

SOME OBSERVATIONS ON THE ALPINE VEGETATION OF MOUNT BIOTA (PAPUA)

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ABSTRACT

The alpine vegetation of the West Dome (Mt Biota) of the Albert Edward Range is a combination of secondary and primary aspects which alternate mosaic-like and often form distinct seral vegetations. Towards the original shrubberies seral communities are growing with treeferns increasing in number towards the shrubberies' edges. A true alpine vegetation is found only towards the summit and consists of a wide open vegetation with few scattered plants.

An EW running range approximately 120 km N. of Port Moresby in the Papuan area of the Territory of Papua and New Guinea, is the Albert Edward Range. This range consists of two parts separated by the deep Chirima valley, the West Dome with an altitude of 4300 m and the East Dome, with the summit at 4400 m. The western dome is named Mount Biota by the local natives and has not been explored botanically, in contrast with the eastern dome which was extensively studied by L. J. BRASS during the 1933–1934 Archbold expedition to that area.

In January 1965 I was able to explore the western dome with a small team of junior botanists from the Division of Botany in Lae. The range these days can easily be reached by flying to Waitape village at c. 1500 m altitude and situated at the western end of the Ero valley leading into Murray Pass. The well kept track from Waitape to the pass crosses the Vanapa River just north of its confluent with the Ero River. Crossing the latter we followed a long, grass-covered spur to Smarai village at c. 2100 m altitude. From there a short, steep ascend across a *Castanopsis-Araucaria* forest leads to the well kept track to Murray Pass. From the top of Murray Pass at c. 3300 m the track winds NE over the slowly rolling plateau from Tsjidibombo to the West Dome, though some deep gulleys have to be crossed. To the NW it skirts the southeastern border of Neo(n) Basin, a large swampy, treeless area. Crossing the treefern covered grasslands on the slopes east of the Basin the track ultimately leads over a slightly rolling and gradually ascending plateau with scattered ponds to the West Dome.

From the top of Murray Pass runs the track to the East Dome, Mount Garamu, via Chirima village.

The grasslands begin at about 3200 m and these are distinctly subseral, witness the large amount of scarred and burnt trees that are distinctly elements of the subalpine forests and shrubberies.

Whether the grasslands nearer to the summit of Mt Biota are all of primary origin must be doubted, since here also remnants of the original forest in the shape of burnt trees are observed. It is probable that after the destruction of the original forest and shrubberies a seral development takes place towards what is now alpine grassland and is maintained by frequent burning, but also, that mainly in the higher altitudes a gradual impoverishing of the forest to true alpine grasslands takes place. Only in a very few places an original alpine vegetation may have existed, such as on seepage slopes, banks of creeks, swamps, bogs, forests' edges, scree and landslides, and that from there after the destruction of the original vegetation, these elements invaded the new areas. But criteria to be laid down on what is a primary and what a secondary alpine vegetation will be difficult, if not impossible.

For a description, which necessarily must be rather limited, no difference will be made between the primary and secondary vegetations, but rather into the two main aspects found, the wet and the dry grasslands. In these grasslands a number of mosaic-like scattered smaller units can be distinguished as follows:

a. DRY GRASSLANDS

1. tall grasses aspect
2. low grasses aspect
3. lichen aspect
4. *Eurya brassii* aspect
5. scree

b. WET GRASSLANDS

6. *Oreobolus* aspect
7. *Plantago-Euphrasia-Sphagnum* aspect
8. bogs, ponds, marshes, terns
9. creekbank aspects
10. seepage slopes.

Independent from these aspects are the treeferns (species of *Cyathea*, *Cibotium*, *Dicksonia*) which are found in all aspects and locally form stands that often form seral vegetations with the shrubberies encroaching into the grasslands. Ultimately the treeferns will disappear in these dense shrubberies.

a. DRY GRASSLANDS

1. The dry grasslands with tall grasses dominate the alpine area between 3000 m and 4100 m and the main components are *Danthonia archboldii* Hitchc., with scattered species of *Agrostis*, *Anthoxanthum*, *Deyeuxia* and *Festuca*. The grasses are mainly growing in large tussocks and sometimes are so densely congregated that crossing these areas is difficult. In general, however, the vegetation is more open and in between the tussocks representatives of the genera *Centrolepis*, *Epilobium*, *Euphrasia*, *Gentiana*, *Oreobolus*, *Oreomyrrhis* and several grasses are growing.

This aspect is generally found in areas that are slightly wet or in which underground water is available. They are therefore often well represented along gulleys, seepage slopes and swampy plateaus. In this type of vegetation the treeferns play a dominant role and locally form transitional stages towards the closed shrubberies.

2. The aspect with low grasses also covers a large area and is mainly restricted to the drier slopes. They include a small number of grasses like *Danthonia archboldii* Hitchc. and *Agrostis reinwardtii* van Hall but usually the herbs outnumber them. Locally even no grasses at all are found. The vegetation, as in the first aspect, is composed of three layers, the highest about 50 cm tall, the second up to about 20 cm and finally the groundlevel composed mainly of mosses, lichens and such creeping herbs like *Geranium potentilloides* L' Hérít., *Hypericum japonicum* Thbg and *Oreobolus ambiguus* Kük. and van Steenis.

In this aspect the most striking species in the upper level are *Gaultheria mundula* F. Muell., *Hypericum macgregorii* F. Muell., *Styphelia sauveolens* (Hook. f.) Wbg and *Tetramolopium flaccidum* Mattf.

In the middle level *Brachycoma papuana* Mattf. is a striking but rare species, while *Cerastium papuanum* Mattf., *Epilobium keysseri* Diels and *Trachymene adenodes* Buw. are more common.

In the ground level the most striking species are species of *Gnaphalium* and *Trachymene rosulans* (Danser) Buw., together with such inconspicuous plants as species of *Haloragis* and *Anotis*.

3. The lichen aspect is a distinct one and is mainly found on dry hillocks, along forests' edges and on roadsides. The main components are species of *Cladonia* with scattered specimens of *Coprosma archboldiana* M. and P., *Cotula leptoloba* Mattf., *Gaultheria mundula* F. Muell., *Gentiana macgregorii* Hemsley, *Lactuca umbellata* Mattf. and the silvery white cushions of several species of *Gnaphalium*. Low creeping *Vaccinium* species form dense mats.

4. Is the third aspect relatively small in size, more extensive is the *Eurya brassii* aspect. This small shrub with obovate, leathery, dark green leaves is subglobose in shape in the lower areas, but becomes increasingly more depressed in the higher altitudes and ultimately forms a hard, dense mat. In this mat several species of *Coprosma* and *Vaccinium* are growing together with *Gaultheria mundula* F. Muell, but usually the number of species is very limited. The aspect is often limited to dry, exposed summits and is one of the few that reaches to near the summit area up to 4100 m.

5. The screes are not extensively developed in the Mount Biota area. This is mainly due to the harder, schistic nature of the rocks of the range and its gradual slopes. Where they are developed they are mostly completely overgrown with a low vegetation of *Centrolepis philippinensis* Merr., *Oreobolus ambiguus* Kük. and van Steenis, *Plantago lanigera* Hook. f. and *P. depauperata* M. and P. in the ground layer, while and indistinct second layer of *Drimys* sp., *Gaultheria mundula*

F. Muell., *Hypericum macgregorii* F. Muell. and *Styphelia suaveolens* (Hook. f.) Wbg, with scattered species of *Rhododendron* and *Vaccinium*, can sometimes be recognised. The most striking species found here was *Agapetes costata* C. H. Wright recognisable by its long, pale green purple flowers.

b. WET GRASSLANDS

The wet grasslands are smaller in size than the dry grasslands but have a richer, more varied vegetation. They are found in gulleys and on flat areas on top of hills, and range from superficially wet to alpine bogs, swamps, ponds, and tarns. The number of grasses is usually rather small, the herbs dominating in these grasslands, sometimes to the exclusion of grasses. This is particularly clear on the seepage slopes and on tracks across the area.

6. In these wet areas the largest aspect is the *Oreobolus* aspect in which most of the grasses occur. This aspect is often found on wet slopes in shallow dips. It is a rather dense vegetation composed on two distinct layers. In the upper layer *Tetramolopium alinae* (F. Muell.) Mattf., grasses and *Gaultheria mundula* F. Muell are the main representatives though few and far apart. The lower layer is a dense mat of *Astelia papuana* Skottsberg, species of *Gentiana*, *Gleichenia vulcanica* v. A. v. R., *Oreobolus ambiguus* Kük. and v. St., *O. pumilio* R. Br., *Oreomyrrhis andicola* Hook. f., *Plantago lanigera* Hook. f., *Ranunculus amerophyllus* F. Muell., and several species of *Potentilla*. These plants owing to water movements in the surface, sometimes form mushroom shaped tussocks by the erosive action on the intermediate soil.

7. The *Plantago-Euphrasia-Sphagnum* aspect is a widespread aspect mainly on seepage slopes, but also along creeks, tracks, rivulets, banks of ponds or in wet places with a relatively stagnant surface water. It is a one-layered vegetation of a few species only, with a dominance of several species of *Euphrasia*, *Plantago aundensis* van Royen, *P. depauperata* M. and P., *P. lanigera* Hook. f., *Ranunculus amerophylloides* Eichler, and sometimes a few scattered specimens of *Gentiana ettingshausenii* F. Muell. Large patches of *Sphagnum* are a distinct feature of this aspect, often to the exclusion of any other species.

8. The bogs, ponds, marshes and tarns are treated here as one aspect because their composition is essentially the same, with a reduction in number of species towards the larger sized water surfaces, so that in the larger ponds only *Isoetes* sp., *Callitriche verna* L, species of *Haloragis* and an occasional grass (*Poa egregia* Chase) is found. The smaller ponds etc., often carry a vegetation that is in no way different from the surrounding wetter slopes.

9. In the alpine areas many creeks and rivulets develop under the moist conditions at these altitudes. Most of these, however, are only temporarily and periodically flooded with water and the vegetation

on their banks differ hardly from the vegetation of any of the previous aspects, though a more luscious development of grasses like *Danthonia archboldii* Hitchc. can be noticed. In general these temporary creeks are shallow and often are mere bogs or swampy. Well developed creeks with permanent water are relatively few in the alpine areas. They often cut out deep and steep gulleys and a vegetation of tree-ferns, *Rhododendrons* and *Vacciniums* and other species of the subalpine shrubberies overhang these gulleys making impenetrable tunnels.

On the open banks dense tufts of grasses such as *Deschampsia klossii* Ridley, *Danthonia archboldii* Hitchc., are interspersed with low cushions of *Cerastium papuanum* Mattf., *Galium australe* DC, *Plantago depauperata* M. and P., *P. lanigera* Hook. f, *Ranunculus amerophyllus* F. Muell., *Trigonotis robusta* Johnston, while more rare are species of *Euphrasia*, *Lagenophora stipitata* Labill., *Lobelia angulata* Forster, *L. conferta* M. and P. and the strikingly beautiful *Epilobium* and *Viola* species. Occasionally the forget-me-nots (*Myosotis saruwagedica* Schlechter) form large clumps but in general this is a rare species. In the creeks large patches of *Scirpus fluitans* Hook. f. and *Callitriche verna* L, wave to and fro in the rapid running water.

At the higher altitudes near the summit the vegetation of the creekbanks approaches that of the surrounding areas and in that respect resemble the vegetation of the temporary creeks mentioned.

10. The seepage slopes can be regarded as one of the few places from where some of the elements of the alpine vegetation originated. They are usually found on slopes, though the latter are sometimes so slight as almost to be imperceptible. In all cases studied these seepage slopes had an impermeable layer of a pale brownish sandy clay at depths varying from a few centimeters to about one meter. In the former case the water is more a surface layer than true seepage. For the composition of its vegetation cover this seemingly makes no difference.

The vegetation is rather dense and essentially a one-layered one, though with deeper clay-layers it will become richer and approaches that of the wet grasslands with its various vegetations. It must be pointed out here that as everywhere in the grasslands usually no sharp distinction exists between the different aspects, and that only a sharp change in soil composition is followed by a distinct change in vegetation.

The main components of the vegetation of the seepage slopes are small grasses and low herbs as *Centrolepis philippinensis* Merrill, *Euphrasia* sp., *Gentiana cinereifolia* van Royen, *G. ettingshausenii* F. Muell., *Oreobolus* spp., *Ranunculus amerophyllus* F. Muell., *R. amerophylloides* Eichler, *Plantago aundensis* van Royen, *P. depauperata* M. and P., *P. lanigera* Hook. f., *Tetramolopium alinae* (F. Muell.) Mattf., and *T. ciliatum* Mattf.