The plume-grasses (*Dichelachne*, Poaceae)

Rhys Gardner

Introduction

The genus *Dichelachne* consists of about ten Australasian temperate-zone species. All are medium-sized perennial grasses of dry and infertile, lowland to montane grassland and open forest. They have a loosely tufted habit, membranous ligule, paniculate inflorescence, and long-awned, 1-flowered spikelets. The lemma is firm-textured and smooth to scabrid, and its awn, which is usually more than 1.5 cm long, is attached near the lemma's shortly bifid tip. It is the latter feature that gives the generic name (Gr. *dichelos* cleft, *achne* scale).

Dichelachne is a rather unexceptional member of its group (subtribe Agrostidinae), but in one respect it is unusual: so far as is known, all species have both "chasmogamous" spikelets, which open at anthesis, and "cleistogamous" ones, which remain closed and duly self-pollinate. There are no differences in stamen number between flower types, but the anthers of the cleistogamous florets are only about half the size of the chasmogamous ones. Edgar and Connor (2000: 262) note that the number of stamens varies from one to three in all our species except in *D. micrantha*, where one stamen is the invariable condition.

The recent Bot Soc trip to Waikumete Cemetery failed to locate its regional rarity *Dichelachne inaequiglumis*, a grass quite frequent there only a decade ago. It ought to be possible to set aside a few hectares of this large cemetery and manage it for *D. inaequiglumis* (and for *Deyeuxia* and *Rytidosperma* spp. too, which similarly thrive only in infertile soil). But in the longer term, "saving" these grasses in northern New Zealand would seem to require biological-control of weeds like agapanthus (*A. orientalis*), aristea (*Aristea ecklonii*) and ratstail grass (*Sporobolus africanus*).

Identification

The key below treats five of the six New Zealand dichelachnes (see Fig. 1), that is, it omits *D. lautumia*, a recently described endemic known only from a limestone quarry in Marlborough. Native status is given to *D. crinita* (at least in large part), *D. inaequiglumis* and *D. micrantha*, while *D. rara* and *D. sieberiana* are regarded as adventives from Australia.

Medium (herbarium-sheet) sized, and pretty when in flower, the plume-grasses have attracted collectors and taxonomists alike, and there are now detailed, broadly-based descriptions of the species in the grass Floras of New Zealand (Edgar & Connor 2000) and Australia (Simon et al. 2009). Nevertheless, there are some pitfalls in using these work's keys. For material in the early stages of flowering, the panicle's side-branches need to be examined closely in order to determine the arrangement of the spikelets. Care must be taken too if the inflorescence is an older one, because here the florets will be loosening from between the glumes, so changing the relative levels of the tips of the glumes and lemma, a crucial diagnostic feature.

The lemma in the New Zealand species is smooth to minutely scabrid except in *D. sieberiana*, where it is notably roughened. But it is never hairy, something to be kept in mind if the grass one might be trying to identify is in fact a species of *Austrostipa*, where a plumose-spicate inflorescence accompanied by long-awned spikelets can produce a fair resemblance to a robust dichelachne.

Key

1a Panicle dense and plume-like, the branches spikelet-bearing almost to their base; lower glume equalling or exceeding the lemma **2**

1b Panicle loose, at least the longer branches bare (i.e., not spikelet-bearing) at their base for 1 cm or more; lower glume mostly 4–5 mm long, exceeded by the lemma **4**

2a Awn 2.5 cm or more long, inserted 1.5–3 mm below lemma tip, the awn column straight, terete, not evidently twisted; lower glume ± equalling lemma and greater than 4 mm long ..... ***D. crinita***

2b Awn slightly less than 2 cm long, inserted less than 1 mm below lemma tip, its column evidently twisted at least once **3**

3a Lower glume usually less than 4 mm long, ± equalling lemma; florets always with just one anther ..... ***D. micrantha***

3b Lower glume greater than 4 mm long, clearly exceeding lemma; anthers 1–3 ..... ***D. rara***

4a Culm glabrous or scabridulous (especially just below the nodes); lemma minutely scabridulous (hardly evident at x 10); awn column only twisted once or twice, nearly straight ..... ***D. inaequiglumis***

4b Culm nodes surrounded byshort, pale patent-retrorse hairs;awn column tightly twisted several times and usually distinctly flexuous at least near attachment; lemma (at x 10)conspicuously tuberculate-scabrid ..... ***D. sieberiana***

Fig. 1. Spikelets of five *Dichelachne* species showing lower part of awn, with the level of attachment of awn indicated by arrows. [x 20 on A4 original]. Detached florets (silhouette), showing the full length of awn. [x 4 on A4 original]. Inflorescences (magnifications various; see Vouchers). [x 0.33 on A4 original] G1 = lower glume; G2 = upper glume; L = lemma. See Appendix for details of source material amd vouchers.

References
Edgar, E.; Connor, H. E. 2000: *Flora of New Zealand*. Vol. V, Gramineae. Manaaki Whenua Press, Lincoln, New Zealand.
Simon, B. K.; Weiller, C. M.; Kodela, P. G. 2009. *Dichelachne*. *Flora of Australia* 44A: 214–221. ABRS/CSIRO, Melbourne.

Appendix
Vouchers for inflorescences:
Dichelachne crinita AK 171983 Auckland City waterfront, infl. 12 cm long
Dichelachne inaequiglumis AK 234432 Wairere Road, Rodney, infl. 22 cm long
Dichelachne micrantha AK 340308 Norfolk Island, infl. 19 cm long
Dichelachne rara AK 306865 Pakatoa Island, infl. 13 cm long
Dichelachne sieberiana AK 295038 NW Nelson, infl. 16 cm long

Vouchers for spikelets and florets:
A, *D. crinita* AK 169212, Waitakeres
B, *D. inaequiglumis* AK 294700, Windy Ridge, Rodney Co.
C, *D. micrantha* AK 161350, Takatu Point
D, *D. rara* AK 1524, Auckland
E, *D. sieberiana* AK 278537, Whangaroa

Arrowroot (*Maranta arundinacea,* Marantaceae) on Norfolk Island

Rhys Gardner

This article concerns the original, West Indian "arrowroot", a name familiar from the biscuit but probably not from the plant itself, which is a slender, erect-stemmed monocot, the type species of a family confined to the New World tropics (Fig. 1). Thousands of years ago the Amerindians discovered that its "roots" (rhizomes) could be processed to give a fine-grained starch (composed of minute but distinctively shaped grains, a boon for archaeologists). This could be eaten, but for a long time seems to have been used mainly in medicine, as a poultice for drawing out infections and allaying fevers, and also, for negating arrow-poisons—something important in that part of the world, and hence the common name; see Appendix, Note 1.

From about the 18th century *M. arundinacea* entered world trade. The value of its very digestible starch to invalids, children and the old became well-recognized and made it a high-value commodity. Plantations were established in the West Indies, which were advanced technologically (because of their experience with sugar-cane) and thus could handle the intensive processing required. The market was good enough, however, to encourage the trial of arrowroot elsewhere in the hopeful 19th century colonial world, including the Pacific Ocean region.

For example, the Expositions of material wealth held in Melbourne and Sydney in the 1880s contained samples of arrowroot from Fiji, and, in planters' writings from there, arrowroot was regarded as a likely viable alternative to copra, bananas, cotton, tobacco, etc. (Horne 1881: 105, Reeve 1989, Mitchell 2009).

In the mid-19th century Norfolk Island too was growing arrowroot. Several things were in its favour: deep, fertile loam soils, a climate that was warm enough, and sufficient clean water for processing. The Melanesian Mission, established there in 1867, seems to have been a major producer: not only did it have numerous willing workers, but the work itself was of a familiar kind, since Melanesians and Polynesians had for centuries processed their own kind of 'arrowroot' (Pollock 1990), from the tubers of the Indo-Pacific monocot *Tacca leontopetaloides* (Taccaceae).

A paragraph from the diaries of Elizabeth Colenso (Appendix, Note 2) who assisted at the Mission in the late 19th C., gives a good idea of the scale there of arrowroot production. A hand-operated arrowroot-grinding machine of that era, now in the No. 10 Quality Row house of the Norfolk Island Museum, is shown in Fig. 2.