718. MORAEA ARISTATA
Iridaceae

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Summary. The striking and highly threatened South African geophyte *Moraea aristata* (D. Delaroche) Asch. & Graebn. is described, together with details of its history, biology and cultivation requirements.

The earliest illustrations of the plant now known as *Moraea aristata* are two watercolour drawings executed for the Florilegium *The Flora Capensis of Jakob and Johann Philipp Breyne* in about 1700. Jakob Breyne (1637–1697), a German merchant and botanist, and his son Johann Philipp (1680–1764), a physician, both established botanical gardens in Danzig through trade with the Dutch East Indies, Japan and southern Africa. The Florilegium, comprising 86 drawings by several artists, was bound in 1724 and finally published more than two and a half centuries later by The Brenthurst Press in Johannesburg (Gunn & Du Plessis, 1978). The stylised, unsigned plates were probably undertaken from wild-collected specimens at the Cape and depict two forms of *M. aristata*, one with typical clear white outer tepals, the other the less common type with blue mottling. The plant was evidently in cultivation in Holland by the 1750s and the first published plates were those of Sydenham Edwards in *Curtis's Botanical Magazine*, illustrated as *Iris pavonia* Curtis in 1791, and one by the Belgian painter and botanist, Pierre-Joseph Redouté, reproduced as *Vieusseuxia glaucopis* DC in the first volume of his *Les Liliacées*, in 1803. A later plate in pencil and watercolour, by the British astronomer Sir John Herschel and his wife Lady Margaret was done from specimens gathered in the grounds of the Royal Observatory (now the South African Astronomical Observatory) in Cape Town in September 1835 (Warner & Rourke, 1996).

In 1758 the Scottish horticulturist and botanist Philip Miller established the genus *Morea* in honour of Robert More of Shropshire, but Linnaeus later altered its spelling to *Moraea*, in order to associate the name with his father-in-law, J. Moraeus, a Swedish physician (Duncan, 2010b). *M. aristata* is a member of subgenus *Vieusseuxia* that includes species with relatively long-lived flowers (lasting 3 days)

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that have much reduced inner tepals, and single leaves. Within this subgenus, *M. aristata* belongs to section *Vieusseuxia* that includes those traditionally known as 'peacock' moraeas which have showy orbicular outer tepals with prominent iridescent spots or 'eyes', outlined in one or more zones of contrasting colour (Goldblatt, 1986). This group includes well known species such as *M. gigandra* L.Bolus, *M. tulbaghensis* L.Bolus and *M. villosa* (Ker Gawl.) Ker Gawl. *M. aristata* most closely resembles *M. villosa* but is distinguished from it mainly in its white tepals, and smooth stem and leaf. Its mode of vegetative reproduction differs from *M. villosa* in its production of cormlets at the tips of subterranean stolons, and it is geographically isolated from *M. villosa* which is absent on the Cape Peninsula.

The genus *Moraea*, with more than 200 species, is widely distributed in sub-Saharan Africa, with outliers in the Mediterranean and the Middle East, but its area of highest diversity is in the winter rainfall zone of the Western Cape, especially in the south-western part of this province. The smaller groups of summer-growing and evergreen groups are native mainly to the Eastern Cape, KwaZulu-Natal, Lesotho and Mpumalanga, and the blue-flowered *M. stricta* Baker has the widest range of all the species, extending from the Eastern Cape to northern Ethiopia (Goldblatt, 1986).

Moraea aristata, the subject of this plate, was first described in 1766 as *Vieusseuxia aristata* by the Swiss botanist Daniel de la Roche from material cultivated in Europe, but was perhaps most well known by one of its later names, *Vieusseuxia glaucopis* DC and by Redouté's famed plate, and it was known under several other names by subsequent authors. The Latinised specific epithet *aristata* is descriptive of the long central lobe of the inner tepals that ends abruptly in a straight point or arista.

This species is endemic to the north-eastern Cape Peninsula, occurring in remnant Peninsula Shale Renosterveld vegetation (Mucina & Rutherford, 2006). It is currently limited to a single subpopulation along the Liesbeek River in the suburb of Observatory, surrounded by urban sprawl. Despite its location within the protected grounds of the South African Astronomical Observatory, it is on the verge of extinction there as the limited number of individuals with their low genetic diversity, poor seed production, and the disturbed site with smothering grass renders this subpopulation non-viable

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Plate 718 *Moraea aristata* GEORITA HARRIOTT

(Duncan, 2003). It has a conservation status of Critically Endangered, mainly as a result of urbanisation (Victor *et al.*, 2009). The species has historically always been restricted to clay slopes and flats east of Table Mountain and plants at the Observatory have traditionally been taken care of by a succession of Directors' wives, the current one being Mrs Anne Charles. It is indeed a paradox in view of its dire circumstances in the wild, that *M. aristata* is one of the most obliging members of this genus to grow and has escaped from cultivation and become naturalised in South Australia (Groves *et al.*, 2003), where it may be potentially invasive. Today it survives in cultivation in botanical gardens and private bulb collections in a number of countries.

During the early 1980s I made an attempt with several Kirstenbosch horticultural colleagues to bolster the only remaining subpopulation at the Observatory by planting 200 additional corms that had been propagated in the Kirstenbosch Bulb Nursery, close to the subpopulation. Initially these additional plants performed well, but because all material of this species in cultivation originates from this subpopulation with its limited genetic base, and perhaps because the beetle pollinators no longer exist in sufficient numbers at this site, the number of individuals there has not increased.

Moraea aristata commences vegetative growth in mid- to late autumn once sufficient autumn rains have fallen. Rapid leaf growth ensues throughout winter and the flower buds appear in mid- August, flowering reaching a peak from late August to early September. Each flower lasts 2–3 days but a succession of flowers is produced per plant over a period of about 3 weeks. In early October the ripe capsules split longitudinally for about half their length and the angular, light brown seeds are dispersed locally by the shaking action of wind.

A study of pollination mechanisms in peacock moraeas showed that the orange- or red-flowered *Moraea tulbaghensis* and the purple-, mauve-, pink- or rarely orange-flowered *M. villosa* are visited and pollinated exclusively by hopliine (monkey) beetles of the family Scarabaeidae (Steiner, 1998). I have often observed the monkey beetle *Pachycnema crassipes* Fabricius feeding on pollen of *M. aristata* plants grown in open beds in the bulb nursery at Kirstenbosch. The beetles are attracted to the dark blue iridescent spot located near the base of each of the three broad outer tepals, and certainly in these cultivated plants pollination is effected as pollen deposited onto

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their heads and backs brushes against the stigma lobes when the beetles enter the flowers of different clones (Duncan, 2010b). At the Observatory site, two as yet unidentified species of cetonid (flower chafer) beetle (Cetoniinae: Scarabaeidae), one of which was covered in pollen, were photographed visiting the flowers of *M. aristata* by the current Director, Prof. Phil Charles, but whether or not these beetles come into contact with the stigmas is unknown.

Cultivation. *Moraea aristata* responds very well to cultivation and flowers prolifically in ideal conditions. The corms are planted in autumn at a depth of about 3 cm in a sandy or clayey medium into which finely sifted, well-decomposed organic matter has been added. They need full sun or as much bright light as can be provided. The plants have a vigorous root system and, when grown in containers, require deep plastic containers with a diameter of 30 cm, in order for them to flower optimally (Duncan, 1983). In temperate climates they can be grown outdoors in deep bulb beds or in dedicated rock garden pockets that are securely lined with wire mesh to exclude mole rats, and kept dry in summer. In addition, the plants can be successfully naturalised in shallow-rooted buffalo grass *Stenotaphrum secundatum* (Walter) Kuntze, provided that it is not watered in summer, and not subject to mole rats and porcupines, (Fig. 1). Corms can be inserted or seeds scattered over the grass in autumn and covered with a 5 mm layer of equal parts river-sand and finely sifted compost (Duncan, 2010a). *M. aristata* is half-hardy and can withstand temperatures down to O°C or 32°F for short periods, but in cold climates it is best suited to the cool greenhouse. Regular heavy drenching is essential during the winter-growing and spring-flowering periods, but the corms must be kept completely dry throughout the summer dormant phase. The plants flower from mid-August to September in the wild but in cultivation they sometimes begin flowering in late July.

Seeds of *Moraea aristata* remain viable for at least 5 years when stored at low temperature, but when stored at room temperature they should be sown in the immediately ensuing autumn following harvesting, failing which viability decreases markedly. Seeds can be sown in deep pots or trays, or directly into deep outdoor seed beds, in the same medium recommended for mature corms. Seeds should be sown at a depth of 3–4 mm, and if fresh, germinate within about 5 weeks. Seedlings should be allowed to grow undisturbed for two

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Fig. 1. *Moraea aristata* naturalised in buffalo grass (*Stenotaphrum secundatum*) at Kirstenbosch Botanical Garden. Photograph: Graham Duncan.

seasons before planting into permanent positions at the beginning of their third season, during which some may flower for the first time, if well grown (Duncan, 2010b).

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In order to obtain pure seeds from cultivated plants it is necessary to cross-pollinate different clones by hand, as the species is self-incompatible. An anther is located underneath each style branch, and pollen is ready for collection once it has become crumbly, turned orange and easily adheres to a pollination implement such as a water-paint brush. In addition to seeds, *M. aristata* and a few other members of the 'peacock' moraea group are readily propagated by cormlets that form at the tips of subterranean stolons, and these can be removed and potted-up after a single season's growth (Du Plessis & Duncan, 1989).

Moraea aristata is not especially susceptible to pests and diseases although the leaves, stems, flower buds and developing fruits are sometimes subject to aphids, and the leaf undersides sometimes fall prey to attack by red spider mites as temperatures rise in late spring. In susceptible areas, the corms are taken by mole rats and Namaqua rock mice. Fungal rotting of the corms often occurs when they are not kept sufficiently dry during the summer dormant phase.

Moraea aristata (D. Delaroche) Asch. & Graebn., Synopsis Mitteleuropaischen Flora 3: 518 (1906).

Vieusseuxia aristata D. Delaroche, Descriptiones Plantarum Aliquot Novarum: 33 (1766). Type: South Africa, Cape, precise locality unknown, *van Royen s.n.* (L, Herb. van Royen, lectotype, designated by Goldblatt & Barnard (1970).

Ferraria ocellaris Salisb., Prodromus Stirpium 41 (1796), nom. nov. pro *Iris pavonia* Curtis var. Type: South Africa, Cape, precise locality unknown, figure in Curtis's Botanical Magazine 5: t. 168 (1791).

Vieusseuxia glaucopis DC, in Redouté, Les Liliacées 1: t. 42 (1803). Type: South Africa, Cape, precise locality unknown, figure in Redouté, Les Liliacées 1: t. 42 (1803).

Moraea tricuspis (Thunb.) Ker Gawl. var. *ocellata* D.Don, British Flower Garden (series 2) 3: t. 249 (1834). Type: South Africa, Cape, precise locality unknown, figure in British Flower Garden (series 2) 3: t. 249 (1834).

Moraea glaucopis (DC) Drapiez, Dictionnaire Classique des Sciences Naturelles 7:478 (1841).

Description. *Deciduous, winter-growing geophyte* 250–420 mm high. *Corm* globose, 10–15 mm in diam., white, forming cormlets at apices of subterranean stolons; outer tunics strong, brownish cream, apices fasciculate; cataphylls 2, upper cataphyll prominent, fibrous, light brown. *Leaf* 1, linear, 400–550 × 4–7 mm, greenish grey, basal, glabrous, bifacial, apex terete. *Stem* erect to suberect, glabrous; stem nodes 2, prominent; sheathing stem bracts erect, greenish grey, apices attenuate, light brown; outer and inner spathe bracts overlapping. *Inflorescence* a rhipidium, sometimes 1–2 branched,

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producing several flowers at staggered intervals; flowers iris-like, 3 outer tepals orbicular, 32–35 × 35 mm, spreading, upper surface white, sometimes lightly to heavily blue-spotted, with prominent iridescent blue or green spot at base, outlined in violet and occasionally yellow above, bases black, hairy; lower surfaces white, streaked deep blue; tepal claws suberect, 12–15 × 2–6 mm, upper surface hairy, yellow above, lower surface greenish; inner tepals 3, tricuspidate, 16–21 mm long, outer lobes 2–3 mm long, central lobe 8–10 mm long, aristate, white, heavily brown-mottled. *Filaments* erect, fused into a white column 2–4 mm long; anthers 3, oblong, 5–6 mm long, appressed to style branches; pollen orange. *Ovary* oblong, 8–10 × 2 mm, light green; style white, branches 3, suberect, 7–8 mm long, crests 6, erect, 6–7 mm long, triangular, margins serrated; stigma lobes white. *Capsule* oblong, 15–20 × 4–5 mm, light brown. *Seeds* angular, testa light brown. *Chromosome number*: 2n = 12 (Goldblatt, 1976).

Distribution. Confined to one site along the Liesbeek River in the north-eastern Cape Peninsula, surrounded by urban sprawl.

Habitat. Seasonally moist clay slopes and flats in remnant Peninsula Shale Renosterveld vegetation.

Flowering period. August to September, with a peak from late August to early September.

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