

Growing New Zealand Mosses and Liverworts

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In 1964 I became interested in growing mosses, and in the following years built up a collection of British species. These are grown in flower pots in glass frames outdoors, on a variety of natural and semi-natural substrata, and watered intermittently (on average two or three times weekly) with rainwater from a pressure spray.

In 1971 I read Sainsbury's *Handbook of New Zealand Mosses*, describing what appeared to be one of the richest, most spectacular and distinctive moss floras in the world. Soon after I wrote to a number of cactus and alpine plant enthusiasts in New Zealand, some of whom sent material. About 20 species were revived, and most grew well. In 1974 B. van Zanten, a botanist of Gröningen in the Netherlands, wrote concerning his plans to visit New Zealand and New Guinea, and was persuaded to send live material of as many species as possible, both here and to Gröningen. Many of the plants mentioned are from his extensive collections, though a few have arrived more recently.

This introduction may explain the existence of such a collection in the hands of an amateur botanist in Britain. It has no scientific pretensions, but since there are many people in New Zealand with an interest in botany and horticulture, but few active students of the moss and liverwort flora, it is hoped this account of their cultivation will stimulate an interest in these plants, as well as introducing a fascinating and complex pastime.

The climate of Reading, in the mid Thames valley, seems similar to that of the drier parts of the South Island. January mean temperature is 4°C, July mean 17°C, rainfall 22 in. per annum. At latitude 51°N the days in December and January are darker than anywhere in New Zealand, which may inhibit moss growth at this time. Sulphur dioxide pollution is sufficient in the town to prevent the growth of all mosses on tree bark, but does not affect mosses in enclosed frames. Most of the New Zealand mosses seem adjusted to the change of scene, being unharmed by temperatures as low as -5°C, and growing through the year when temperatures are between 5°C and 20°C. The period of strongest growth, as with British material, is generally in spring.

With many mosses, especially the smaller ones, an appropriate substrate is essential. It may need to be organic (rotten wood, humus, peat) or inorganic (loam, rock), be of approximately suitable pH, and in many cases be of a certain texture (loam, clay, loose sand, soft porous rock). Fortunately the New Zealand plants, whose habitats are not familiar to me, do not seem in general very demanding in this respect. A large proportion are forest-floor species which grow well on leaf mould or rotten wood. Notable among these are some

umbrella mosses such as *Mniodendron dendroides*, and *Rhizogonium* spp., *Cyathophorum bulbosum*, *Camptochaete angustata*, *Ptychomnion aciculare*, and many hepatics, of which the most ubiquitous and vigorous are species of *Chiloscyphus* and *Lophocolea*.

Another group (though there is much overlap) are grown on neutral loam. Some are species of wet shaded banks, such as *Hypopterygium commutatum*, *H. novae-seelandiae*, *Fissidens asplenioides*, and many striking hepatics such as *Hymenophyton flabelatum*, *Pallavicinia connivens* and *Symphyogyna hymenophyllum*. Some forest plants have not shown a clear preference between soil and humus here, growing equally well (or badly) on either. They include *Eriopus brownii*, *Distichopyllum* spp., and *Schistochila appendiculata*.

Many plants of more exposed soil also grow here, though most happen to be from wet alpine habitats. They tolerate low humidity and sunshine if kept waterlogged and watered thoroughly. Notable are *Atrichum ligulatum*, *Philonotis tenuis* (an aggressive weed of wet sunny soil in cultures) *Conostomum pentastichum* (vigorous, but not developing a characteristic appearance) *Polytrichadelphus magellanicus*, and among hepatics, *Haplomitrium gibbsiae* (slow growing) *Treubia lacunosa*, *Jungermannia orbiculata*, and *Isotachis lyallii*.

Problems of substrate have arisen with *Dawsonia superba*, a plant of loose loam which died when planted in humus, and possibly with *Mielichhoferia australis*. A few plants of exposed acid peat from Tasmania include *Sphagnum falcatum*, *S. antarcticum* (det. A. Eddy) and *Pleurophascum grandiglobum* (regrettably sterile).

I have very few species of rock, but *Racomitrium crispulum*, *Grimmia trichophylla*, and two *Frullania* spp. appear to have come from exposed acid rock, and are here maintained on bare slate or granite. Like similar British cultures they grow only slowly.

The most important aspect of moss culture is the provision of a suitable watering programme. The nature of the substrate water content, the way in which water is applied, the humidity, and the incidence of drought can all be varied, and different plants need different combinations of these. Few mosses rely entirely on water in the substrate, absorbed and distributed inside the plant (the normal pattern in higher plants). For all the others overhead spraying is essential. A fine mist is sufficient to moisten the whole growing surface, but an occasional much heavier watering is needed to completely moisten tufts, to wash away algal growth and "lime" deposits, and to replace water lost by evaporation. At times this collection is watered daily, but it has been left for as long as three weeks unattended without harm. The water used should be free of chlorine and should not have come into contact with zinc or copper, to which many mosses are sensitive.

Different plants need different humidity conditions. Plants of wet exposed habitats are indifferent to humidity. Plants of permanently moist sheltered habitats are easily kept in a shaded, moist, enclosed

frame. There are many such plants from New Zealand here, especially hepatics such as *Bazzania* spp., *Plagiochila gigantea*, *Lepidozia microphylla*, *Trichocolea* spp. and others mentioned earlier. They are among the most vigorous and beautiful of all, though even a few minutes' exposure to sunshine or dry winds can damage them.

More problems are likely to occur with mosses of drier habitats, especially those of rock or tree bark. Attempts to keep *Frullania* spp. or *Papillaria crocea* on a wet substrate quickly spoil them, and it is impracticable to keep them growing by watering several times a day. There is a paradox, that the most drought-resistant species can only grow well if for long periods they are bathed in completely saturated air. One frame here contains a bowl of water warmed by a fish tank thermostat and heater. In the steam from this, even some pendent epiphytes make reasonable growth, including *Papillaria*, *Weymouthia mollis* and *Trachyloma planifolium*. The method of "planting" these is described presently.

The amount of water needed in the substrate also varies. A large proportion of the New Zealand material grows in waterlogged cultures. The pots are simply stood in plastic trays containing an inch or two of water. Many more need plenty of water in the substrate when growing, but are not inconvenienced if dried out for long periods. Plastic flower pots retain enough water for such plants to be in continuously damp soil in winter and during moist summer weather. Among such cultures with impeded drainage from New Zealand are *Bryum truncorum*, *Leucobryum candidum*, and strangely, two epiphytes, *Leptostomum macrocarpum* (very vigorous) and *Lepyrodon australis*.

However, for many species, especially epiphytes and plants of rocks, banks and dry soil, the water retained by a plastic pot seems harmful; they look unhappy, become overgrown, or are damaged by traces of "lime" on leaf or shoot tips. A clay pot allows a far greater water loss from the substrate by evaporation, and absorbs all but a very small part of the free water, except during spells of frequent heavy watering and high humidity. About half of all the cultures, and a quarter of the New Zealand ones, are grown in clay pots. Of these, most are pleurocarpous mosses such as *Thuidiopsis furfurosa*, *Lembophyllum clandestinum*, *Racomitrium strumiferum* and *R. robustum*, *Rhynchostegium* sp., and many similar species.

The almost total absence of acrocarpous mosses on well-drained soil here probably indicates that those who collected material for me did not collect much from dry soil habitats.

Some hepatics, especially in *Lejeunea* and related genera, seem especially sensitive with respect to drainage, growing naturally on bare sloping, vertical or overhanging surfaces. For these, and for many epiphytes (including most of those from New Zealand), I use cultures mounted on pieces of expanded polystyrene. The substrate (usually tree bark) is grated or crushed and pressed onto a piece of tile

covered with a spirit-based glue. The plant can then be glued on, or single shoots pressed into the tile surface.

Only a small proportion of more than a hundred cultures of mosses and hepatics from New Zealand have been mentioned. It is not clear to what extent, if any, the culture of these plants in Britain, however, extensive or successful, represents a useful addition to our knowledge about them. The methods described are not necessarily the best for the species concerned, and Ella Campbell has noted many differences between the conditions provided here, and those of their natural habitats. A similar collection in New Zealand would undoubtedly contribute more effectively to a study of their ecology and taxonomy, and even in the hands of an enthusiastic amateur, would probably arouse a lot of interest.

Names are given as in K. W. Allison and J. Child, *The Mosses of New Zealand*, and *The Liverworts of New Zealand*, or in a few cases as in Sainsbury's *Handbook of New Zealand Mosses*.

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Myosotis traversii, Mt St Patrick

Photo: Arthur Bates