

Two new species of *Pterodiscus* (Pedaliaceae) from southern Africa

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Abstract

Two new species, *Pterodiscus makatiniensis* and *P. cinnabarinus*, are described from southern Africa. *P. makatiniensis* is a rare species known only from the Makatini Flats, northeastern KwaZulu-Natal, South Africa. Its nearest relative is probably *P. ngamicus*, from which it is easily distinguished by its larger, uniformly pale yellow flowers. *P. cinnabarinus*, with red or reddish orange flowers, is confined to the lowveld of Mpumalanga and Limpopo Provinces, South Africa, as well as adjacent parts of Zimbabwe and Mozambique. Although hitherto mainly confused with *P. ngamicus*, it appears to be most closely related to *P. aurantiacus*, a species with bright orange flowers from Namibia and Angola. *P. cinnabarinus* is also quite different from *P. elliotii* of Zimbabwe and Zambia. Illustrations and a comparative table to distinguish among the six currently recognized species of *Pterodiscus* in the Flora of Southern Africa region are provided.

Introduction

Pterodiscus is a genus of about ten currently recognized species. The group is confined to sub-Saharan Africa and ranges from Somalia to South Africa. All the species have either tuberous roots, a swollen above-ground caudex, or a combination of the two. The stems are deciduous and die back to the swollen caudex or underground tuberous roots at the end of the growing season. In the present contribution two new species of *Pterodiscus* are described from southern African, namely *P. cinnabarinus* and *P. makatiniensis*. This brings the total number of *Pterodiscus* species for the Flora of Southern Africa (FSA) region (South Africa, Namibia, Botswana, Lesotho, and Swaziland) to six. Illustrations as well as a comparative table to distinguish among all the species of the FSA region are provided.

Members of *Pterodiscus* are characterized by leaves that are opposite, subsucculent and elongated, with wavy or sinuate to dentate margins. They are bright green to greyish green, and when the surface is crushed, give off a pungently scented mucilage which



Figure 1. *Pterodiscus makatiniensis*, showing typical dwarf habit with swollen above-ground caudex.

has soap-like properties in water. At the base of each petiole on the sides of the axillary flower bud is a pair of prominent, often dark-coloured glands (extrafloral nectaries). These nectaries attract ants, presumably for protection, although in cultivated plants the ants appear to also act as pollinators.

The tubular flowers are borne in the axils of the leaves. They are short-lived and open for a single day only. As long as the annual stems grow healthily, a new set of flowers is produced at consecutive axils for an extended period of time. Each flower has five corolla lobes and five stamens, four of which are fertile, but the fifth one is very short and sterile (a staminodium). The four fertile stamens are inserted on the inside of the corolla tube above the ovary. Within the corolla tube on the ventral side there is in most species a landing area for visiting pollinators. This area consists of five raised ridges below the stamens and stigma and probably assists in bringing the pollinator into contact with the anthers and stigma above.

The indehiscent four-winged fruit, after which the genus is named (Greek *pteron* = wing + *diskos* = disc), develop shortly after fertilisation of the ovules and enlarge rapidly. When mature, often while still green in colour, these fruits

are easily dislodged and dispersed by the wind. The seed of the southern African species number two per fruit (one per locule) in *P. speciosus* and *P. makatiniensis*, but four per fruit (two per locule) in the other species. These counts are based on observations of *in situ* as well as cultivated plants. The species in north-eastern Africa can have more than four seeds per locule and up to eleven were found in each locule of an as-yet-undescribed species from Somalia. The seed display various degrees of dormancy, and usually relatively few will germinate in the first season after shedding of the fruit.

From a cursory survey of the literature, it appears that *Pterodiscus* is not used by humans for any medicinal or other biocultural purpose, except for members of the group being widely encountered in the collections of succulent plant enthusiasts. No material of this genus has been noticed on the occasions the author visited the large traditional muti (medicinal) market in downtown Johannesburg. However, members of the related genus *Harpagophytum*, in particular the root tubers of *H. procumbens* (devil's claw), are extensively used in traditional medicine.

Taxonomic treatment

Pterodiscus makatiniensis Peckover, sp. nov.

Pterodiscus makatiniensis resembles *P. ngamicus* in having a swollen aboveground caudex, but is easily distinguished from that species by the flowers being uniformly yellow (vs. of two contrasting colours; corolla lobes red/brown, tube greenish yellow), style \pm 10 mm long (vs. \pm 20 mm long), stigma positioned a third from the base of the corolla tube (vs. halfway up the tube), and several other floral and fruit features (Table 1).

TYPE: South Africa, KwaZulu-Natal, 2732 (Ubombo), Balamhlanga Pan, (2732 AA), 6 December 1994, Peckover 228 (PRU, holo!).

Perennial herb up to 150 mm high; branching at the top, the basal organ a swollen above ground caudex, 30–40 mm in diam., with underground nu-



Figure 2. *Pterodiscus makatiniensis*, showing the uniformly pale yellow flowers with slightly darker yellow tube.



Figure 3. *Pterodiscus ngamicus* near Waterpoort, Limpopo, South Africa. Note flowers of two contrasting colours; corolla lobes pale reddish-brown, tube greenish yellow on the inside. Photograph: Prof. A. E. van Wyk.

merous thin fusiform roots. *Leaves* very variable in shape and size, up to 60 mm long, 20 mm wide, sub-entire, strongly sinuate, usually with 4 pairs of lateral veins. *Flowers* pale yellow with throat slightly darker yellow; corolla tube cylindrical, 25–28 mm long; limb \pm 30 mm in diam., up to 4 \times the diam. of the throat; lobes sub-equal, oblate. *Fruit* usually round to circular in lateral view, 18 mm long, 15 mm wide; beak indistinct, 1 mm wide; wings of the two sides of the fruit not contiguous at the base of the fruit, hence base distinctly cordate. *Seeds* 1 in each locule (Figs. 1, 2 & 6).

Pterodiscus makatiniensis appears to be most closely related to *P. ngamicus* (Fig. 3). Both species have a swollen aboveground caudex, and thin fusiform roots. However, the two species differ in several floral and fruit features (Fig. 6; Table 1). The flowers of *P. makatiniensis* are pale yellow overall (Fig. 1), whilst those of *P. ngamicus* have contrasting red/brown corolla lobes and a greenish yellow corolla tube (Fig. 3 & 6). In *P. ngamicus* the corolla tube opening is twice as broad as that of *P. makatiniensis*. The position of the stigma within the corolla tube of *P. makatiniensis* is situated a third from the base, whilst in *P. ngamicus* it is half-way up the tube.

This relates to a style length of 10 and 20 mm respectively. The height of stamen insertion on the tube as measured from the base of the corolla is significantly less in *P. makatiniensis* than in *P. ngamicus*, at 2 and 5 mm respectively. The corolla tube is also significantly shorter in *P. ngamicus*. *P. makatiniensis* has mature fruit that are significantly smaller than those of *P. ngamicus*, as are also the seed contained therein (Fig. 6). Diagnostic features to distinguish among *P. makatiniensis* and the other South African members of the genus are provided in Table 1.

Pterodiscus makatiniensis is only known from the type locality on the Makatini Flats, north-eastern KwaZulu-Natal, South Africa. This area forms part of the Maputaland Centre of Endemism, a biogeographical region rich in restricted-range plants and animals, many of which appear to be neo-endemics (van Wyk & Smith, 2001). In the distant past, parts of this low-lying area between the Lebombo Mountains and Indian Ocean coastline were periodically below sea-level, as can be seen by visiting the quarries used for road building material and which contain fossilised shells and ammonites. Although the soils over

most of Maputaland are pale-coloured unconsolidated sands, heavy clay soils are encountered on the Makatini Flats. The dwarf, yellow-flowered *Pterodiscus makatiniensis* was collected in December 1994 next to the Balamhlanga Pan. The plants were growing in heavy black clay soils on exposed mounds, in areas that are seasonally inundated by the pan. Other associated succulents included *Ceropegia nilotica* and *C. rendallii*, a species of *Plectranthus*, as well as an undescribed species of *Euphorbia*.

***Pterodiscus cinnabarinus* Peckover, sp. nov.**

Pterodiscus cinnabarinus appears to be most closely related to *P. aurantiacus*, but is easily distinguished from that species by the flowers being red or reddish orange and almost glabrous (vs. bright orange and covered with fine hairs as well as an upper purplish red zone on the upper lip bordered with a fringe of hairs), stigma and anthers positioned at the entrance to the corolla tube (vs. positioned further down the tube), point of stamen insertion on the corolla tube about 10 mm from base of tube (vs. 1 mm), and several other floral and fruit features (Table 1).



Figure 4. *Pterodiscus cinnabarinus* showing the bright reddish orange flower.



Figure 5. *Pterodiscus cinnabarinus* growing in mopane woodland near Tzaneen, Limpopo, South Africa.

Table 1. Diagnostic characters to distinguish between the species of *Pterodiscus* in the Flora of Southern Africa region.

	<i>P. luridus</i>	<i>P. makatiniensis</i>	<i>P. aurantiacus</i>	<i>P. cinnabarinus</i>	<i>P. ngamicus</i>	<i>P. speciosus</i>
Distribution	Namibia; South Africa (Free State & N. Cape)	South Africa (North-eastern KwaZulu-Natal)	Namibia; Angola	Zimbabwe; Mozambique; South Africa (Limpopo, Mpumalanga)	Namibia; Botswana & South Africa	Botswana; South Africa (northern provinces)
Plant growth form	Swollen caudex aboveground, with thick fusiform roots.	Swollen caudex aboveground, with thin fusiform roots	Swollen caudex aboveground, with thick fusiform roots.	Swollen caudex aboveground, with thick fusiform roots.	Swollen caudex aboveground, with thin fusiform roots	Underground tuber, with thick, much divided roots.
Leaves (colour & margin)	Grey green, thin; margin sharply dentate	Bright green; margin strongly sinuate	Bright green; margin horizontally undulate	Bright green; margin with a few sharp sinuate projections	Bright green; margin slightly wavy, sinuate	Bright green; margin. very slight wavy
Fruit size: length × width & seeds/fruit	28 × 25 mm 4	18 × 15 mm 2	35 × 35mm 4	30 × 30mm 4	25 × 20 mm 4	15 × 12 mm 2
Flower colour	Pale purple, with tube purple yellow	Pale yellow all over	Bright orange, with purple upper area to tube entrance	Bright red to reddish orange, with yellow tube entrance	Lobes reddish brown, tube yellow	Dark pink to violet all over
Hairs on corolla lobes	Almost hairless, few at entrance	Fine hairs all over	Tube opening fringed with dark hairs; conspicuous hairs all over rest	Only a few at tube entrance	Very few, scattered	Almost hairless, few at entrance
Length of corolla tube	32mm	28mm	18mm	25mm	35mm	45mm
Length of free corolla lobes	8mm	10–12mm	10mm	12mm	8–10mm	18–20mm
Diameter of corolla tube half way up tube	8mm	5mm	9mm	4mm	8mm	8mm
Length of style	16mm	10mm	15mm	25mm	20mm	22mm
Position of stigma in relation to tube length (% of length from base)	50%	36%	80%	100%	60%	50%
Diameter of corolla tube entrance	10mm	5mm	5mm	5mm	12mm	15mm
Raised landing area in corolla	Present	Present	Present	Absent	Present	Present
Height of insertion of stamens above corolla base	4mm	2mm	1mm	10mm	5mm	4mm

TYPE: South Africa, Limpopo, 2330 (Tzaneen), Tzaneen, Eiland Spa, (2330 DB), 13 December 2012, Peckover 288 (PRU, holo!).

Perennial herb up to 200 mm high, branches erect or ascending; basal organ a swollen aboveground caudex 30–40 mm in diam., with underground a few thick, fusiform roots. *Leaves* lanceolate, up to 70 mm long, 20 mm wide, sub-entire, with a few sharp sinuate projections, usually with 4 pairs of lateral veins. *Flowers* red or reddish, with

yellow throat; corolla tube cylindrical, ± 25 mm long; limb at least 6× the diam. of the throat; anterior lobe of limb enlarged, nearly circular. *Fruit* usually oblate in lateral view, up to 30 mm long, 30 mm wide; beak very narrow, almost imperceptible; wings on either side of the fruit almost contiguous at the base of the fruit. *Seeds* 2 in each locule (Figs. 4 & 5).

The nearest relative of *P. cinnabarinus* is probably *P. aurantiacus*, both which share a similar swollen aboveground caudex as well as thickened fusiform

roots. The main differences between the two species relate to the morphology of the flowers and geographical distribution. The two species occur more than 1 000 km apart and *P. aurantiacus* (Namibia and Angola) grows in a region with less than half the rainfall received by *P. cinnabarinus*. In *P. cinnabarinus* the flowers are red or reddish orange and almost glabrous (Figs. 4, 5 & 6), whereas those of *P. aurantiacus* are bright orange and finely hairy (Fig. 6), with a dark purplish-red zone bordered with a fringe of hairs on the ventral surface

Figure 6. Comparison of the leaves (row 1), flowers (row 1), flowers (rows 2-4) and fruit (row 5) among six species of Pterodiscus. Flowers are depicted from the front (row 2), obliquely from the side (row 3), and laid open to show the position of the stamens and the style (row 4). In each row images for the various species are arranged in the same order from left to right: A *P. luridus*; B *P. makatintensis*; C *P. aurantiacus*; D *P. cinnabarinus*; E *P. nganicus*; F *P. speciosus*. (Scale bar 20 mm).



of the upper lip (at the entrance to the corolla tube). *P. cinnabarinus* has the longest style of all the southern African species of *Pterodiscus* and stigma and anthers are positioned at the entrance to the corolla tube; in *P. aurantiacus* these are positioned further down the tube. Furthermore, the stamens are inserted significantly higher (10 mm) above the base of the corolla tube in *P. aurantiacus* than in *P. cinnabarinus* (1 mm). The diameter of the corolla tube is much narrower than in *P. aurantiacus*, and the flowers contain no landing area. The fruits of *P. aurantiacus* are larger than those of *P. cinnabarinus*, as are the seeds contained therein. Diagnostic features to distinguish among *P. cinnabarinus* and the other South African members of the genus are provided in Table 1.

The existence of *P. cinnabarinus* was first mentioned to me by the late Philip Alp who recalled that in the Lowveld of South Africa (Limpopo and Mpumalanga Provinces), he had encountered a red-flowering *Pterodiscus*. The taxon remained elusive as the opportunity was never used with Philip to search for the plants. In December 2012, whilst visiting the Eiland hot water spa about 70 km east of Tzaneen, Limpopo Province, I explored a section of the indigenous woodland on the property and my eye caught the bright reddish orange flowers of a *Pterodiscus*. I immediately knew this was the *Pterodiscus* seen by Philip. The *P. cinnabarinus* plants were growing in association with mopane trees (*Colophospermum mopane*) in sandy loam soil. Other succulent plants growing nearby included *Ceropegia crassifolia* and *Brachystelma brevipedicellatum*. As this was summer, some already mature fruits had been shed and these, together with the type material, were taken back to the nursery. The seeds germinated and after a few months flowered with their beautiful deep reddish orange flowers. Pollination of these nursery plants was probably effected by large black ants, initially attracted to the extra floral nectaries at the base of the petioles.

Based on the relatively few herbarium collections of *P. cinnabarinus* in the National Herbarium (PRE), Pretoria, this species is confined to the Lowveld

of Mpumalanga and Limpopo in South Africa, from where it ranges into Zimbabwe and probably Mozambique. Existing herbarium collections in PRE have mostly been incorrectly identified as *P. ngamicus*, even though the flowers and leaves are quite different in the latter species. The earliest collection traced dates from January 1915 and is from "Umhlaferi Bridge" in the Lowveld (Breijer 15634 in PRE). Herbarium specimens of the species have since, among others, also been collected in the Kruger National Park, Klaserie Private Nature Reserve, Hwange [Wankie] National Park (Zimbabwe), and from near Hoedspruit and Komatipoort.

In 1936 J.E. Repton (PRE 24479) collected for cultivation live material of a species of *Pterodiscus* at Malips Drift in Sekhukhuneland, Limpopo Province. It was identified as *P. aurantiacus*, and subsequently described and illustrated under that name in *Flowering Plants of Africa* (Phillips, 1939). Hardy (1988) discussed Repton's find and concluded it was *P. ngamicus*, an identification with which I agree (considering the original illustration). However, in his article Hardy included a photograph which clearly depicts *P. cinnabarinus*.

Pterodiscus cinnabarinus should not be confused with the well-known red-flowered form of *P. elliotii*, a species often associated with mopane woodland in Zimbabwe and Zambia (Ihlenfeldt, 1988). Plants of *P. elliotii* are characterised by long aerial deciduous stems sprouting from a turnip-shaped underground tuber. Plants of *P. cinnabarinus*, on the other hand, have aerial deciduous stems that sprout from an aboveground swollen caudex with a few underground thick fusiform roots. The flowers of *P. elliotii* have a type of landing area ("bulge") of five ridges below the stigma and stamens, which have to be crossed by the pollinator to ensure contact with the back of the insect with the pollen or stigma. Flowers of *P. cinnabarinus* lack this landing area. The position of the stamens and stigma within the corolla tube of *P. elliotii* is half way up the tube, whilst in *P. cinnabarinus* the stamens and stigma are at the entrance of the tube. The corolla tube of *P. elliotii* is significantly

longer and more uniform in shape compared with that of *P. cinnabarinus*, which is more pointed at the base and shorter. There are easily visible hairs at the entrance of the corolla tube in *P. cinnabarinus*, but these are absent in *P. elliotii*. The mature capsules of the two species also differ, in that those of *P. cinnabarinus* are consistently larger as well as having broader wings than those of *P. elliotii*.

Pterodiscus in the FSA region

With the description of *Pterodiscus makatiniensis* and *P. cinnabarinus*, the total number of *Pterodiscus* species recognised in the FSA region is brought to six, the others being *P. aurantiacus*, *P. luridus*, *P. ngamicus* and *P. speciosus* (Fig. 6; Table 1). The manuscript name, "*P. namibensis*", has been suggested by Dr. Hans-Dieter Ihlenfeldt for a form said to differ from *P. luridus* in fruit morphology. However, fruit morphology is very variable in *P. luridus*. The variation in fruit morphology of *P. luridus* from a single locality near Upington is depicted in Fig. 7. As can be seen, variation in the same population shows the lateral wings to be relatively broad or narrow in the lower part of the fruit, as well as almost contiguous as well as separated, whereas the beak may vary from conical to more slender. Hence the form provisionally labelled "*P. namibensis*" is here treated as conspecific with *P. luridus*.

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References

- HARDY, D.S., 1988. *Pterodiscus aurantiacus*: a case of mistaken identity. *Aloe*, 25:27.
- IHLENFELDT, H.-D., 1988. *Pedaliaceae*. In: Launert, E. (ed.), *Flora zambesiaca*, 8(3). Flora Zambesiaca Managing Committee, London.
- PHILLIPS, E.P., 1939. *Pterodiscus aurantiacus*. *The Flowering Plants of Africa*, 19:Plate 734.
- VAN WYK, A.E. & SMITH G.F., 2001. *Regions of floristic endemism in southern Africa: a review with emphasis on succulents*. Umdaus Press, Hatfield, Pretoria.

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Figure 7. *Pterodiscus luridus*. Six fruits from the same population near Upington, Northern Cape, South Africa, showing the variation in fruit morphology.