple, spotted form, which flowers from April to early June, the median sepal, petals and lip are serrate, with short apiculae; the conical spur pointing backwards (figs f–h, i 'B'). Orientation of the lateral sepals differs markedly between the green-brown form, where they are reflexed, and the other forms, where they are concave to forwardly directed and, with the median sepal, present a cup-like appearance. Specimens of yet another distinctive form, found by Guthrie, Bodkin and Schlechter at Houwhoek in April 1862–1896 (in the Compton and Bolus herbaria), have 30 to over 50 flowers that are mostly distantly spaced (see fig i 'A').

Apart from its obvious similarities to members of *Disa* section *Trichochila* (formerly *Herschelianthe*), the affinities of *D. tenuis* to other species of *Disa* have been uncertain, as a result of its more peculiar features. In 1888 Bolus created the section *Amphigena* to accommodate this species. The Greek *amphigenes* (*amphi* = on both sides, *genes* = origin) probably refers to the caudicles on both sides which come together to form a single viscidium. Because of the single viscidium, Kränzlin placed this species in *Monadenia*. Rolfe went further still, creating the new genus *Amphigena* solely for *D. tenuis* and *D. leptostachys*, which he considered a separate species. *Disa tenuis* and *D. salteri* were included in a DNA molecular analysis as representatives of Bolus's section *Amphigena* (Bytebier *et al.* 2007). Both species form a strongly supported and distinct evolutionary group, and this group lies basally in a clade comprising the members of the section *Trichochila*, into which they are thus currently placed.

Most records for *D. tenuis* are from the Cape Peninsula. Its forms are also known from scattered sites near Betty's Bay, Kleinmond, Elgin, Caledon, Franschhoek, Paarl and Tulbagh reaching altitudes of 1000 m. Apart from being essentially rare, this cryptic species is hard to detect amongst restios and fynbos shrubs. In proof of their longevity, two marked plants of the typical form in the southern Cape Peninsula mountains have been observed yearly between 1992 and 2012 (figs a–c). An inflorescence with 30–40 smooth, greenish-brown flowers was produced every second winter, with the three to four leaves present only in alternate years. The inflorescence was usually fully pollinated, with capsules appearing well developed by mid-July. As observed for many other species in *Disa* section *Trichochila*, populations of *D. tenuis* are small and mostly limited to three or four flowering plants. In an unusually prolific flowering event, from May to early June 1995, over 100 plants of this form were counted on a burnt sandstone mountain expanse near Scarborough, at an altitude of 180–210 m.

Alongside a greenish-flowered plant with distantly spaced flowers (form mentioned above), Bolus figured the rosy-purple, spotted form of *D. tenuis*, with serrate margins of the median sepal and petals, both specimens having been found at Houwhoek near Elgin in April 1895 (Bolus 1913; see fig. i). In the Bolus Herbarium there

Disa tenuis: the rosy-purple, spotted form, with a serrate median sepal and petals. Flower diameter 8–10 mm. East-facing slopes at Franschhoek Pass. Photo: W. Liltved, (18 April 2000).

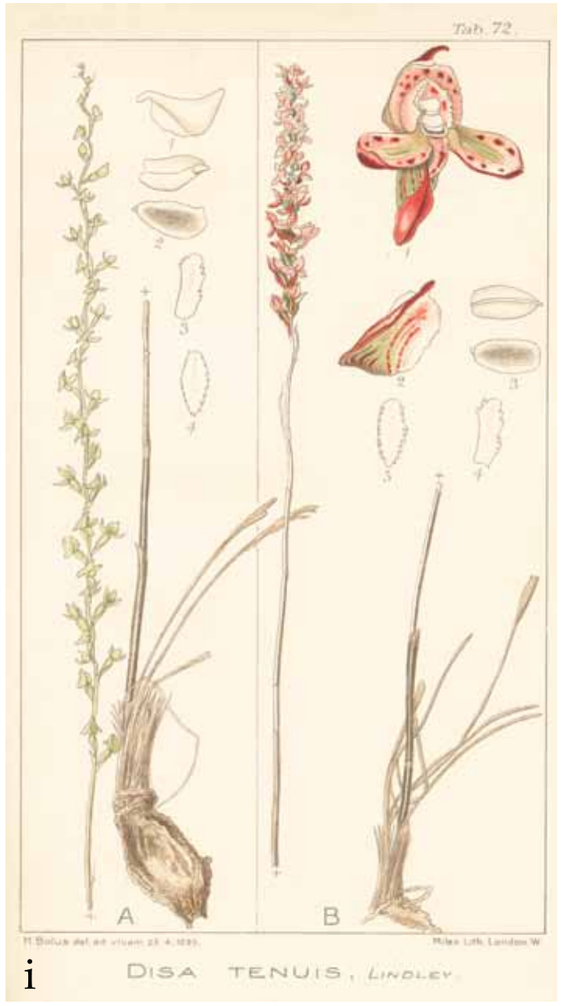
Disa tenuis: the rosy-purple, spotted form. Flower with serrate median sepal, petals and lip; diameter 5–7 mm. Palmiet River Mountains, Kleinmond. Photos: W. Liltved (g), H. Stärker (h), 10 April 2012.

WHAT DOES THAT MEAN?

clade A group of species that is found to be closely related, based on a phylogenetic analysis of either morphological or molecular (DNA) characteristics; thus representing a distinct evolutionary group.
conspecific Belonging to the same species.
crenulate A margin with a scalloped edge.
exserted Protruding beyond a surrounding organ, e.g. petals exserted from the median sepal.
holotype Type specimen: the original specimen from which the description of a new species is made.
morphology The study of plant structure.
phenology The study of the timing of lifecycle events, here generally referring to flowering season.
pollinarium (pl. **pollinaria**) A cohesive mass of pollen grains plus their appendages (i.e. stalk and viscidium).
section One of the taxa at a level between a genus and a species, grouping a number of more closely related species together.
taxon (pl. **taxa**) A taxonomic category of any rank, for example, species.
viscidium The sticky part of the pollinarium which allows for adhesion to the pollinator.

are specimens of the rosy-purple form that were found by Thomas Stokoe near Palmiet River mouth, Kleinmond, in May 1922. In April 2012, two plants of this form were observed near the same locality, in shale-band soil of the Palmiet River Mountains (586 m). The larger plant was 300 mm tall with 44 flowers, 5–7 mm in diameter (cover, figs g, h). A similar plant, from an altitude of 400 m on the lower east-facing mountain slopes near Franschhoek Pass, was seen flowering in April 2000 (fig. f). Its inflorescence, like that drawn by Bolus, had over 40 flowers. Another herbarium specimen of this form, found at an altitude of 1000 m near Franschhoek, was collected as late as 31 October in 1930.

The original sheet of Sonder's *Disa leptostachys*, housed in the herbarium of the Riksmuseet, Stockholm, is the holotype, but is confusing in that it contains two separate collections and apparently two separate forms. Which individual specimens relate to which label has unfortunately not been recorded on the sheet. Six of the seven specimens on the sheet (one of them including the twining slender stem of a creeper) showing short apiculae, are



Disa tenuis: the rosy-purple, spotted form, with a serrate median sepal and petals. Houwhoek near Elgin. From Bolus, *Orchids of South Africa*, vol. 3. (1913: t. 72 'B'). The plant, with distantly spaced, greenish flowers (t. 72 'A'), also originated from Houwhoek.

apparently the rosy-purple, spotted form, and were probably all collected from the 'Grietjesgat' locality of Ecklon & Zeyher and were June-flowering ('56.6'). Grietjesgat is near the top of Sir Lowry's Pass. The seventh specimen on the herbarium sheet is slightly more lax, with flowers that are more spreading and exhibit long apiculae. Could this represent the second collection, that of Zeyher from 'Heidevalley'?

Although many of Fay Anderson's botanical illustrations were destroyed by a fire at her Kenilworth home, her painting of *D. tenuis* survived, with only minor damage that has been repaired (fig. d). In March 1965, two plants of this striking Cape Peninsula form, with 16 and 30 brown-striped white flowers and prominent thread-like apiculi of the sepals, were found by Fay Anderson and her husband Dick Geary-Cooke near Constantia Nek (fig. e). This is the same form of *D. tenuis* figured in *An Introduction to the South African Orchids* (Schelpe 1966, as '*Amphigena tenuis*') and *Wild Orchids of Southern Africa* (Stewart *et al.* 1982) and has not yet been seen by us. Other recorded localities of this form, flowering from February to April, include Constantiaberg (760 m) and Table Mountain (240–610 m), among low Cyperaceae and Restionaceae.

The rosy-purple form of *D. tenuis* (April to June flowering) seems adapted for daytime pollination and releases a strong, pleasant, yet hard to define, scent in warm weather. The spur is nectar-filled. The tiny flowers are long-lived and the inflorescence remains in bloom for over a month as seed capsules gradually replace pollinated flowers from base to tip. Plants of the typical greenish-brown form, mostly with high fruit-set, were examined at sites on the southern Cape Peninsula. Inspection of the flowers in May and June revealed that an efficient insect pollinator had been at work. Most anther sacs were empty, with masses of pollen granules deposited on the broad, circular stigma. The ascending one millimetre-long spur was filled with thick, clear nectar. It was fascinating to see how droplets of sweetish nectar coalesced around the stigma and oozed copiously onto the lateral sepal bases. Examination of the stigma rim showed that the area was stippled with tiny white structures, which may be glandular. Cryptic coloration of the flowers is suggestive of pollination by tiny moths at night. However, moth-pollinated orchids are usually strongly night-scented and no floral scent was detected over a 24-hour period. This pollination mystery persists, especially considering that the wet Cape winter is somewhat marginal for insect activity. Schelpe (1970) noted that two terrestrial south-western Cape species with small flowers, in which every flower sets a seed pod, are the locally common *Disa bracteata* and the rare *D. tenuis*.

In conclusion, our present state of understanding of the various entities currently placed under the 'catch-all' name, *Disa tenuis*, is still too inadequate to allow for any last word on the subject. However, there is enough information to suggest that there are sufficient co-occurring characters (e.g. in phenology, morphology and coloration as it relates to pollinator attraction) for us to be fairly sure that we are here dealing with three or four different taxa that deserve taxonomic recognition at one or another level.

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ACKNOWLEDGEMENTS

The following are thanked for contributing to this article: Fay Anderson (watercolour painting), Lorraine Beneke, Chris Bester, Eleanor-Mary Cadell (editorial assistance), Jeremy and Alida Croudace (Bo-Kloof Biodiversity Conservation Area), Jim Holmes, Amida Johns, Dr Ted Oliver (editorial assistance), Helga Stärker, Herbert Stärker (photography) and Sue Stuckie.