

Collecting and Growing Sabah Rhododendrons

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Mt. Kinabalu, 13,455 feet, is a plant collector's paradise in Sabah (formerly known as North Borneo, now forms part of Malaysia), with its core of granite rising steeply from around 4,500 feet to a rocky plateau above 12,500 feet. For the reasonable active it is quite possible to do the climb to the summit in a day and a half following the south route and this was our schedule when my wife and I paid our first visit to the mountain in February 1958, shortly before my retirement from the Malayan Government Service. So fascinated were we by the montane plants that we revisited the area in January and February 1966, when we were permitted to do some selective plant collecting with a view to subsequent cultivation.

Dr. W. Meijer (1963), after Miss L. S. Gibbs (1914), has listed the following climatic zones and vegetational types from Mt. Kinabalu :

1. The hill zone, up to 3,000 feet.
2. The lower montane zone, 3,000 - 6,000 feet.
3. The upper montane zone, 6,000 - 10,000 feet.
4. The summit zone, 10,000 - 13,455 feet.

Rhododendrons are inconspicuous and quite local in the hill zone, home of many important timber and fruit trees, and this vegetation type was already familiar to us from life in Malaya. However, the lower montane zone became of immediate interest from the frequent occurrence on the forest floor of the bright poppy-red fallen corollas of the epiphytic form of *R. brookeanum*. In the mixed forests of oaks, chestnuts, figs, *Eugenia* and gymnosperms (*Agathis* and *Podocarpus*) this species seems to favour a tree crutch about 50-70 feet above ground. On Kinabalu, at least, the flower colour is usually poppy red (40D) or slightly paler. However, one particularly fine plant which we found growing on a huge granite boulder in the bed of a torrential tributary of the Mesilau East River had larger flowers of a deeper shade (40C), and we have named this F.C.C. clone 'Mandarin' (Allen, 1970). When we found this plant its single umbel carried 15 flowers : in cultivation it produced 13 flowers in December 1968 and 18 flowers in October - November 1969. In no case did we ever see a wild plant with more than one large flower head, but one clone has carried two in cultivation, the flower colour of this being a very pale vermilion. A third clone has also flowered with us, while a fourth, with somewhat atypical foliage, is healthy but has still to flower. It is intriguing to note that when this same species was first shown to the Society in 1869 - a century earlier - it was also awarded an F.C.C., to a form with somewhat smaller and fewer flowers of a beautiful yellow, tinged with pink, which was well illustrated in the *Botanical Magazine* (1856, t.4935).

R. brookeanum has a remarkably wide altitudinal range, having once been found in Singapore at sea level, whereas on Kinabalu we found it conspicuous between 4,000

and 5,000 feet. At one time a plant was in cultivation in the Botanic Gardens, Singapore (Holttum, 1939).

The upper montane zone, which may start as low as 5,300 feet on some ridges, is characterised by the so-called moss or elfin forest, where branches of trees and shrubs are thickly clothed with epiphytic mosses, liverworts, club-mosses, ferns, orchids and even algae. Filmy ferns are very common and pitcher plants (*Nepenthes*) frequent, so it is not unexpected that this is also the cloud zone, where mists and dripping rain are of almost daily occurrence. It was here that we found *R. brookeanum gracile* in conspicuous groups - a small upright shrub, commonly 5-8 feet tall, growing in the shade of taller trees with, in the forest, only 3 to 5 golden-yellow, waxy-textured flowers with a delicious but fleeting lemon scent. On Kinabalu these two varieties are so very distinct that I feel sure we are not the first field botanists to have taken them for different species. I am grateful to Dr. H. Sleumer for naming our cultivated plants. Our single plant of var. *gracile* is less vigorous than the epiphyte but it has now flowered twice - in April 1969 (10 flowers) and April 1970 (7 flowers), the second umbel being on a weak side shoot. The different flowering seasons of the two varieties in cultivation are puzzling.

The very distinct *R. stenophyllum* was quite common on ridges in the same zone. Its orange-red flowers, from one to three per head, are somewhat too small to be of garden value but the narrow leaves, 3 in. long and 1/6 in. or less across, are guaranteed to puzzle the non-botanist. Only one of our two plants has survived : the second, although well established, failed its first hardiness test when plunged outside. It seems to flower regularly and, if propagation proves to be easy, it should become popular in botanic gardens.

In the same zone, but somewhat more locally, we found *R. fallacinum* in full flower in February 1958 but none was seen or collected in 1966. This species has beautiful coppery orange flowers and broadly ovate, sessile leaves shining golden from the thickly clustered scales which are persistent on the lower surfaces. Our very limited observations suggest that it may not be very free flowering in the forest.

At least on Kinabalu *R. orbiculatum* seemed to us to be even more local and we found it in flower at only one site. It was here growing semi-epiphytically, close to the crest of a precipitous ridge in shady moss forest on the east side of the deep ravine formed by the Mesilau East River. The root zone consisted of reddish-brown peat and the stems grew out horizontally, with very long internodes, until the growing tips found more light, the internodes shortened and a single terminal umbel was produced with 20 or more pure white, tubular flowers, strongly jasmine scented and with remarkable pink stems. We later discovered (Sleumer) that this was close to the upper limit of its altitudinal range as it occurs elsewhere down to 2,700 feet. In Sarawak and Brunei Sleumer has described it as being generally terrestrial on bare sandstone rocks in low scrub so it is clearly a very adaptable species and this accounts for our finding it amenable in cultivation. In good light it grows quite compactly and it has proved to be free flowering. Our best clone, 'Painted Snipe' (A.M.), first flowered in May 1968, again in May 1969 and - as I write - has produced ten flowering heads in two flushes during May 1970. The flowers last about three weeks, during which time both pedicels and styles elongate and the scent becomes less strong.

We have three other seedlings of *R. orbiculatum* in cultivation but one of these, which is at least as vigorous as 'Painted Snipe', has always suffered from severe foliage chlorosis. Furthermore a rooted cutting from this clone suffers equally from chlorosis and we have not yet found a remedy for this complaint. Of the other two clones one has flowered while the second is healthy but slow growing.

A single seedling of *R. crassifolium*, collected from about 6,000 feet, has grown steadily and flowered first in July-August, 1969. The small head of orange flowers made a poor show against its bold javanicum-type foliage and we think that it has little horticultural value.

We collected many seedlings of the small leaved *R. quadrasianum* alongside the main ridge path to the summit. Its tiny reddish flowers are in proportion to the small plant size so we were disappointed when none survived our treatment. However, one other small leaved seedling, with deeply impressed veins and a glossy upper leaf surface, has always looked healthy. After the last re-potting it has grown away strongly, the leaves are now much larger, and Dr. Sleumer has been able to identify it with certainty as *R. maxwellii*. He has described it as rather rare and we look forward to its first flowering. From the description it sounds a most ornamental species.

A very exciting small epiphyte, of which we found only the one specimen, was *R. polyanthemum*. This was covered with small coppery orange, funnel-shaped, strongly fragrant flowers. It would make an ideal plant for a hanging basket. This species was quite new to us so we took only sufficient material for two herbarium specimens. To our great regret we were unable to find any seedlings and, not knowing how rare it might be, I was naturally reluctant to collect the entire plant. Had I known at the time how easily these *Vireya* rhododendrons root from small cuttings we would probably have been able to establish it by such means.

R. malayanum was found, in flower, in the same tree as *R. polyanthemum*. We were familiar with this species at Cameron Highlands, Malaya, in the same altitudinal range of 5,000-6,000 feet. It is the type species of Sleumer's sub-section *Malayovireya*, in which the leaves are very densely scaly, the scales of two sizes and the scale centres markedly darker than the margins. Flower colour is very variable in *R. malayanum* but the flower size is probably a little too small to be of horticultural value.

At about 10,000 feet two very fine species are conspicuous. The smaller plant, *R. acuminatum*, has small elliptic-ovate leaves, very stiff in texture and bullate (deeply puckered). They are dark with rusty brown dense scales of the *Malayovireya* type. The downy young shoots are silver grey at first, soon becoming brown and very attractive. One plant photographed in 1958 carried four flower trusses when only 20 in. tall but it grows more leggy in shade. The deep pink tubular flowers hang downwards like those of *R. cinnabarinum*. This species has proved easy to cultivate but has not yet flowered. Perhaps our minimum glasshouse temperature of 10 degrees C (50F) is a little too high for flower initiation.

The other very remarkable species at this altitude is *R. lowii*, a most striking plant. We found it common only from 9,600 to 10,000 feet, where it occurs as a massive, thick-stemmed epiphyte with very short internodes. Local observers seem to have

confused it with the yellow-flowered *R. brookeanum gracile* but *R. lowii* has much broader and flatter leaves which are less acutely pointed. Its tree hosts are dwarfed and often leaning at this altitude so it is easy to observe and sometimes grows almost at ground level. The very large flower heads, each with 15-17 waxy, funnel-shaped flowers are orange yellow, flushed apricot and very strongly scented. We collected only very small seedlings and these proved difficult to manage and painfully slow growing. However, three healthy plants have survived and these are at last growing well. During periods of active growth it seems important to keep day temperatures down and humidity high in order to prevent the bud scales from sticking to the expanding leaves and thus causing distorted growth. None of these three plants has flowered yet nor has material been sufficient to take cuttings. In this region night temperatures can certainly fall as low as 5 degrees C (41F) so this species might well succeed outdoors in humid gardens where tree ferns thrive.

From about 11,300 feet almost to the summit there occurs a massive tree species, although much dwarfed at the highest altitudes. This is *R. buxifolium robustum*, apparently always terrestrial and frequently growing amongst huge granite boulders. Some flat-topped specimens seen in rain from a distance appeared to be 20-25 feet tall and as much or more across. However, this species will flower in full exposure when only 6-8 feet high. These large trees make a wonderful sight when in full flower as a single specimen can carry hundreds of heads of bright crimson, scentless flowers. The small ovate leaves, little more than one inch across, are clustered terminally and very densely on thick shoots. All herbarium specimens collected in 1966 had the older and leafless branches densely covered with a black growth of the epiphytic alga *Trentepohlia*, identified by Mr. H. M. Burkill. We have found this rhododendron to be very difficult in cultivation : all our seedlings have died and none of our seed collections has germinated.

Another species of the high rocky peaks which must be very conspicuous during its main flowering period is *R. ericoides* - well named as both its tiny foliage and small scarlet flowers are heath like. This is a fascinating plant to a botanist and, although clearly of less interest to the gardener, we regretted not having collected it and no ripe seed was found.

Rainfall on Mt. Kinabalu is so heavy and frequent and dry spells so unpredictable that fresh seed of rhododendrons is difficult to collect. This seed is also very small and remains viable for only a few weeks. Our usual practice, having identified a flowering specimen, was to search for small seedlings 2 to 4 in. tall and to dig these up with a fern trowel and place them at once in a labelled polythene bag which was then sealed with plenty of air inside. Some of these collections survived in the bags for over a month in spite of three days of tropical heat in Singapore and a very wintry February on our return flight to London.

SOILS AND CULTIVATION

Corner (1965) has succinctly described Mt. Kinabalu as a granite intrusion into Eocene shale and older ultrabasic rock. The entire core and summit plateau consists of granite and allied acidic rocks while the so-called ultrabasic rocks - peridotite, dunite and serpentine (Collenette, 1955) outcrop on the south side of the mountain, roughly

between 7,000 and 9,000 feet and also on the lesser known north-west. At lower levels the hills are made up of older sandstones.

The rock type, slope and altitude - affecting both precipitation and temperature - all seem to have some influence on soil type. Thus on the main ascent route to the south one meets moss forest more or less where the ultrabasic rocks first appear. The overlying soil is extremely acid and often shallow and there is a surface accumulation of peat. This surface layer of peat, roots, moss and other vegetation is sometimes so thick that it is often difficult to examine the mineral soil below. Higher up, just before reaching the well-known Paka Cave (9,800 feet), the granite is reached, slopes become less steep and the soil type changes to a deeper "mull", still very acid indeed but with plenty of large earthworms and a somewhat more varied tree flora. The term "mull" means to an ecologist what "mould" means to a gardener : there is no surface accumulation of leaf litter as this is incorporated into the soil by earthworm activity. Very similar soils to these have been reported on in some detail (Askew, 1964) after the 1961 Royal Society Expedition to the east ridge of the mountain. This paper is perhaps too technical for the gardener but it is worth noting that the top 25cm (about 10 in.) of a ridge crest soil at 5,300 feet had a pH of 2.0-2.4 and that the base saturation of the mineral soil just below was only 1 per cent. However, a mull type soil at 10,000 feet, overlying granite, had a pH of 3.4-3.6 and a base saturation of 4-8 per cent. Even by most rhododendron garden standards these soils are both exceedingly infertile and very acid indeed.

Before our second expedition I had taken the precaution of gaining experience with pot cultivation of rhododendrons using the Maddenii hybrid 'Lady Alice Fitzwilliam'. This cultivar thrived in a potting compost of equal parts of sphagnum moss peat, perlite and oak leaf mould, with or without the presence of pelleted bone meal. However, seedling loss and severe leaf chlorosis, particularly with *R. orbiculatum* and *R. lowii*, soon indicated that neither perlite nor bone meal were beneficial. In fact bone meal was lethal to very small seedlings. We now use a mixture of peat moss, chopped bracken fronds (collected in October) and oak leaf mould and this has given good results with no fertiliser addition at all. That there is still room for improvement is shown by the severe chlorosis associated with one clone of *R. orbiculatum*. The leaf pattern suggests iron deficiency but the most dilute solutions of iron sequestrene were markedly harmful and often lethal. It may possibly be caused by phosphate toxicity arising from initial applications of bone meal. Suffice to note that Kinabalu rhododendrons thrive in the forest either on an exceedingly infertile soil or as rock or tree epiphytes.

PROPAGATION

Cuttings from four clones of *R. orbiculatum*, one of *R. brookeanum* and one of *R. acuminatum* have all given 100 per cent take. These were all 'internodal', the cut being made just above the second pseudowhorl of leaves. In all cases rooting hormone (A.N.A. + I.B.A.) was applied and the rooting medium was made up of equal parts of sharp sand and moss peat. The small clay pots were then plunged into a sand bed with bottom heat of about 18 degrees C (65F) and this bed was watered twice a day using rainwater. Cuttings taken from August to November have rooted promptly; those

taken in May developed a black rot at the base of the stems but, when this was cut away, they finally rooted in late summer or autumn.

Fresh seed of *R. brookeanum*, *R. brookeanum gracile* and *R. orbiculatum* has been distributed to a number of botanic gardens and private individuals over the last two years. On the assumption that no news of success indicates failure it would seem that only private gardeners have succeeded with this quite difficult material. My own experience indicates that fresh seed germinates readily with bottom heat and high humidity. However, casualties are high during the first winter when very free drainage is important. At this stage either impatience or liquid feed is lethal.

When small plants of *R. orbiculatum* and *R. acuminatum* reach an established size they seem to thrive better in plastic than in clay pots. However, all young plants and also the pure epiphytes seem to like old clay pots although clearly this is influenced by type of compost and watering regime. Although I have not yet conducted replicated tests it seems as if the addition of a pinch of compost from an established pot plant benefits the early growth of small cuttings. This suggests that the presence of root mycorrhiza may be of particular benefit to young rhododendrons and particularly to epiphytes. Indeed it is notable that the last worker to study this difficult subject on *Rhododendron* (Gordon, 1937) confined his attention to seven terrestrial species and to a few hybrids. A recent masterly survey of the whole subject (Harley, 1969) suggests to me that a re-examination of rhododendron mycorrhiza with particular reference to the epiphytic species, would make a valuable study and the results might prove of equal value to the rhododendron gardener as comparable research has already been to the orchid grower.

SUMMARY

Fourteen *Rhododendron* spp. From Mt. Kinabalu, Sabah, are described briefly. We have eight of these in cultivation of which five have flowered. Two species have been shown to the Society and have received awards.

In an earlier account (Allen, 1969) I have quoted Meijer (1963) in saying that there are 58 species of rhododendron recorded from Mt. Kinabalu. This I now find to be an error since Sleumer lists only 34 species from the whole of Borneo, all lepidote, of which some 27 appear to have been recorded from the mountain.

Of the species seen but not collected we think that *R. fallacinum*, *R. polyanthemum* and perhaps also *R. ericoides* would be of horticultural interest.

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