

721. MASSONIA BIFOLIA

Hyacinthaceae

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Summary. The history, ecology, pollination biology and distribution of *Massonia bifolia* (Jacq.) J.C. Manning & Goldblatt. (= *Whiteheadia bifolia* (Jacq.) Baker) are given, and its position in the tribe Massonieae is briefly discussed. Cultivation notes are provided.

This curious bulb has fascinated botanists and botanical artists for over three centuries but has only recently divulged the secret of its intriguing appearance. Restricted to the semi-arid, winter-rainfall region along the South African west coast, *Massonia bifolia* is scarcely known in cultivation beyond specialist collections but is instantly recognized by the pair of prostrate leaves flanking a squat, leafy spike of greenish flowers surmounted by a crown or coma of sterile floral bracts. The soft, semisucculent leaves are unusually fragile and readily damaged, reputedly even by raindrops (Obermeyer, 1965). Its distinctive inflorescence, with its sweeping, leafy eaves, suggested the common name PAGODA LILY (Manning *et al.*, 2000).

Initially described as *Eucomis bifolia*, it was one of dozens of Cape bulbs that were first illustrated in Nikolaus von Jacquin's monumental florilegium, *Icones Plantarum Rariorum* (Jacquin, 1781–1793). The coloured engravings in this, like those in his other works, were based largely on plants from the Imperial Gardens at Schönbrunn or from the University Botanic Garden (Rix, 1989). Most of the South African material figured in these volumes was collected by the Schönbrunn gardeners Georg Scholl and Franz Boos, despatched to the Cape of Good Hope in 1786 at the request of Jacquin himself. Once there, they undertook several collecting trips in the region, initially in the company of the Scottish gardener Francis Masson, who was there at the behest of Sir Joseph Banks on a similar errand on behalf of Kew. Boos, who docked in Trieste on June 17, 1788 laden with natural history specimens gathered in the Cape and the Indian Ocean islands of Mauritius and Reunion over the preceeding 2 years, was handsomely rewarded for his efforts by Emperor Josef II. Scholl was detained at the Cape for a further thirteen years, in no small measure by the low esteem in which the Dutch held the Holy Roman Emperor, before



Plate 721 *Massonia bifolia*

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eventually making his way back to Vienna in 1799 to claim his reward for service to the Empire. Although their itinerary is not known, some of their collections make it clear that Boos and Scholl (or more likely Scholl alone) travelled well north of Cape Town into Namaqualand.

The extraordinary success of the efforts of Boos, Scholl and Masson fuelled the passion for Cape plants that was sweeping the botanical and horticultural fraternities of Europe at the turn of the 18th century, (Manning *et al.*, 2002). Among those who succumbed to its allure was the wealthy London merchant George Hibbert, one of the 'opulent commercial men' and 'great encouragers of exotic botany' of the time, who has amassed a most impressive 'collection of heaths, Banksias and other Cape and Botany-Bay [sic.] plants' (Desmond, 1994). Hibbert engaged James Niven, another of the indefatigable Scottish gardeners that were active in Georgian Britain, to travel to the Cape as his resident collector between 1798 and 1803. Niven's evident success on behalf of his English patron prompted the Empress Josephine to engage him on his return, sending him straight back to repeat his endeavours on France's behalf! It was Hibbert's greenhouses that furnished the plant that was illustrated and described by Henry Andrews (1804) as the new species *Melanthium massoniifolium* (a later synonym of *Massonia bifolia*) and it is certain that it was Niven who collected it. It is almost as certain that Hibbert shared his material with E. John Alexander Woodford, another London plant enthusiast, as Woodford was able to provide William Curtis with a flowering specimen for illustration a year later (Ker-Gawler, 1805).

It appears that Niven travelled only as far north as Clanwilliam during his commission for Hibbert but this is just far enough to have enabled him to encounter the species at its southern limit in the northern Cedarberg Mountains. Fifty years were to pass before the species was seen in the wild again, this time around the mission station at Modderfontein west of Springbok in northern Namaqualand, where the resident Anglican clergyman Rev. Henry Whitehead found it in 1855–1856. His specimen formed the basis for *Whiteheadia latifolia*, described by colonial botanist William Harvey (1868), who had overlooked its earlier introduction in Vienna. Although struck, like Jacquin before him, by the similarity of the curious mop of sterile bracts capping the floral axis to that in the genus *Eucomis*, Harvey was led by the difference in habit (notably the pair of leaves and spike-like

inflorescence), hooked style, and papery, winged capsules, to treat the species in a separate genus in honor of its putative discoverer. The association between Harvey's genus and Jacquin's earlier epithet was established by the Kew botanist J. G. Baker (1873), and the species was subsequently known under the name *Whiteheadia bifolia* until recently, when it was transferred to the genus *Massonia* (Manning *et al.*, 2004).

Winter rainfall southern Africa is the centre of diversity for the tribe Massonieae, which includes 9 genera and ± 200 species of these often attractive bulbous plants. Most of the genera are small, with the great majority of the species (± 120 spp.) included in *Lachenalia* J. Jacq. ex Murray. Among the remainder, only *Ledebouria* Roth (± 50 spp.) comprises more than a handful of species. Generic circumscriptions in Hyacinthaceae have hinged in the past on often subtle floral differences, with significant disagreement among botanists on generic boundaries. The introduction of DNA sequence data has provided a welcome source of additional information, and a consensus on the evolutionary relationships among the species is now emerging. This suggests that several of the traditional species associations were erroneously founded on morphological convergences, necessitating a complete review of the characters used to define genera. The recent and unexpected discovery of two species of uncertain generic affinity from a remote valley in arid southern Namibia (Müller-Doblies & Müller-Doblies, 1997) has further complicated matters. Until this discovery, *Whiteheadia* Harv., with just a single species, had been separated by its leafy, spike-like inflorescence topped by a coma of large bracts from the allied genus *Massonia* Houtt., in which the inflorescence is corymbose and lacking a coma. The description of a second species of *Whiteheadia*, *W. etesionamibensis* U.Müll.-Doblies & D.Müll.-Doblies, with rather smaller bracts subtending the flowers, was therefore of particular interest. DNA data indicate that this species falls between *Whiteheadia* and *Massonia* rather than grouping immediately with *Whiteheadia*, providing grounds for concluding that it shared a recent common ancestor with *Massonia*. Available evidence, therefore, suggests that it occupies an evolutionary position intermediate between the two genera, as a result of which we elected to treat *Massonia* rather more broadly than before to include *Whiteheadia*, rather than embrace the alternative solution of describing an additional monotypic genus for *W. etesionamibensis* (Manning

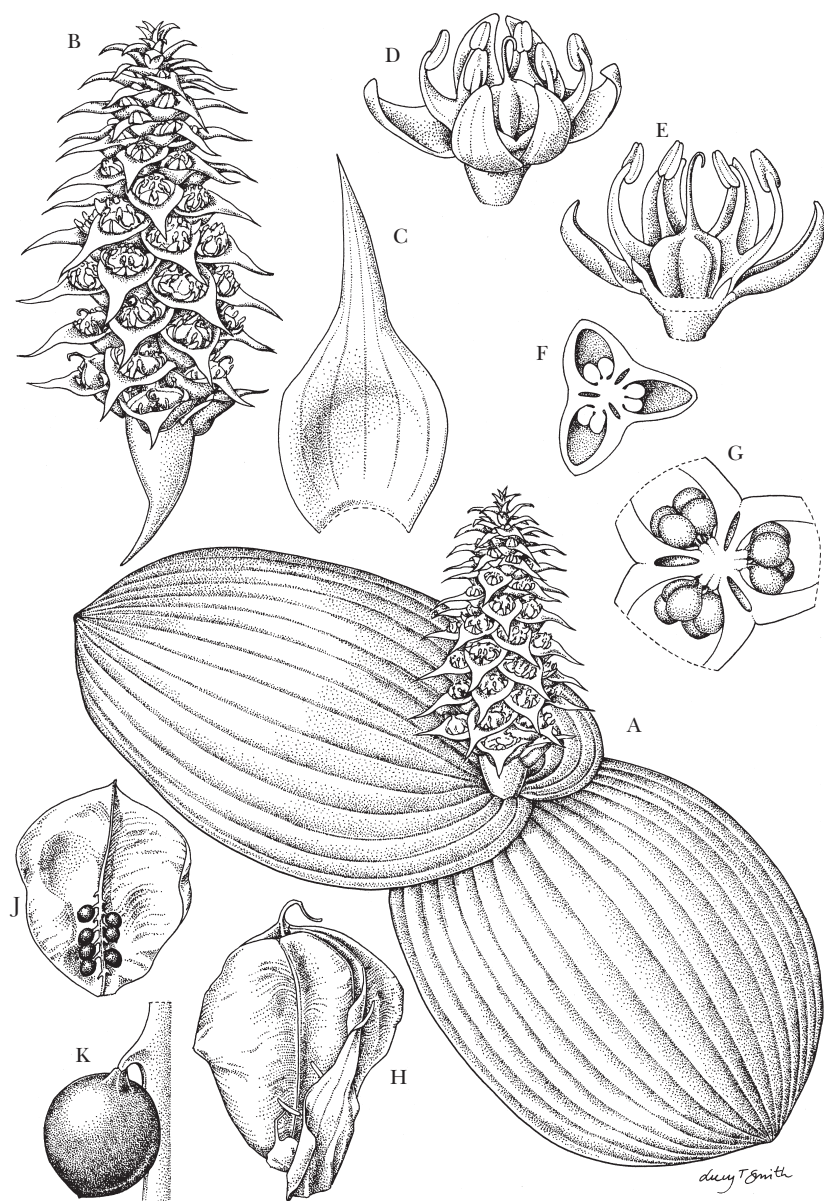


Fig. 1. **Massonia bifolia**. A, whole plant, $\times \frac{1}{3}$; B, inflorescence, $\times \frac{1}{2}$; C, bract, $\times 1.5$; D, flower, $\times 1.5$; E, flower with 2 perianth segments and stamens removed, $\times 1.5$; F, t.s. ovary, $\times 3$; G, t.s. ovary, showing immature ovules, $\times 6$; H, ripe capsule, $\times 1$; I, ripe capsule showing seeds, $\times 1$; J, ripe capsule showing seeds, $\times 1$; K, seed, $\times 7$. Drawn by Lucy Smith from plants grown at Kew.

et al., 2004). In this circumscription, *Massonia* now comprises some 10 species, defined by the membranous outer bulb tunics, pair of prostrate leaves, low-flowering habit a very short or subterranean peduncle, conspicuous floral bracts, basally connate filaments, and papery, three-winged capsules (Manning *et al.*, 2004).

The Cape geophyte flora is distinguished by a prevalence of striking and highly unusual morphological and ecological features, many of them presumably adaptations to the semi-arid environment in which the group has diversified (Manning *et al.*, 2002). Several of these are developed in *Massonia*, including the prostrate leaves, which may play a role in maximising photosynthesis at the low temperatures and low incident angle of sunlight that characterise the winter growing season at these moderate latitudes. Adaptation for dispersal of the seeds by wind is another common ecological characteristic, and the large, persistent bracts and winged, papery capsules in the genus assist in this strategy. Unusual pollination systems are not uncommon among Cape bulbs, and pollination by terrestrial rodents is one of the most interesting of these. It has been demonstrated in several species of *Colchicum* L. and in *Massonia depressa* Houtt. (Johnson *et al.*, 2001), and we postulated that the shallow, sour-smelling flowers of *M. bifolia*, borne close to the grounds, were similarly adapted for this strategy (Manning *et al.*, 2002). This has now been confirmed (Wester *et al.*, 2009; Wester, 2011), and *M. bifolia* joins the small group of Cape bulbs that are adapted to pollination by these small mammals. Other features of this strategy, found in both species of *Massonia* with this pollination system, include firm-textured flowers and the production of viscous, sticky nectar. Pollination of *M. bifolia* in the Cedarberg Mountains is accomplished largely through the activities of Namaqua Rock Mice (*Aethomys namaquensis*) (Order Rodentia: Muridae) but occasional visits by the evolutionary distant Cape Rock Elephant-shrews (*Elephantulus edwardii*) (Order Macroscelidea: Macroscelididae) have also been recorded.

CULTIVATION. Plants of *Massonia bifolia* break dormancy in autumn, growing and flowering through the winter and spring before re-entering dormancy for the summer. Seeds should be sown in autumn when day temperatures are about 22°C and the nights about 10°C. A day–night temperature fluctuation of $\pm 12^\circ\text{C}$ is required to break seed dormancy. Sow the seeds in plastic pots in a free-draining soil

mix and keep them moist. We recommend four to five parts good quality potting mix, one part coarse grit, one part good quality sand and a small amount of well rotted manure.

Keep the seedlings moist through the winter and spring, and dry them off for the summer. Pots should be kept under glass if necessary – they should not freeze and may require 50% shade in summer. In habitat the plants grow in deep shade in the protection of rocks. After the first or second year of growth, once the bulbs are big enough to handle, pot them up into a larger container, in the same well-drained soil mix. The plants can be fed while in growth, using a fertiliser low in nitrogen.

Massonia bifolia (Jacq.) J. C. Manning & Goldblatt, *Edinb. J. Bot.* 60: 564 (2004).

Eucomis bifolia Jacq., *Collectanea* 4: 215 (1791). Type: South Africa, without locality or collector, illustration in *Icones Plantarum Rariorum* 2: t. 449, lectotype designated by Jessop, *Jl. S. Afr. Bot.* 42: 433 (1976).

Basilaea bifolia (Jacq.) Poir., *Encyc. Suppl.* 1: 591 (1811).

Whiteheadia bifolia (Jacq.) Baker, *J. Linn. Soc., Bot.* 13: 226 (1873).

Melanthium massoniifolium Andr. [as '*massoniaefolium*'], *Bot. Rep.* 6: t. 368 (1804). South Africa, Cape, without precise locality or collector, 'in the Hibbertian collection' (no specimen located); illustration in Andrews, *The Botanists' Repository* 6: t. 368 (1804), lectotype, here designated.

Whiteheadia latifolia Harv., *Gen. S. A. Pl.*, ed. 2.: 396 (1868). Type: South Africa, [Northern Cape], Namaqualand, Modderfontein, *Whitehouse s.n.* (holotype TCD).

DESCRIPTION. *Bulbous perennial*; bulb subglobose, 2–3 cm diameter; outer tunics papery, pale brown. *Leaves* 2, prostrate, elliptical to suborbicular, 8–22 × 5–17 cm, subsucculent and fragile, pale green, veins impressed, clasping at base. *Inflorescence* a stout, conical spike borne at ground level, 3–11 cm long, the peduncle scarcely protruding, tapering below; floral bracts spreading or apically decurved, broadly ovate, acuminate or attenuate, (15)20–40 × 8–20 mm, concave or cupped, subsucculent, green, persisting in fruit, the uppermost bracts sterile and forming a small or conspicuous coma. *Flowers* subsessile, shallowly campanulate, pale green, sour-scented; pedicel stout, short, up to ± 3 mm long; perianth tube cup-shaped, 4–7 mm long; tepals ascending, ovate, 6–9 × 4–6 mm. *Stamens* adnate to the base of the tepals, whitish; filaments erect-incurved, connate basally for 1–2 mm, free parts awl-shaped and 6–7 mm long; anthers 2.5–3.5 mm long, creamy yellow. *Ovary* obtriangular or obovoid, 3–5 × 3–6 mm, green; style ± arcuate, 4–5 mm long. *Capsule* broadly obovoid-subglobose or obtriangular, three-winged, papery, 1.5–2.5 cm diameter, surrounded at first by persistent, papery perianth. *Seeds* globose, ± 2 mm diameter, glossy black.

DISTRIBUTION. Western southern Africa, ranging from southern Namibia through the higher-lying parts of northern and central Namaqualand to the northern Cedarberg Mountains near Clanwilliam in South Africa.

HABITAT. The species is always found in humic pockets in sheltered rocky sites that are locally moist during the winter growing season and that offer shade and protection from the sun throughout the year.

FLOWERING TIME. Winter and early spring (June to August in the southern Hemisphere).

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