

Doodia caudata

There has been some confusion as to the exact identity of the *Doodia* species (Figure 15A) naturalized in KwaZulu-Natal, South Africa. Specimens from Pietermaritzburg collected in the mid-20th century were first identified as *Doodia media* R.Br. by Prof. E. Schelpe. Subsequently, Burrows (1990) referred this taxon to *Doodia caudata* (Cav.) R.Br., and more recently it has been assigned to *Doodia squarrosa* Colenso (Roux 2001, 2009). The fact that no single identification key to all *Doodia* species exists has confounded attempts to verify the identity of the South African naturalized species. There are separate keys available to the New Zealand (Parris 1972) and Australian (Parris 1998) taxa of *Doodia*. However, *D. caudata* is an Australian entity (Parris 1980, 1998), whereas *D. squarrosa* is confined to northern New Zealand (Parris 1972). Although *D. caudata* was initially considered to occur also in New Zealand (Parris 1972), plants so associated with this name were described subsequently as a New Zealand endemic, *Doodia mollis* Parris (Parris 1980). Accordingly, the two available keys are not definitive in respect of resolving *D. squarrosa* and *D. caudata*.

There is a high level of morphological variation in most species of *Doodia*; accordingly *D. caudata* and

D. squarrosa are apparently often confused in herbaria. Both have pinnate dimorphic fronds with discrete to confluent sori, and pinnae that are auriculate or stalked to partly adnate in the middle and adnate to decurrent in the upper part of the frond (Parris 1972, 1998). The fronds of *D. caudata* are 57–460 mm long with the longest pinnae 2–110 × 1–4 mm (Parris 1998), whereas the fronds of *D. squarrosa* are of similar maximum length, 140–450 mm long, but with the longest pinnae only 15–60 × 1–2 mm (Parris 1972). Frond and pinnae length are not always useful distinguishing characters especially since they are frequently environmentally influenced.

South African material was compared to the lectotype of *Doodia squarrosa* (Colenso 9/83, frond second from right, K) and a high resolution image of the holotype of *D. caudata* (L.Née s.n. MA). It was found to match the material for *D. caudata* more closely. During subsequent correspondence with Dr B. Parris, she confirmed the identity of the South African material as *D. caudata*, the most variable species in the genus and the one that has become the most widely naturalized. According to Parris (pers. comm.) the South African material approaches *D. media* R.Br. var. *moorei* Baker in having rather longer fertile pinnae than the typical form; this aforementioned variety intergrades with the typical form in Australia and



FIGURE 15.—A, *Doodia caudata*, habit; B, *Phlebodium aureum*, habit. Photographs: N.R. Crouch.

cannot be upheld. It has consequently been placed in synonymy under *D. caudata* (Parris 1998).

Accordingly, the *Doodia* species that has escaped from cultivation in KwaZulu-Natal is *D. caudata*, the small rasp fern.

***Doodia caudata* (Cav.) R.Br.** in *Prodromus florae Novae-Hollandiae*: 151 (1810); Burrows: 338 (1990). Type: Nova Hollandia [Australia], *L.Née s.n.* (MA, holo.).

D. squarrosa sensu Roux: 153 (2001) et sensu Roux: 105 (2009), non Colenso: 382 (1881).

For a complete list of synonyms see Parris (1998).

Rhizome erect, up to 0.1 m tall, to short- or long-creeping; rhizome scales brown. **Fron**ds markedly dimorphic; stipe slender, short, dark towards base and without tubercles. **Fertile lamina** generally more erect and scabrous, longer and broader than sterile ones, 57–460 × 5–180 mm, with a long apical segment ($\frac{1}{3}$ – $\frac{1}{6}$ – $\frac{1}{9}$ of lamina length, 1-pinnate; pinnae more distant and narrower than sterile ones, simple, oblong to linear-lanceolate, margins sharply toothed, more than 2 pairs of pinnae stalked in basal third of lamina, stalked to partly adnate to decurrent in middle third, partly adnate to decurrent in distal third, longest pinnae 2–110 × 1–4 mm, rachis and pinna midvein without tubercles. **Sterile lamina** decumbent, 1-pinnate, pinnae simple, oblong, apices rounded, margins toothed. Venation with some anastomoses forming areoles on either side of costa. **Sori** in 1 (rarely partial second) row on each side of costa, 0.8–10 (or more) × 0.8–1.5 mm, often laterally confluent when mature, confluent across costa, nearer to midvein than margin; indusium linear, entire to repand, opening towards the costa (Andrews 1990; Parris 1998).

Doodia caudata is a native of Australia where it occurs in eastern South Australia, eastern Queensland, New South Wales, southern Victoria, northern Tasmania

and Lord Howe Island (Parris 1998). It has naturalized in KwaZulu-Natal, South Africa (Burrows 1990; Roux 2001, 2009), California (USA), as well as the Azores, Madeira and in Sri Lanka (Burrows 1990; Parris 1998). It can locally be found growing exposed or in deep shade on seasonally moist earthbanks, roadside cuttings and forest margins (Crouch 1994; Roux 2001).

An attempt has been made to trace the original source of the *Doodia* material imported into South Africa. Since the South African material most closely resembles the form described as *D. media* var. *moorei* which was collected from the Richmond River north of Sydney in New South Wales, the most likely source would be what is today known as the Royal Botanic Garden of New South Wales, Australia (B.S. Parris pers. comm.). Reports of the Natal Botanic Gardens in Durban from a century ago, reveal that its Curator, J.M. Wood was regularly exchanging plant material with the Botanic Gardens in Sydney, and from the accession register of 'Overseas and Tropical African specimens ex Wood Herbarium. Vol. I' it is apparent that J.H. Maiden of the Sydney Gardens provided Wood with plants of *D. caudata* for cultivation. A voucher (*J.M. Wood 5766 NH*) at the KwaZulu-Natal Herbarium indicates that this species was first grown in the Natal Botanic Gardens (Durban Botanic Gardens) prior to the mid-1890s. Notably, this particular specimen was correctly named *D. caudata* and has not been subject to re-determinations, likely due to its placement in the cultivated section of the NH collection. As Wood also exchanged live material with the Pietermaritzburg Botanic Garden at that time, plants from the Durban facility may have been transferred to the Pietermaritzburg Garden, from where they escaped.

Although *Doodia caudata* is locally common across the mistbelt zone of Pietermaritzburg (Figure 16), from Sunnyside to Ferncliffe (1 000 m), this species has apparently not naturalized elsewhere in the Midlands,

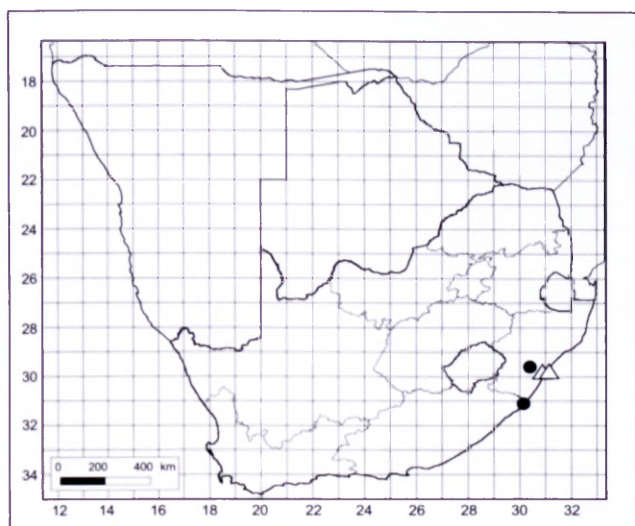


FIGURE 16.—Distribution in FSA region of *Doodia caudata*, ●; and *Phlebodium aureum*, △.

besides Howick (Crouch 1994)—this since its documented escape from cultivation over half a century ago. It was somewhat surprising then to encounter this taxon growing in a remote site near the Transkei coast under different climatic conditions, indicating that it may now be an emerging weed. This record extends the previous distribution range southwards some 170 km (Figure 16).

Specimens examined

KWAZULU-NATAL.—2930 (Pietermaritzburg): Sunnyside, Pietermaritzburg, (–CB), 01-03-1953, *A. Dohse & L. Lindahl* 102 (NH); Maritzburg District, 4000 ft [1 200 m], (–CB), 16-08-1956, *ACS* 10 (NU); Ferncliffe Nature Reserve, Pietermaritzburg, 1 000 m, (–CB), 23-02-1992, *N.R. Crouch* 561 (NU); Ferncliffe Nature Reserve, earth bank adjacent to parking area, 1 000 m, (–CB), 30-04-2007, *N.R. Crouch* 1153 (PRE); KwaZulu-Natal National Botanical Garden, growing alongside path on banks, in indigenous forest section on far side of river in garden, (–CB), 03-09-2008, *N.R. Crouch* 1172 (PRE); opposite 11 Tanner Rd, Wembley, Pietermaritzburg, colony on earth bank, (–CB), 06-01-2008, *N.R. Crouch* 1145 (NH). 2931 (Stanger): Natal Botanic Garden, in cultivation, (–CC), *J.M. Wood* 5766 (NH).

EASTERN CAPE.—3130 (Port Edward): Lukabeni stream junction with Mtentu River, 30 m upstream of high tide mark, small colony growing on earthbank in coastal forest, 4 m, (–AA), 04-01-2008, *N.R. Crouch* 1143 (NH).

POLYPODIACEAE

Phlebodium aureum

Phlebodium aureum (L.) J.Sm. (Figure 15B) is commonly cultivated in South Africa and has escaped from cultivation in the vicinity of Durban, KwaZulu-Natal and Port St Johns in the Eastern Cape (Burrows 1990). It has also been reported to have become naturalized in Zimbabwe (Roux 2009). This fern species was documented in cultivation in the Durban Botanic Gardens in 1941 (*C. Kent* 16 NH), and to have started escaping in the immediate vicinity of the gardens by 1968 (*R.G. Strey* 8071 NH). It has more recently been collected in Kloof some 25 km distant, and has been sighted and photographed growing on a decaying log in remnant indigenous riverine scrub, at Inanda to the north of the metropol (Figure 16).

The golden polypody or golden serpent fern is so named because of the golden scales on its creeping rhizome. Its arching to pendent fronds are deeply lobed (Nauman 1993) and very similar to those of *Microsorium scolopendria* (Burm.f.) Copel. It is distinguished from this indigenous fern by the venation of the lamina (fewer included veinlets), its very dense tomentum of golden scales clothing the rhizome, the close spacing of the pinnatifid segments and the sori which are not sunken into the lamina (Schelpe & Anthony 1986). It has been reported to grow epiphytically in moist evergreen riverine forests and forest margins (Roux 2001, as *Polypodium aureum* L.), and is also found in Durban growing as a lithophyte in more exposed situations, and on building ledges in a manner reminiscent of *Pteris vittata* L.

Phlebodium aureum is native to Central America from Florida and Georgia in the USA, through Mexico to Brazil in South America and the West Indies (Burrows 1990; Nauman 1993; Roux 2001). Plants are reportedly intolerant of heavy frosts which would account for limited naturalization of *P. aureum* along the warm eastern seaboard. Additionally, although usually evergreen, plants may be briefly deciduous during periods of drought stress, so allowing them to invade relatively dry areas such as man-made structures. Although it is recognized as a garden escape, no herbarium specimens documenting it as a truly naturalized species could be traced for South Africa; this report with associated voucher corrects this insufficiency.

***Phlebodium aureum* (L.) J.Sm.** in *Journal of Botany* 4: 59 (1842). *Polypodium aureum* L.: 1087 (1753). Type: *Herb. Linn. No. 1251.10* (LINN, lecto.), designated by Proctor (1977: 334).

Rhizome creeping, \pm 8–15(–30) mm diam., densely scaled; rhizome scales reddish to golden, long attenuate, 10–20 mm. *Fronds* bright green or glaucous, arching to pendent, 0.3–1.3 m; stipe 150–500 mm, smooth, with a few scales near base; lamina deeply pinnatifid, 300–800 \times 100–500 mm, glabrous, terminal segment conform; pinnae up to 35, lanceolate to elliptic, or linear-lanceolate to linear, 60–200 \times 10–40 mm, margins entire, occasionally undulate. *Sori* in a single line on each side of costae, occasionally a 2nd row present, terminal or at a plexus of included veinlets; exindusiate (Nauman 1993).

Specimens examined

KWAZULU-NATAL.—2930 (Pietermaritzburg): Krantzklouf Nature Reserve, Kloof, at eastern end of reserve, immediately above The Splash, growing as a lithophyte adjacent to Molweni River in full sun, 218 m, (–DD), 28-04-2009, *N.R. Crouch* 1243 (PRE); Kloof, opposite Maytime Centre on ledge of pedestrian bridge across the M13 highway on eastbound carriageway, 450 m, (–DD), 27-04-2009, *N.R. Crouch* 1244 (PRE). 2931 (Stanger): Durban Botanic Gardens, (–CC), 06-1941, *C. Kent* 16 (NH); Natal Herbarium garden, epiphyte on *Raphia*, (–CC), 03-03-1968, *Strey* 8071 (NH).

WOODSIACEAE

Diplazium esculentum

Diplazium esculentum (Retz.) Sw., the vegetable fern (Figure 17), is a widespread native from both tropical and temperate eastern and southeastern Asia, where it



FIGURE 17.—*Diplazium esculentum*, habit. Photograph: N.R. Crouch.

is commonly cultivated and/or harvested for its young fronds which are used as a vegetable (Kato 1993; Mertz 1999; Roux 2001). It has become naturalized in South Africa and Zimbabwe (Roux 2009), as well as in Florida, Louisiana and Hawaii (USA) (Kato 1993; Smithsonian Institution 2009) and Australia (Jones 1998). It grows mostly in disturbed areas, exposed or in partial shade but always in wet sites such as streambanks (Roux 2001), where it forms large clonal colonies due to prolific root budding. Sporing in South Africa is evidently rare; close examination of large colonies at Kirstenbosch (Cape Town), Pietermaritzburg and Durban surrounds over several years has revealed only three plants bearing sori. *Diplazium esculentum* has an erect rhizome that can become rather trunk-like (up to 1 m tall) in older plants, for which feature it is grown as an ornamental. It is distinguished by its broad, arcuate 2-pinnate fronds of up to 2 m long, with veins that unite along the costae below the sinuses. The scales on the stipe bases and rhizomes have black margins and forked teeth (Hoshizaki & Moran 2001; Olsen & Olsen 2007).

Until recently, invasion by *Diplazium esculentum* was known only from several sites in the greater Durban region, where it seems to have escaped from gardens and established along watercourses. Once colonies are established, erosive flooding events disperse root buds and plantlets which establish downstream. More recently, the vegetable fern has been found naturalized both in Pietermaritzburg and in Zululand (Figure 18), indicating that it is an emerging alien invader. Urgent attention should be directed towards its eradication.

***Diplazium esculentum* (Retz.) Sw.** in Journal für die Botanik 1801,2: 312 (1803). *Hemionitis esculenta* Retz.: 38 (1791). Type: 'Habitat in India orientali', J.G. König s.n. (LD, holo.).

For a complete list of synonyms see Roux (2009).

Rhizome erect, often forming a slender black trunk 0.3(–1) m tall; scaled at apex, rhizome scales \pm 10 mm

long, dark brown, margins finely toothed, apex long-acuminate; forms clonal colonies by vegetative increase from root buds. **Fronds** 1–2 \times 0.5–1 m, erect to arching; stipe black and scaly at base, paler above; lamina 2- to 3-pinnate, 0.5–1.5 \times 0.5–1 m, dark green; pinnules variable in size, \pm 50–80 \times 15–25 mm, subsessile, margins very shallowly lobed, lobes toothed, basal lobes longer than the rest, glabrous abaxially; veins simple or forked, lowest 3–5 pairs of adjacent vein groups anastomosing. **Sori** spreading along most veins; indusium thin, dark brown, margins becoming uneven with age (Jones 1998).

Specimens examined

KWAZULU-NATAL.—2930 (Pietermaritzburg): KwaZulu-Natal National Botanical Garden, naturalized in sandbank in seasonally flooded river running through the garden, highly disturbed site, (–CB), 03-09-2008, N.R. Crouch 1173 (PRE); Krantzkloof Nature Reserve, Kloof, colony growing in semi-shade to full sun immediately above The Splash on the lower Molweni River, 215 m, (–DD), 28-04-2009, N.R. Crouch 1242 (PRE); Pinetown, Sarnia, along banks of Umbilo River, plants form large stands on streambank, (–DD), 24-06-2001, J.P. Roux 3137 (NBG); Durban, on banks of Umhlathuzana River as it passes next to Old Mill, adjacent to Coedmore Road, Yellowwood Park, 40 m, (–DD), 12-05-2009, N.R. Crouch 1245 (NH, PRE). 2831 (Nkandla): footslope of Ongoye Mountains, rocky area among homesteads, (–DC), 2006, N.F. Magagula 1 (ZULU).

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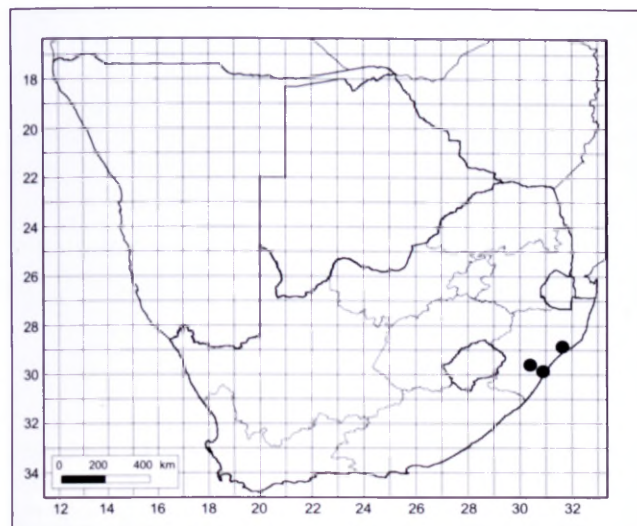


FIGURE 18.—Distribution in FSA region of *Diplazium esculentum*.

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