

Notes on African plants

VARIOUS AUTHORS

IRIDACEAE

ARISTEA NIGRESCENS (SUBGENUS *PSEUDARISTEA*). A NEW SPECIES FROM WESTERN CAPE, SOUTH AFRICA WITH A NOVEL STRATEGY FOR POLLINATOR ATTRACTION

INTRODUCTION

Aristea Aiton comprises ± 50 species of evergreen, rhizomatous perennials distributed through sub-Saharan Africa as far north as Ethiopia and Senegal, with seven species in Madagascar (Manning *et al.* 2002). The genus is especially diverse in the Cape Floral Region, where some 33 species are recorded. Recent advances in our understanding of morphology and relationships among the species have led to the recognition of three subgenera based on differences in fruit, seed and pollen (Goldblatt & Le Thomas 1997; Goldblatt *et al.* 2004). In contrast, the flowers of most species are very similar in form and colour, displaying little of the remarkable variability that is associated with other genera of African Iridaceae. With few exceptions, flowers of *Aristea* are rotate, uniformly deep blue, and fugacious, lasting a single morning. Significant exceptions are many species of subgenus *Pseudaristea* Pax, which is characterized by a relatively high degree of floral diversification. Subgenus *Pseudaristea* is endemic to the southwestern Cape, and is well defined by several vegetative and floral characters. The inflorescences are sessile, with large rhipidial spathes concealing the flower buds, and the ovaries are elongate and subcylindrical, maturing into elongate, 3-lobed capsules that can measure more than 80 mm long. These are thick-walled and slow to dry, remaining closed for up to a year in some species, only releasing the seeds gradually over an extended period. The distinctive seeds are triangular-columnar in shape with obliquely truncate ends, and are shortly fringed or papillate along the angles. Florally, the subgenus is characterized by prominent, deeply fringed stigma lobes, and dizonosulcate pollen that is unique for the entire Iridaceae.

Unlike other species of *Aristea*, which are pollinated by pollen-collecting bees, most species of subgenus *Pseudaristea* have developed highly specialized pollination systems, relying primarily on hopliines, or monkey beetles (Scarabaeidae: Hopliini) (Goldblatt & Manning 1997). This unusual pollination system, which is well developed in lowland habitats in the southwestern Cape, is often associated with the evolution of highly localized endemic plant species. Beetle-pollinated members of subgenus *Pseudaristea* are no exception, and the ranges of most species extend little more than 50 km and may be substantially smaller than that. The local nature of the species and their small population size puts them at high risk of extinction. In addition, the pyrophilic nature of many of the species, which flower only in the spring following a burn, means that they are rarely seen. This has led to several species being overlooked for decades or

even centuries despite their proximity to well-populated areas (Goldblatt & Manning 1997). Currently, nine species are recognized in subgenus *Pseudaristea* (Manning *et al.* 2002; Goldblatt *et al.* 2005). Three of these have been described during the past decade (Goldblatt & Manning 1997; Goldblatt *et al.* 2005), all of them from well-botanized areas near large towns. The new species *Aristea nigrescens*, described here, is another example, and increases the number of species in the subgenus to ten. The species is extremely vulnerable to extinction through transformation of the habitat to agriculture.

Aristea nigrescens J.C.Manning & Goldblatt, sp. nov.

Plantae (100–)200–300(–500) mm altae vivaceis caespitosis, foliis linearibus 3–5 mm latis, caule angulato simplex vel raro uniramoso, inflorescentia terminali 4–6-flora, spathis late lanceolatis infra viridibus supra siccis brunneisque (10–)12–15 mm longis, floribus albis vel caeruleis, tepalis externis partim nigris nitidisque, tepalis patentibus oblique obovato-spathulatis subaequalibus vel interioribus leviter latioribus (20–)25–35 \times 13–14 mm, filamentis 5–7 mm longis, antheris 6–7 mm longis, ovario cylindrico \pm 10 mm longo, stylo 12–15 mm longo ecentrico, capsulis pedicellis ad 12 mm longis, cylindricis 40–50 mm longis.

TYPE.—Western Cape, 3319 (Worcester): Wolseley, Farm Romansrivier, southwestern slopes of hill above dam behind farmhouse, alluvium, (–AC), 2 September 2006, J. Manning 3054 (NBG, holo.; K, MO, iso.).

Plants (100–)200–300(–500) mm high, evergreen, tussock-forming. *Stem* erect, angled to slightly winged, bearing two or three short, reduced leaves, simple or rarely with one axillary rhipidium. *Leaves* in a basal fan, linear, one third to \pm half as long as stem, loosely twisted, 3–5 mm wide. *Inflorescence*: rhipidia, terminal or lateral, if present sessile, in axil of uppermost stem leaf, 4–6-flowered; rhipidial spathes paired, broadly lanceolate, (10–)12–15 mm long, acute, green at base but dry and papery brown in distal two thirds with paler margins, sometimes irregularly torn; floral bracts 5–7 mm long, entirely dry and papery. *Flowers* shortly pedicellate, pedicels \pm 1.5 mm long, actinomorphic with style eccentric, upright, white or pale to mid-blue but paler in centre, outer tepals partially glossy blackish on reverse, lasting one day, opening mid-morning \pm 10:00 and fading in afternoon \pm 17:00; tepals spreading, obliquely obovate-spathulate, cucullate, connate at base for \pm 1 mm, subequal or inner slightly broader, (20–)25–35 \times 13–14 mm.



FIGURE 1.—*Aristea nigrescens*, Manning 3054. A, flowering stems and base of plant; B, fruiting stem. Scale bar: A, B, 10 mm. Artist: John Manning.

Stamen filaments suberect, straight, 5–7 mm long, white to pale blue; anthers basifixed, 6–7 mm long before anthesis, yellow; pollen yellow, grains dizonasulcate, exine reticulate. *Ovary* cylindric, \pm 10 mm long, elongating rapidly after fertilization; style 12–15 mm long, white or flushed blue in distal half, dividing into three short, broad, fringed lobes 1.5–2.5 mm long. *Capsules* on pedicels up to 12 mm long, cylindric, 40–50 mm long, 3-lobed in transverse section. *Seeds* numerous per locule. *Flowering time*: late August to mid-September. Figure 1.

Distribution and ecology: a highly local endemic known from two sites along the foot of the Waaiohoek Mountains overlooking the Breede River near Wolseley in Western Cape (Figure 2). Plants flower only in the season following a summer burn. At the type locality, Romansrivier Farm, the species is still abundant, occurring in large numbers in a narrow ecological zone on ferricrete, or sandstone alluvium overlying Malmesbury shale. Most plants at this locality have pale blue flowers but flower colour through the population varies from white to mid-blue. The vegetation is transitional fynbos-renosterveld. A second population located on a neighbouring farm has been reduced to just a handful of plants through cultivation of the slopes for vineyards. Both plants seen at this locality had white flowers but the small sample makes it impossible to ascertain if this was typical of the entire population. It is likely that the species once occurred in a band all along the foothills of the Waaiohoek Mountains but much of the natural habitat has now disappeared under cultivation or silviculture and the species must therefore be considered to be highly endangered.

The species is adapted to pollination by hopliine beetles (Scarabidae: Hopliini), and we observed and captured individuals of two species, *Anisonyx ditus* and *A. ursus* as frequent visitors to the flowers, which open in the mid-morning at around 10:00 and fade in the early afternoon around 15:00. The beetles crawl over the flowers, become dusted with pollen in the process and subsequently transfer it to the stigma. In the post-fire environment, *Aristea nigrescens* flowers with several other beetle-pollinated species, including *Drosera cistiflora* (Droseraceae), *Moraia versicolor*, *M. villosa* and *Ixia viridiflora* (all Iridaceae). These species show the characteristics of flowers adapted to this pollination system, notably a brightly coloured, salver-shaped perianth with dark central markings that act as pollinator attractants. *Aristea nigrescens* is anomalous in lacking dark markings in the centre of the flower, either on the tepals or on the stamens, and only the underside of the outer tepals is flushed blackish. The dark underside of the tepals is highly visible in the buds surrounding the open flower and in older, withered flowers, however, and the form of the buds especially is highly reminiscent of the beetles themselves. The buds in *A. nigrescens* are well exposed above the spathes for several days prior to anthesis and thus quite visible among any open flowers. In other species in the subgenus the buds are concealed among the spathes and floral bracts until the morning of anthesis. In *A. nigrescens*, therefore, it appears that the function of pollinator attraction has been transferred from the mature flower to the buds and withered flowers, which

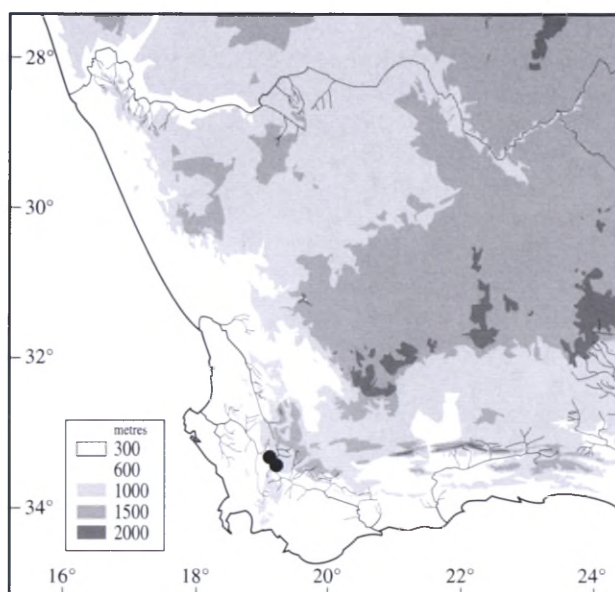


FIGURE 2.—Known distribution of *Aristea nigrescens*.

thus act as accessory pollinator attractants. The use of accessory structures for pollinator attraction has been identified in several southern African bird-pollinated taxa: floral buds and immature flowers function as accessory floral attractants in bird-pollinated species of *Melianthus* (Melianthaceae) (Linder *et al.* 2006), and in Iridaceae the inflorescence spathes in *Klattia* or the floral bracts in certain species of *Gladiolus* such as *G. abbreviatus* (Goldblatt *et al.* 1999) play a similar role. This is the first record, however, of secondary pollinator attraction among insect-pollinated members of the Iridaceae. A distinct indole-dominated fragrance was detected at anthesis in a single flower, fading within an hour or so, but investigation of several other stems failed to detect any scent and this remains an anomalous observation.

Diagnosis and relationships: *Aristea nigrescens* is characterized by unbranched stems bearing a solitary, terminal flower cluster, or very rarely with a single second cluster in the axis of the upper stem leaf; broadly lanceolate rhipidial spathes, (10–)12–15 mm long, that are papery brown in the distal two thirds; and by its large, white to blue flowers without dark markings. The underside of the outer tepals is flushed blackish and the buds thus appear dark. In its unbranched stems and broad, rather blunt rhipidial spathes, the species resembles *A. lugens* (L.f.) Steud. and it is likely that the two are allied. *Aristea lugens* is distinguished by its strongly dimorphic tepals, with the outer tepals \pm half as long as the inner and dark brown or black over most of the surface and strongly incurved, exposing both upper and lower surfaces. Thus *A. lugens*, like *A. nigrescens*, utilizes the underside of the tepals for pollinator attraction but, unlike the latter, only in the mature flower and not in bud. Other species in subgenus *Pseudaristea* typically have branched stems bearing several lateral flower clusters and smaller, acute or acuminate rhipidial spathes that are \pm entirely leathery and green.

Other material examined

WESTERN CAPE.—3319 (Worcester): Wolseley, Waaiohoek Road, Silver Leaf Mountain Vineyards, (–CB), 12 September 2006, J. Manning & P. Goldblatt 3055 (MO, NBG).

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