Mosses of the Onehunga Springs

Jessica E. Beever

Two botanically interesting wetlands are found associated with springs in Onehunga, at Bycroft's Springs and Captain Springs Reserve. Their history and vascular plant vegetation are described in the accompanying article by Rhys Gardner (Gardner, 1994), and the present article deals with their mosses.

Early collections of aquatic mosses were made in the area by Auckland Museum botanist T. F. Cheeseman. There is an undated specimen of *Fissidens berteroi* in the Cheeseman Herbarium at Auckland Museum, labelled 'Onehunga Springs', together with a specimen of *Amblystegium riparium* collected by him in April 1882 from 'bogs at Onehunga', which may well be the same site. Although now highly modified, these wetlands support a significant moss flora, including the two species collected by Cheeseman.

At Captain Springs Reserve large humic mounds formed from the base of *Carex secta* clumps provide a substrate for a range of mosses. The highly humid atmosphere above the standing water of the swamp encourages luxuriant growth of *Stokesiella praelonga, Isopterygium minutirameum, Sematophyllum amoenum, Bryum billardierei* and *Amblystegium serpens.* Nearby, on the rough bark of crack willow (*Salix fragilis*), *Bryum billardierei, Rhynchostegium tenuifolium, Hypnum cupressiforme, Tortula princeps* and *T. papillosa*, grow as epiphytes. Towards the margins of this reserve, in shaded sites, a range of modified and artificial substrates are colonised by mosses. The robust *Fissidens taxifolius* and the very much smaller *F. pungens* and *F. exilis* are present on soil fill. Colonies of the xerophytic species *Tortula muralis, Ceratodon purpureus* and *Barbula convoluta* are growing on relatively dry concrete slabs, heaped up to form an embankment at the swamp margin, while the moisture-requiring *Trematodon suberectus* and *Bryum pseudotriquetrum* flourish on damp, silted concrete at the base of a wall. Out in the open two light-demanding species of *Bryum* were recorded on thin soil over concrete, *B. argenteum* and *B. dichotomum*, with *Barbula unguiculata* on bare soil nearby.

At Bycroft's Springs fast flowing spring water is present. The two aquatic species recorded by Cheeseman, *Fissidens berteroi* and *Amblystegium riparium*, are still present here. The former species, apparently rare in New Zealand, is found also in Australia and South America. Early records suggest it occurred in unmodified streams but present known New Zealand localities are highly modified. The species occurs in a range of water conditions. At Onehunga it is growing in oligotrophic spring water, but in the Wairarapa it is in streams running under road bridges which, although they rise in forest, cross farm-land before reaching the road and are undoubtedly much more eutrophic than is the Onehunga spring water. Another locality, recently found by Alastair Suren of the National Institute of Water and Atmospheric Research (NIWA), is Motions Creek, downstream of the Auckland Zoo, which must surely be a highly eutrophic waterway! The species has been grown successfully 'in captivity' by Tom Moss in Wellington and John Clayton and colleagues at NIWA, Hamilton, under low light and with no extra aeration. As for substrate, it grows luxuriantly on concrete, but also on natural rock and wood. In Britain the closely related *F. fontanus* is believed to have increased as more suitable substrates were provided with the building of locks and weirs, and that species 'appears to enjoy some pollution' (Jones, 1991). The apparent rarity of *F. berteroi* in New Zealand is thus something of a puzzle, but the destruction of natural habitats is not a likely explanation.

Although dominated today by exotic vascular plants, the swamp-land, at least at Captain Springs Reserve, is still 'native in character' (Gardner, 1994). Even for vascular plants it is not always easy to differentiate between native species and those that have been introduced to New Zealand (see for example Gardner, 1985) - for mosses this is even more difficult. There were fewer early collectors of bryophytes, so an absence of early records is an even less reliable indicator of a true absence, and as a general rule mosses distribute themselves much more readily than do vascular plants. Many species are cosmopolitan in their range, and these often have highly resistant spores (van Zanten, 1978), and hence could have been naturally dispersed. Thus the presence in New Zealand of species also found in Europe does not indicate that the moss is introduced, nor does the fact that it

may be found in disturbed habitats, since it may occur in similar habitats in its native land. Although most of the mosses found at the Onehunga Springs are considered to be native, several may be exotic, and these are discussed below.

Barbula convoluta was known by Sainsbury (1955) from two gatherings 'made from rock walls and pavements in Auckland', and he considered 'the habitat is obviously too artificial to justify its inclusion as an indigenous moss'. In Britain, however, where it is considered indigenous, the species is found on 'soil on waste ground, paths, in arable fields, crevices in footpaths, old buildings etc' (Smith, 1978) so its presence here in modified habitats does not necessarily preclude it being indigenous. While it is now known to be more widespread in New Zealand, this does not necessarily reflect recent spread, but perhaps just more collecting. The species reproduces both by spores (although perhaps not in New Zealand) and vegetative tubers.

Amblystegium serpens and *Ceratodon purpureus* are both widely distributed around the world, and could be introduced in New Zealand. However tests of spore viability from European material after desiccation, followed by rehydration and freezing at -30° C, showed that the spores are resistant to such treatment (van Zanten, 1978), and thus could have arrived in New Zealand by natural long distance dispersal.

Stokesiella praelonga is widespread in the Northern Hemisphere. Scott and Stone (1976) hedge their bets as to whether it is introduced in Australia, stating that 'it may be introduced,....at least in part of its range', but it has generally been accepted as indigenous to New Zealand (e.g. Martin, 1946). Although this is a common moss in lawns and rough grassland, capsules are very rare. They are however present in abundance on the plants at Captain Springs. Perhaps the continuously humid atmosphere of the swamp provides an ideal environment for the development of sex organs and subsequent fertilisation in this species.

Fissidens taxifolius seems to be a more certain candidate for an introduced moss (see Beever & Stone, 1992). Today it is a common species in northern New Zealand, vigorous in its growth and sometimes forming conspicuous sheets a square metre or more in extent, for example in the Auckland Domain and Ayr Street Reserve, Parnell. Capsules have not been found in New Zealand, and no male plants have been seen here, but the plants reproduce vigorously by vegetative means. Like *Barbula convoluta* they have tubers. The first known collection in New Zealand is very recent, in 1966, by John Linzey at Blockhouse Bay. It seems unlikely that the skilled collectors of last century, such as S. Berrgren, W. Colenso and J. D. Hooker, whose collections were all studied in Europe where it is a well known moss, as well as the more recent bryologists such as G.O.K. Sainsbury, K. W. Allison and W. Martin earlier this century could all have missed it, if it were as common as it is today.

Fissidens exilis is also likely to be an introduction, but is much less conspicuous. It was first recognised here by Tadashi Suzuki, a Japanese *Fissidens* specialist who collected it on the campus of Massey University in Palmerston North in 1984. Several other collections have since been made, on bare ground in disturbed habitats, but it is such a minute moss, with the gametophyte shoots only about 1.5 mm tall, that it is likely to be much more common than present records indicate. *Fissidens exilis* is similar to *F. tenellus*, with a serrate margin on the vaginant laminae, but the lamina cells are smooth. The leaves are broad, and the nerve fails several cells before the apex. Good illustrations are provided by Crum & Anderson (1981). New Zealand plants have a characteristic dark green colour, and persistent protonemata which form a dark green layer on the soil between the scattered plants.

Although small and highly modified, these vegetation remnants are valuable botanical sites in the midst of the Auckland conurbation.

Moss species list for Onehunga Springs

Moss names follow Beever, Allison & Child (1992)
* indicates that capsules were seen in February 1994.

J E Beever collection numbers for voucher specimens placed in the herbarium of Auckland Museum (AK) are given.

Amblystegium riparium 72-89
*Amblystegium serpens** 81-04a
Barbula convoluta 81-12b
Barbula unguiculata 81-21
Bryum argenteum 81-10a
Bryum billardierei var. *platyloma* 81-08
*Bryum dichotomum** 81-10b
Bryum pseudotriquetrum 80-99
Bryum sauteri 81-24
Ceratodon purpureus 81-23a
Dicranella sp. 81-11
*Eurhynchium muriculatum** 81-100
Fissidens berteroi 72-87a
Fissidens exilis Hedw.* 81-25a
*Fissidens pungens** 81-14, 81-25b
Fissidens taxifolius 81-01
Hypnum cupressiforme 81-15
*Isopterygium minutirameum** 81-05
Racopilum convolutaceum 81-13a
*Rhynchostegium tenuifolium** 81-16, 81-02, 81-13b
*Sematophyllum amoenum** 81-09
*Stokesiella praelonga** 80-96, 80-97
*Tortula muralis** 81-12a
Tortula papillosa 81-06
*Tortula princeps** 81-17
*Trematodon suberectus** 80-99a

References

Beever, J E; Allison, K W & Child, J (1992) The Mosses of New Zealand. University of Otago Press, Dunedin. 214pp.

Beever, J E & Stone I G (1992) Studies of *Fissidens* (Bryophyta: Musci) in New Zealand: *F. taxifolius* Hedw. and *F. integerrimus* Mitt. *New Zealand Journal of Botany 30:* 237-246.

Crum, H A & Anderson, L E (1981) Mosses of eastern North America. Columbia University Press, New York. 1328pp.

Gardner, R O (1985) Six plants whose nativity of New Zealand has been doubted. *Auckland Botanical Society Newsletter 40:* 41-44.

Gardner, R O (1994) Vascular Plants of the Onehunga Springs. *Auckland Botanical Society Journal Vol. 49 (2):* 69-71.

Jones, E W (1991) The changing bryophyte flora of Oxfordshire. *Journal of Bryology 16:* 513-549.

Martin, W (1946) Geographic range and internal distribution of the mosses indigenous to New Zealand. *Transactions of the Royal Society of New Zealand 76:* 162-184.

Sainsbury, G O K (1955) A Handbook of the New Zealand mosses. *Royal Society of New Zealand, Bulletin No. 5:* 1-490.

Scott, G A M & Stone, I G (1976) *The Mosses of Southern Australia.* Academic Press, London. 495pp.

Smith, A J E (1978) The Moss flora of Britain and Ireland. Cambridge University Press, Cambridge. 706pp.

van Zanten, B O (1978) Experimental studies on trans-oceanic long-range dispersal of moss spores in the Southern Hemisphere. *Journal of the Hattori Botanical Laboratory 44:* 455-482.

Acknowledgments

I am grateful to Tadashi Suzuki for introducing me to the fascination of 'micro-*Fissidens*', and for providing me with information on his New Zealand collections; also to Rhys Gardner, a stalwart field companion in difficult terrain.

Celmisia on Mt Pirongia, Western Waikato: some notes on its identity and taxonomy

P. J. de Lange

Cheeseman (1879) provided the first account of the indigenous vascular flora of Mt Pirongia (see de Lange, 1994 - this issue). In his paper he mentioned the peculiar fact that although *Celmisia gracilenta* was present on the hills near Whatawhata, and widespread to the south of the Mountain, it