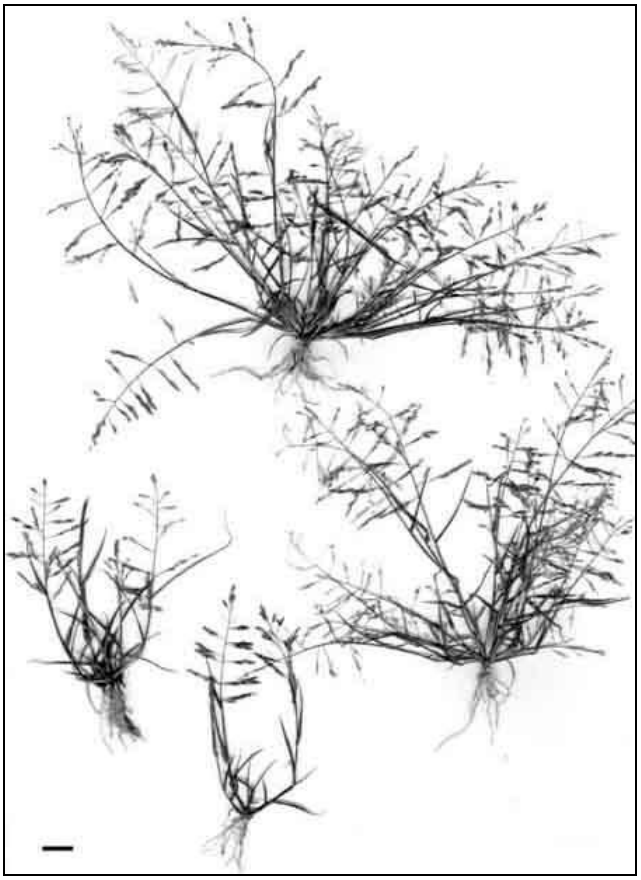

Fig. 1. *E. multicaulis.* Scan of flowering specimens. (scalebar = 1 cm). Figs. 1 & 2 from *ROG 11224* (AK), Kakamatua, collected 25 Dec 2013.

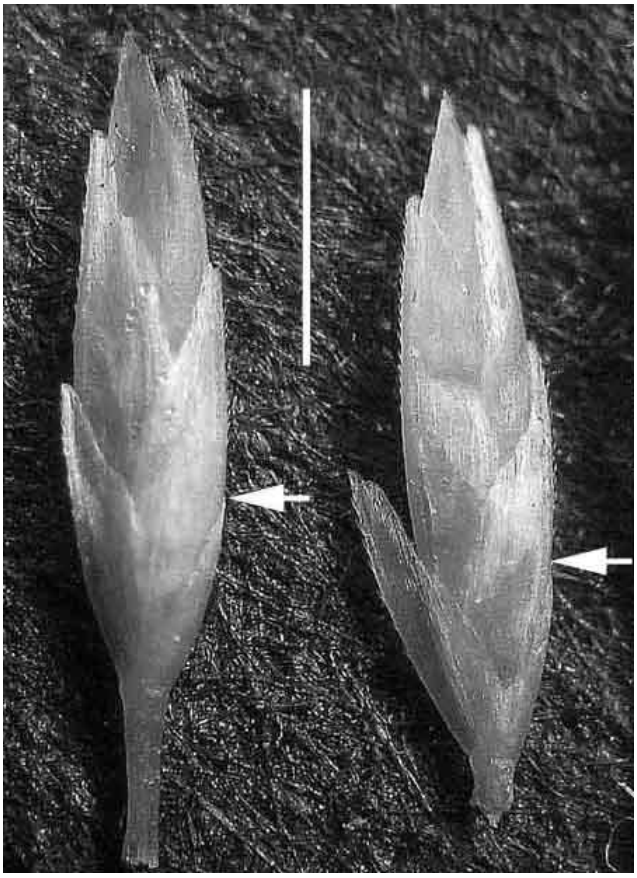

Fig. 2. Close-up of two pre-anthesis spikelets (scalebar 1 mm; arrow at right-hand side of each spikelet indicates top of lower glume).

November to early January. Helped in this way the second author found it this year further west from Kakamatua, in several places along the gravel verges (seaward side only) of the Huia Road as far as the Huia Store (AK 348104), and at one further station, just beyond Little Huia (AK 348106). In the opposite direction it was seen to have almost reached the Cornwallis turnoff (AK 348107). Further spread must be expected; Titirangi's cafe set is urged to keep an eye out for it and note especially any change in aggressiveness as it enters the urban zone.

References

Edgar, E.; Connor, H. E. 2010: Flora of New Zealand. Vol. V. 3rd edn. Manaaki Press, Lincoln.

Gardner, R. 2011: Collecting in the footsteps of another: an *Eragrostis* sp. (Gramineae) in the Waitakeres. *Auckland Botanical Society Journal* 66: 46.

Palmer, J.: Lazarides, M.; McCusker, A.; Weiler, C.M. 2005: *Eragrostis*. Flora of Australia 44B. ABRS/CSIRO Publishing, Melbourne.

Veldkamp, J. F. 2002: Revision of *Eragrostis* (Gramineae, Chloridoideae) in Malesia. *Blumea* 47: 157–204.

Sexuality of tawapou (*Planchonella costata*, Sapotaceae)

Rhys Gardner

Introduction

One of our rarer native trees, *Planchonella costata* is probably best known and admired for its beautifully coloured fruit. Its small pale flowers, which are not produced in any profusion, would usually be overlooked. Perhaps because of this disparity much remains to be learnt about how these flowers work. A recent account of the sexuality of some New Caledonian planchonellas (Mendez & Munzinger 2010) has been the stimulus for the very preliminary note here.

The older New Zealand literature contains nothing relevant, and we have to start from the material in two popular modern books. Moore & Irwin (1978: 116) say that the flowers of *P. costata* are "often

unisexual" and illustrate a "female flower" but no pollen-bearing ones. Dawson & Lucas (201l: 466) say that the flowers are "male and female on the same tree"; one of their photographs is of a female flower from above, while the other is a side-view impossible to classify.

Morphology and observations

A young tawapou tree (c. 15 years old; P.J. de Lange pers. comm.) on the verge at 16 Jesmond Terrace, Mt Albert, three others of similar age nearby at Mt Albert War Memorial Park ("Rocket Park"), and two somewhat older trees at One Tree Hill Domain and Cornwall Park, were examined this summer. Each tree was sampled just once, by more than 50 flowers, at different times from late December (when the earliest tree to flower, the Jesmond Tce one, had been flowering for several weeks) to the end of January.

The flowers, in the axils of the older leaves, are solitary or in few-flowered fascicles. The greenish yellow corolla, c. 3 mm in length and diameter, is barrel-shaped, that is, its lobes are nearly erect and recurve only at their somewhat frilly edges. As is often the case in the family the fertile stamens, if present, alternate with staminodes, each of which consists just of a filament. The ovary is superior and is densely covered most of the way above its base by long erect hairs. The tissue under these hairs is yellowish; it may be glandular, but I have never detected nectar (or scent) from these flowers (and thrips have been the only insect-visitors seen).

The three "Rocket Park" trees and the two "One Tree Hill/Cornwall Park" trees bore only female flowers. They were four-merous or, less often, five-merous. Their four or five vestigial stamens, which alternate with the staminodes, have a sterile flattened apex. Each ovary-locule contains an ovule.

The Jesmond Tce tree was different. Its flowers tended to be five-merous, and were morphologically bisexual, that is, the stamens had pollen-filled anthers (1 mm long) but the ovary was similar to that of the female flower.

I did not study floral development, but it is obvious that the opening of flowers of both kinds is preceded by a "protruded-stigma" stage, the minutely lobed and sometimes reddened stigma standing up to a millimeter beyond the tightly wrapped corolla lobes and the tightly appressed sepals. This stage probably lasts for some time, perhaps even as long as a week. It would be strange if this were not the time when cross-pollination takes place. (In the pollen-bearing flowers the anthers open at this stage, but pollen cannot get out and onto the stigma until the corolla begins to spread). (See also Appendix.)

It can be mentioned that the "male/hermaphrodite" Jesmond Tce tree bore almost-ripe fruit from last season's flowering.

Discussion

In their investigation of some New Caledonian planchonellas Mendez & Munzinger (2010) found that female and bisexual flowers occurred on the same individual. They claimed this as a "first record of gynomonoecy for the family" but have overlooked A. C. Smith's (1981, p. 746) statement about *Planchonella* in Fiji: "flowers hermaphrodite (but frequently female in the same inflorescence". Because Smith did not elaborate we have to assume this was not a new finding. I have not been able to trace it, but note that Smith mentions in his references the scholarly monographs on the Sapotaceae by (French botanist !) Charles Baehni, while Mendez and Munzinger do not.

Secondly, although Mendez & Munzinger made numerous measurements (of flower size, correlation of sexuality with position on shoot, etc.) they did not establish, by observation or experiment, that pollen-bearing flowers actually are capable of developing into fruit — they only state (loc. cit. p. 71) that "cryptic dioecy [sic] is ... unlikely because the gynoecia of [pollen-bearing] flowers were well-developed and even heavier than those of female flowers". My own observations on the relatively short time that pollen-bearing flowers stay on the tawapou twig suggest the contrary, that (admittedly, perhaps just under conditions of a low incidence of cross-pollination) these flowers act primarily as males — cf. my findings that five out of six so-called "gynodioecious" native trees are effectively dioecious (Gardner 2011).

In fact, the observations reported here on the six tawapou individuals do not confirm the gynomonoecious condition. One might suppose that the sampling was too limited — possibly year-to-year variation in abundance of flower types on a single tree occurs. All people with an accessible tawapou tree are urged to carry out the relevant tagging and pollination experiments

References

Dawson, J.; Lucas, R. 2011: *New Zealand native trees*. Craig Potton Publishing, Nelson.

Gardner, R. O. 2011: Sex ratios of some trees native to New Zealand. *Auckland Botanical Society Journal* 66: 151–155.

Mendez, M.; Muntzinger, J. 2010: *Planchonella*, first record of gynomonoecy for the family Sapotaceae. *Plant Systematics and Evolution* 287: 65–73.

Smith, A.C. 1981. *Flora Vitiensis Nova*. Vol. 2. Pacific Tropical Botanical Garden, Hawaii.

Appendix

The following extract, a piece of nature study from an old Indian Flora (P. F. Fyson, *The flora of the Nilgiri Hills and Pulney hill-tops*, 1914, p. 270), concerns the pollination of an Indian representative of the family, *Planchonella tomentosa* (now *Xantolis tomentosa*):

"The buds point down at about half a right angle, with the style protruding and always curled upwards. The stigma appears to be receptive at an early stage, though more so later on. When the flower opens the petals spread widely, with the anthers that have already dehisced, pressed up against them by their stiff filaments. The staminodes are curled inwards with rounded backs and tips curved up against the style, so covering the nectariferous disc. This latter is usually dry but if stimulated by the contact of a bristle becomes wet with a copious exudation of honey. An insect visiting the flower for honey would have to hang on to the flower and in probing for the narrow slits between the staminodes, by which alone access to the honey is possible, would shake the corolla and be dusted with pollen; the style being curved upwards out of the way would not receive this pollen. The flower closes again before dropping off, and autogamy would occur as the corolla and stamens fall off past the style."

Titan arum (*Amorphophallus titanum*) flowers in New Zealand for the first time

Ewen K. Cameron

Fig. 1. The local radio kept announcing the exciting news and c.10,000 visitors flocked to the Wintergarden in the Auckland Domain to see the first titan arum flowering in New Zealand on Sunday 1 Dec 2013. The queue double-looped around the courtyard between the two glasshouses. All photos by EKC.

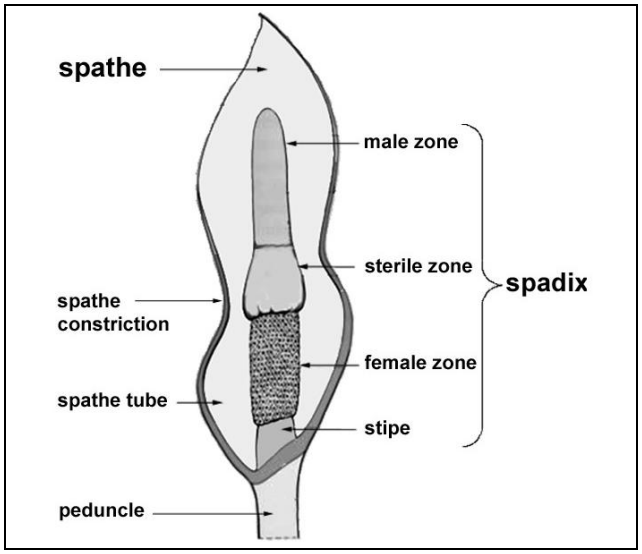

Fig. 2. A stylised diagram of an arum inflorescence (image improved by Joshua Salter).

On the 30 November 2013 a titan arum (*Amorphophallus titanum*) flowered in the Tropical House at the Wintergarden in the Auckland Domain, attracting large crowds (Fig. 1) as it was the first time this species has flowered in New Zealand. It belongs to the arum family (Araceae) and the 'flower' as such is not a single flower, but a cluster of flowers – an inflorescence. The central fleshy spike, the spadix, has a zone of male flowers and below them a separate zone of female flowers; the spadix is wrapped in a leaf-like bract, the spathe, which is open above allowing pollination (Fig. 2). Well-known cultivated members of the family include philodendrons (*Philodendron*) and calla or arum lilies (*Zantedeschia*). The name titan arum was coined by David Attenborough during the filming of the *Private Life of Plants* series (1995). Titan arum is often considered the largest inflorescence of herbaceous plants (cf. the palm genus *Corypha*) but *Amorphophallus gigas* is alleged to be taller (Mabberley 2008).

The titan arum was discovered and described in a different genus (*Conophallus*) in 1878 by the Italian botanist Odoardo Beccari and transferred to *Amorphophallus* the following year. There are about 150 species in the genus *Amorphophallus* occurring in the Old World tropics (Mabberley 2008). A translation of the scientific name:

amorphous (Greek) – shapeless or deformed
phallus – penis (referring to the spadix)
titanius – very large

Titan arum is native to the tropical rainforests of Sumatra (Indonesia) and is locally known as *bunga bangkai*, roughly translated as 'corpse flower'. It is