NOTES ON THE STRUCTURE AND DEVELOPMENT OF THE TERRESTRIAL ORCHIDS.

E.D.Hatch.

" Precise homologies of underground parts remain obscure and detailed anatomical and developmental studies would be rewarding." L.B.Moore.

(in Moore & Edgar. Flora of New Zealand 2:1970.p.102)

In New Zealand the terrestrial orchid is a typical monocotyledon. It consists of a creeping, branching rhizome with alternating nodes and internodes. Each node bears buds for lead, leaf and branch, and the relative development of these buds depends on their position on the plant. Below the surface leaf-buds form scale-bracts and branches develop freely. Above the surface green leaves are usual and branches less frequent. In those species which lack chlorophyll, the leaves, not being required for food production, retain their underground scale-bract dimensions. The buds are borne only on the nodes and it follows that any bud-bearing structure must be,or include,a node. The round tuber in Pterostylis, Corybas, Acianthus etc. is therefore an enlarged terminal node, adapted for food storage, dormancy and regrowth, while the so-called 'root' which precedes it is a single elongated internode. Not all these branch internodes bear tubers. Some remain slender, have numerous root hairs and appear to function only as feeders. In Pterostylis those species which have a bracteate-leaved mature form (I have experimented with alobula, alveata, brumalis and coccinea) will throw rosettes of juvenile leaves from the nodes of the flower stem in the event of damage to the plant. Usually the lower nodes but sometimes halfway up the stem, and these branch rosettes will in turn produce their own descending, tuber-forming internodes. Working with Pt. oliveri I discovered that if a flower stem comes into contact with the soil it will throw tuber-bearing branches from the nodes (i.e. from the axils of the leaves).

The elongated tuber in Thelymitra, Orthoceras and Calochilus and in Spiranthes also, is an initial node combined with a partly enlarged, following internode. In Gastrodia the whole rhizome is enlarged, nodes and internodes together. Scale leaves and scars of scale leaves point the position of the nodes.

The function of the tuber is to tide the plant over the dry season and in those species which form several tubers, to provide a means of vegetable increase. In mountain species the dormant period is extended to cover the cold season as well. In species which live under relatively damp conditions throughout the year (Adenochilus, Yoania) there is a tendency for the rhizome to be perennial and no tubers are formed. Corybas cryptanthus which is normally rhizomatous, will form tubers under adverse conditions, while Acianthus viridis and Corybas aconitiflorus sport both semi-perennial rhizomes and regularly-formed tubers. Some swamp species are also perennial. Thelymitra pulchella, which sometimes grows in water, will often throw a new leaf alongside

the still-green old one and the same occurs with Spiranthes. In Spiranthes also, if the plant is too small to flower, it will go on growing and not die back until it has flowered at the end of the second season. Until, that is, it has built up sufficiently large tubers with enough store of food to flower on. Spiranthes can do this because of the swamp environment; 'dry' species are often forced to spend several seasons building up the tubers to flowering size.

In species which have different leaf-forms at different stages in their growth, for example the trullifolia complex in Pterostylis, the growth stage depends entirely on the size of the tuber, that is on the amount of nourishment available. In Pt. alobula tubers up to 3 mm. diameter will produce only rosettes, 4-5 mm. the intermediate flowering form with both types of leaves, while anything above 7 mm. will produce the mature flowering form with bracteate leaves only. Similarly in Pt. coccinea the rubicon is 12 mm. Anything below that will produce a rosette, anything above it a flowering plant. The rosette form which the small plants assume, provides a maximum area of green leaf for photosynthesis and results in the rapid formation of flowering-sized tubers. This variation in form does not affect species with basal rosettes (Pt. nutans, curta etc.) since maximum leaf development is always present. If the mycorrhizome of Pt. brumalis chances to develop in a congenial spot it will throw some tubers large enough to flower the following season, 2 years from seed to seed. But this is rare - the tubers are normally smaller and develop rosettes. I have done this experimentally and have also grown Spiranthes from seed and produced flowering plants in 3 years.

The form the plant takes depends upon the development of the leaves and the length of the internodes. Large leaves and short internodes produce conspicuous rosettes like those of Pt.curta or nutans; large leaves and long internodes forms like Pt. banksii. Scale leaves and long internodes give plants like Gastrodia and Yoania, while tubular leaves and long internodes give Prasophyllum and Microtis. The tall seeding peduncle of Corybas and Chiloglottis is a single internode. The structure is simple but the possibilities are endless, and so the Orchidaceae has proved.

Psilotum nudum (L.) Palisot-Beauvois.

In the July number of the News-Letter, members were asked for further records of Psilotum nudum in the urban area of Auckland. Here is one not without interest. When I was living in Maungawhau Rd, Epsom (a road that runs parallel to Mountain Rd), I noticed P. nudum growing on the roots of a large pepper tree (Schinus molle) in our front garden. I certainly would not have thought of looking for it in such a place! Later I have learned that it has been recorded in Northland (Merita Bay), growing on a pohutukawa, "up a deep gully three quarters of a mile from the shore." H.B. Mathews.

Miss M. Crookes.

A member of the University Grounds staff recently found a very healthy specimen of Psilotum at the base of a pohutukawa growing in Wynyard St. City in one of the University car parks. - Ed.