

A bouquet for the moth-plant (*Araujia hortorum*, Asclepiadaceae)

Rhys Gardner

Introduction

Introduced long ago as a garden plant, this South American weed has now scrambled its way over much of northern New Zealand, across waste ground, hedges, disturbed scrub and woodland, and, thanks to its plumose seeds, into native forest too. However (and I may be wrong about this) I believe that around urban Auckland the plant has begun to decline in abundance. I wonder whether its flowers are not being pollinated efficiently— certainly there are not so many feral honey-bees around nowadays, and, I think, not nearly so many moths either.

It seems a good time then to describe something of what I have learnt about the structure and function of its complicated flowers, as remarkable as those of any orchid but not nearly so well known. The plant's habit and some floral details are shown in Figs. 1–3.

Note that in New Zealand the moth-plant has sometimes been called *A. hortorum* and sometimes, *A. sericifera*. The former name is used here, in accord with current research (Anon. 2009).

Floral structure

The flower is typical of the order Gentianales in being pentamerous and radially symmetrical. The base of the corolla tube is bowl-like and bears the family's characteristic "corona", here seen as a set of five, broadly spatulate, deeply cupped, upwards-extending lobes. These spring off the corolla bowl but are aligned with the stamens and so are regarded as staminal outgrowths. The five, sessile stamens are in close contact with (but are not fused to) the central pentagonal "style head". The apex of this, at the top of the flower, bears two upwards-curving fleshy beaks. These are not the stigmas; in fact, the stigmas are not easily located, not even in the literature! It seems they might be mere minute slots or patches on the lower side of the style head, and presumably they alternate with the anthers. The superior bicarpellate ovary with its many seeds is concealed deep inside the expanded and fused-together bases of the stamens.

On the style head, at each of its five angles, is one of the most remarkable developments in flowering-

plant morphology: a little (0.66 mm long) dark brown, bullet-shaped structure, the "corpusculum". Extending down from the lower end of each corpusculum is a pair of pale yellow-green straps, the "retinacula". At first the lower tip of each retinaculum is free, but as the flower matures each becomes attached to an ovoid aggregation of pollen (a "pollinium"), the upper end of which is exposed slightly further down the flower, on the anther's adaxial side. The corpusculum and its retinacula are non-cellular — they are created by the hardening of chemical secretions in the appropriately placed parts of the style head's epidermis. The process was first described by the great botanist and microscopist Robert Brown (1810), who was acquainted with the earlier, not quite correct descriptions of the flower of this family, and who had the advantage of having collected and examined live representatives of several Australian genera.

In *Araujia* the corpuscula are tipped by a small cordate-discoid projection, which is like the retinacula in being fleshy-translucent. It is not always illustrated correctly, e.g., in Jessop and Toelken (1986, fig. 516) each projection is shown as a pair of hooks. This structure is not an invariable feature of the asclepiad corpusculum.

The apex of the anther, a broadly triangular membranous flap, is appressed to the side of the style head and partly covers the two flanking corpuscula. Laterally downwards the edges of the flap become thicker, yellowish and cartilaginous, and form a pair of radially directed wings. Each of the two wings of an anther lies parallel to the wing adjacent, so the result is a set of five dart-like structures, which extend down into the bowl of the corolla, just past the lower sides of the coronal lobes.

The very narrow slot between the wings of adjacent anthers is called, helpfully, a "guide rail". It is here that a pollinating insect will eventually place its proboscis or leg while probing for the nectar that accumulates (to only a moderate degree, in my observation) in the bowl of the corolla, around the base of the corona-lobes. A high-power examination of the guide rail shows that its edges are frayed into harsh little projections. These are directed apically,

Fig. 1. A: *Araujia* sp. Edwards' *Botanical Register* 21(1836) t. 1759, as *Physianthus albens*. Original colour illustration by Miss Sarah "Ducky" Drake. **B:** *Araujia hortorum* flower bud. B and D drawn from material collected in Auckland; no vouchers were kept. Scale bar 1 cm. **C:** Floral diagram for typical members of the Asclepiadaceae (ROG after Eichler 1875, fig. 137). Note the five anthers free from the central pentagonal "style head". Each of the latter's five apices bears a dark corpusculum, and a pair of retinacula connect these to the anthers' pollinia (cross-hatched). Note that the location of the stigmas is not shown; also, that the margins of the coronal lobes are curved towards the style head, whereas in *Araujia* they are curved outwards. **D:** *Araujia hortorum* flower cut across at midway up the style head (2.5 mm diam.), showing anthers and corpuscula.

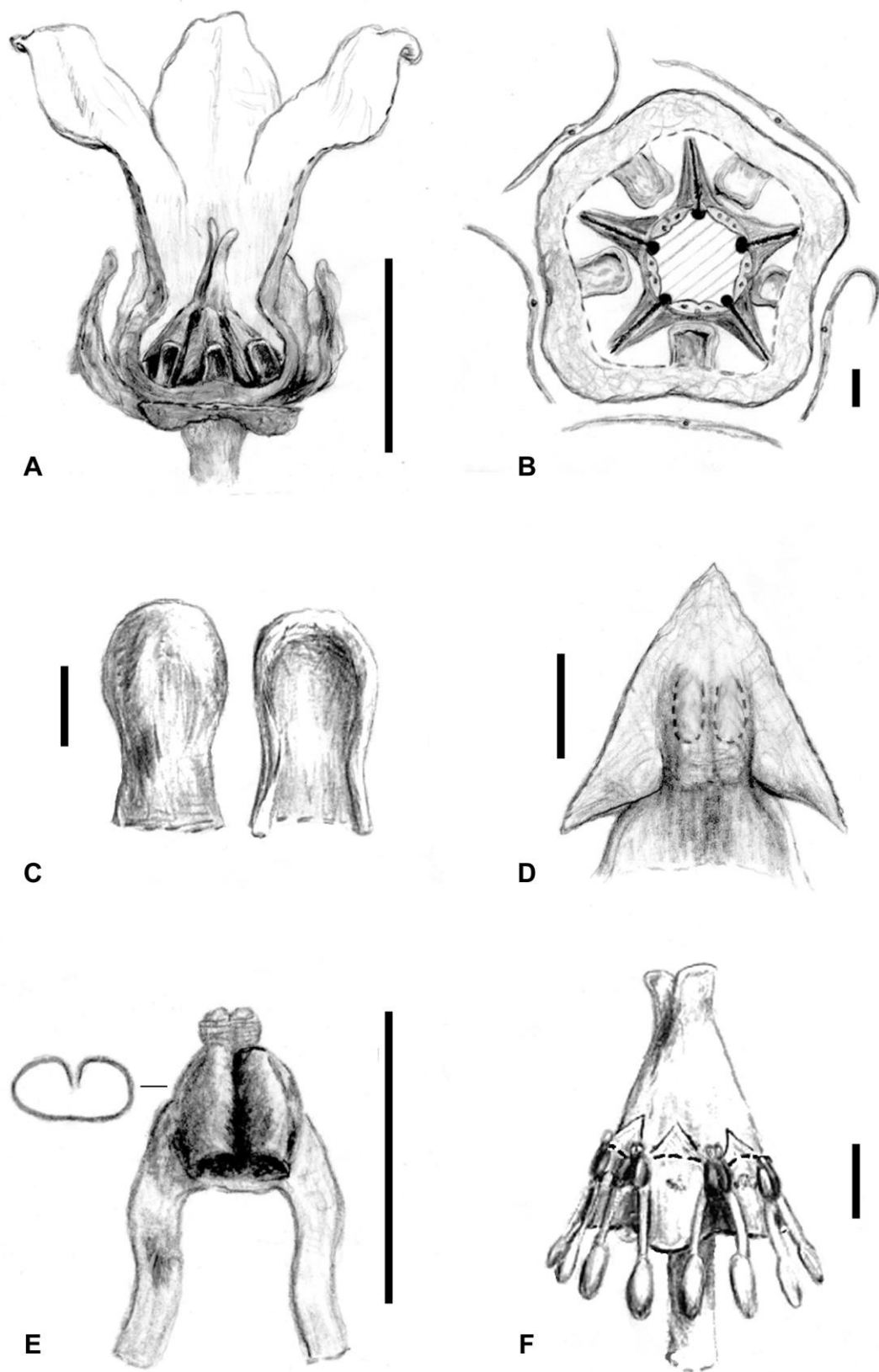


Fig. 2. *Araujia hortorum* floral details. Scale bar of A is 1 cm long; B–F, 1 mm. **A:** Flower, front sepal and part of corolla removed. **B:** Flower cut across at midway up style head (cf. Fig. 1D). **C:** Coronal lobe, adaxial (left) and abaxial (right) views. **D:** Anther, abaxial view: the position of the two adaxial pockets (each with a pollinium) is dashed. **E:** "Staminal apparatus": the corpusculum (cross-section to left), apically tipped by a cordate disc, laterally at base each side with a curved strap (retinaculum) that will attach to a pollinium. **F:** Style head, with the winged part of the anthers removed (below the dashed lines).

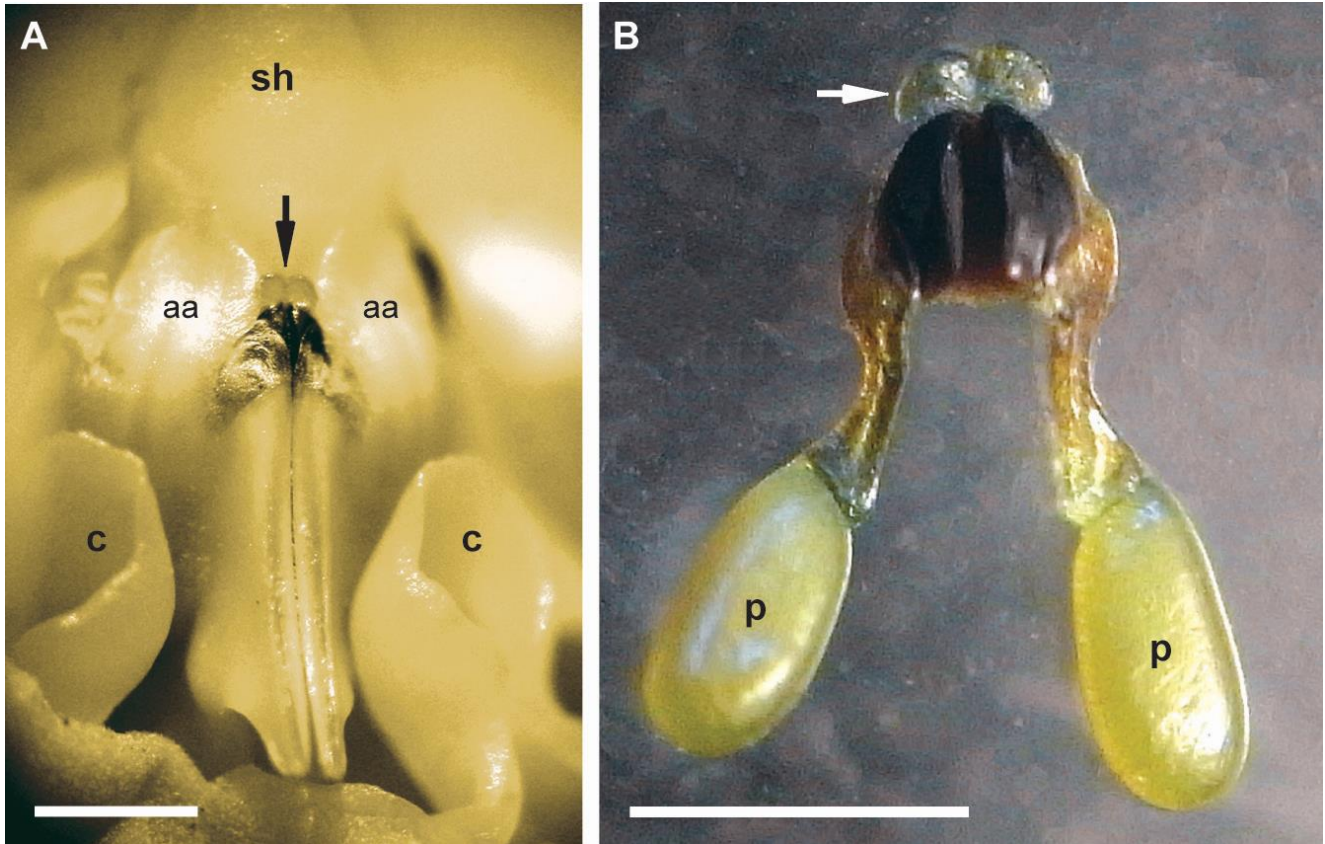


Fig. 3. *Araujia hortorum* floral details. **A:** Anther, side view. Showing style head (**sh**), membranous apex of anthers (**aa**), coronal lobes (**c**). The small cordate prolongation of the dark shiny corpusculum is arrowed. Scale bar 1 mm. **B:** Staminal apparatus, showing pollinia (**p**) and cordate top of the corpusculum (arrow). Scale bar 1 mm.

so hindering the insect's appendage from being withdrawn elsewhere than at the widening at the top of the guide rail, between the two retinacula. If all goes well, then, the male apparatus here — the corpusculum, retinacula and two pollinia — will be plucked out by the insect and will adhere to it long enough to be deposited on another flower. Coleman (1935) describes this series of events for the plant in Australia, noting visitations by moths, honey-bees and skipper butterflies.

The rest of the pollination process remains unclear to me. I do not know where on the style head insects usually deposit the pollen-bearing apparatus, nor whether cross-pollination might generally be required (Alan Esler thought it might; see Esler 2004). Perhaps these points can be resolved before the plant declines further and becomes just an urban legend.

References

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