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ALPINE PLANT COMMUNITIES OF MT. ELGON. — AN ALTITUTDINAL TRANSECT ALONG THE KOITOBOSS ROUTE

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ABSTRACT

The afroalpine vegetation of Mt. Elgon was studied along an altitudinal transect ranging from the montane forest up to the summit of koitoboss (13,880 ft.). •

Since, due to recurrent fires, the boundary between the lower Ericaceous and the alpine belt is an interlocking one, both vegetation girdles were encompassed in the studies. The Ericaceous belt can be divided into a woodland and bush storey. The former, with respect to the species encountered represents a transition zone from the montane forest to the microphyllous bush vegetation. The latter was designated as Ericaceous bush and exhibits various indications of former fires, thus rather reflecting different stages of regeneration than a climax vegetation. Within the alpine belt tussock grassland and two types of *Carex* bog form a lower storey. The vegetation of the upper zone is characterized by a field layer of predominantly *Alchemilla elgonensis* and thus could be address as Alchemilla scrub. However, according to the accompanying species several types of this crub were distinguished: a ***Helichrysum scrub*** which was found on shallow soil covering volcanic rock slabs; an ***Euryops bush***, bordering the so-called *Dendrosenecio* woodland vegetation. The latter was divided into a *Dendrosenecio elgonensis*-Community on moist soil and a *Dendrosenecio barbatipes*-Community covering the well-drained steeper slopes of the caldera rim.

INTRODUCTION

Mt. Elgon (14,178 ft.) is one of the seven East African high mountains exhibiting alpine vegetation. As described in detail by Hedberg (1951) the vegetation characteristic of the alpine belt is usually found above the so-called Ericaceous belt, i.e. above 11,000 to 11,500 ft. However, probably due to recurrent burning, a broad altitudinal zone exists at Mt. Elgon, in which alpine grassland or scrub vegetation has penetrated into the Ericaceous belt thus narrowing that girdle considerably and even bordering the montane forest belt in a small area south of the caldera (Hamilton, 1981). In the present communication this zone of mutual interference was included in the alpine belt. With respect to the upper border of this belt, Mt. Elgon is not high enough to exhibit a nival zone; therefore the summits, too, are covered by alpine vegetation. Since this paper describes the plant communities along the Koitoboss route, i.e. along the access from the south-east, it should be mentioned that the East of Mt. Elgon gains considerably less precipitation than the South

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and especially West (Hamilton 1981). Thus the southeastern slopes may be intermediate with respect to humidity and rainfall. Although no exact data were available, there is no doubt that the maximum of rainfall occurs in the montane forest belt (Hamilton 1981), and that the alpine region, although more often covered by clouds than the montane girdle, gains considerably less precipitation.

The soils along the Koitoboss route are mostly of the alpine Brown Soil or Brown Soil-Gley type which have been described for Mt. Kenya (Beck et al. 1981), but mires and boggy areas outside and inside the caldera were also recorded. The soil of these swamps consists of a material classified as "radicellous peat", i.e. an organic soil which had developed predominantly from roots and rhizomes of higher plants as well as from mosses, but without any contribution of Sphagnum species. Hedberg (1964) also stated that he could not find one Sphagnum plant at Mt. Elgon. In particular close to the caldera rim, and also at the summit of Koitoboss, large slabs of volcanic rock crop up which are covered by an only very shallow humus layer.

TOPOGRAPHY

Easy access to the alpine region of Mt. Elgon is provided by a driveway leading from the Kitale Gate of Mt. Elgon National Park to an altitude of about 10,800 ft. It ends about 260 ft. above the sharply notched Kimothon valley. From that point a faint foot tract which enters the caldera rim between Koitoboss and Lower Elgon was used to establish the altitudinal transect. From the sadle the tract turns eastward to climb Koitoboss summit via its W face. Some bogs of the caldera, in particular the so called Koitoboss swamp were included in the transect. For mapping the route and localizing the plots the Sheet NA-36-12 (Kapenguria), Series Y 503, printed by Survey of Kenya was used and a sketch of the relevant area was drawn magnifying the pertinent area (Fig. 1).

CLASSIFICATION OF THE VEGETATION

Conspicuous, repeatedly occuring combinations of plant species were listed and species quantification was performed according to the method of Braun-Blanquet (Mueller-Dombois and Ellenberg, 1974). Unknown plant species were collected and identified using the "Flora of Tropical East Africa" (Hubbard and Milne-Redhead), "Upland Kenya Wild Flowers" (Agnew 1974), "Kenyan Trees and Shrubs" (Dale and Greenway 1961) and "Afroalpine Vascular Plants" (Hedberg 1957). To the Dendrosenecios the nomenclature proposed by Nordenstam (1978) was applied. Identification of difficult speceies was confirmed by comparison with material of the East African National Herbarium at Nairobi. Unfortunately, the mosses have not yet been identified. For abstraction of vegetation units, the proposals of Hedberg (1964) were used as guiding principle.

THE VEGETATION FORMATIONS

Ericaceous belt

Having passed several types of dense montane forest along the driveway to the Koitoboss area, an open type of ***Ericaceous woodland*** is entered at an altitude of a bout 10,200 ft. This woodland is characterized by tree-like representatives of the Ericaceae as are the broad-leaf species *Agauria salicifolia* and the microphyllous species *Philippia keniensis* (and *excelsa*) and *Erica arborea*. It still comprises montane forest species, too. Typical respresentatives of the latter are the trees of *Olea kilimandscharica, Juniperus procera, Rapanea rhododendroides, Hagenia abyssinica* and *Hypericum keniense* as well as some herbs, e.g. *Viola eminii*. This lower storey of the Ericaceous belt thus may be regarded as natural transition from the forest to the Ericaceous bush, the latter representing the upper storey of this belt. Two analyses of such a woodland vegetation are provided by Table 1 (plots 1 and 2). Clearing on rocky outcrops exhibit an open vegetation type which, in analogy to *Klötzli*'s classification on Mt. Kilimanjaro (1958) might be described as *Exotheca abyssinica - Agrostis* spp. - Community (plot Nr. 3). Apart from the replacement of *Agrostis volkensii* at Kilimanjaro by *A. gracilifolia* and *A. kilimandscharica* at Mt. Elgon, this community differs from that described by Klötzli in that mosses are dominating on the rocky soil instead of grasses.

In contrast, e.g. to the western part of Mt. Kilimanjaro (Beck et al. 1983) the Ericaceous bush on Mt. Elgon is an open vegetation, appropriately characterized by Cotton (1932) as "subalpine grasslands with scattered Ericaceous bushes and suffruticose plants of temperate genera". There is no distinct border between the lower storey of the Ericaceous belt and the upper one. In the latter the trees are more and more replaced by bushes of microphyllous species, such as *Philippia keniensis, Anthospermum usambarense* and *Stoebe kilimandscharica*. In the visited area between Kimothon and Kassowei (Fig. 1) the Ericaceous bush more or less everywhere exhibits signs of burning, such as charred *Philippia* stems, from the basis of which new shoots had developed. Another direct indication of former fire is the absence of the cylinders of dry leaves around the stems of *Dendrosenecio elgonensis*. Thus the plant communities found in these areas (plots 28 to 30) on the one hand by the absence of the tree-like differential species listed in Table 1 can already be distinguished from those of the Ericaceous woodland, but on the other hand rather appear to reflect regeneration stages of the bush than the climax plant community. According to Hedberg (1964) luxuriant growth of *Carduus keniensis*, as it is indicated by plots 29 and 30 can be taken as to show recolonization of burnt-over areas. According to our own observations on Mt. Kilimanjaro (Beck et al. 1983) the same is true for the predominance of *Artemisia afra* (plots 28 to 30).

Alpine belt

The vegetation formations and plant communities typical of the alpine belt are shown in Table 2.

a) Tussock grassland

In the Koitoboss area the upper boundary of the Ericaceous belt varies between 10,800 and 11,800 ft (cf. Hamilton 1981). Usually it extends to the higher altitudes merely on steep slopes and rocky crests while on the valley floors it is replaced by a tussock vegetation. According to Hedberg (1951) tussock grassland is the most important vegetation type of the alpine belt of Mt. Elgon, covering more than half of the area. This author further emphasized (1964) that fires are at least partly responsible for the large extension of the tussocks inside and outside the crater and that it is in particular the frequency of burning that favours the spread of grassland at the cost of the scrub vegetation. This is undoubtedly true for grassland covering well-drained soils, especially in the lower zone of the alpine belt. In plots 24 and 25 such plant communities have been analyzed. The herb layer is dominated by the tall tussocks of *Festuca pilgeri*, the gaps in between being occupied by other grass species as *Pentaschistis borussica, Agrostis kilimandscharica* and *Koeleria capensis*. The inconspicuous occurence of Everlastings in such tussock grasslands may indicate the above mentioned fire-triggered competition of grassland with scrub communities. A dense moss layer was found covering patches of bare soil in between the grass tussocks.

b) Carex bogs

Another type of tussock vegetation is represented by the so-called Carex bogs (Hedberg 1964) which cover water-soaked peaty soils on flat depressions without any or with reduced drainage. Naturally those bogs occur more frequently at lower elevations than in the upper alpine regions. At Mt. Elgon two types of Carex bogs may be differentiated by the presence (plots 23 and 26) or absence (plots 13 and 14) of tree-like groundsels. Carex bogs (type 2 in Table 2) characterized by the latter (Fig. 2) by phenotype very much resemble those described from the southeastern slopes of Mt. Kilimanjaro (cf. Fig. 86 in Hedberg, 1964) which have been described by Klötzli (1958) as *Senecio cottonii-Carex monstachya* Community. At Mt. Elgon the dominant sedge is *Carex runssoroensis*, and *Dendrosenecio elgonensis* was found instead of *D. cottonii* (plot 22 and Fig. 2). In the Ericaceous bush storey *Carex ninagongensis* and two other Cyperaceae, presumably *Scirpus* species (which could not be identified due to the lack of reproductive organs) appear to replace *Carex runssoroensis* (plot 26) at otherwise comparable bogs. The other type of Carex bog (type 1 in Table 2) which on the transect was found exclusively inside the caldera (plots 13 and 14) at altitudes around 13,000 ft. appears to be characteristic of more or less permanent flooded areas. It is dominated by the tussocks of *Carex runssoroensis* (Fig. 3) and like the first bog type contains considerable numbers of the attractive giant rosette species *Lobelia elgonensis*. Another similarity results from the occurrence of *Alchemilla johnstonii* in between the hummocks. However, the occurrence of hydrophilic herbs as *Ranunculus volkensii, Ericaulon volkensii, Crassula granvikii* or *Swertia crassiuscula* and the above mentioned absence of giant groundsels render easy differentiation of the two types of Carex bogs which physiognomically may be addressed as mires (plots 23 and 26) and swamps (plots 13 and 14), respectively.

It should be noted that the absence of *Alchemilla elgonensis* from the typical Carex bogs and from the tussock grassland clearly distinguishes these vegetation formations from all other plant communities recorded in the alpine zone of Mt. Elgon (Table 2). With a few cuts the same holds true for the absence of *Helichrysum ambliphyllum, Lobelia telekii, Valeriana kilimandscharica* and *Festuca abyssinica*. Thus, next to the tussock grassland, a scrub vegetation in which in particular *Alchemilla elgonensis* is of great importance characterizes the alpine belt of Mt. Elgon.

c) Alchemilla scrub

A pure Alchemilla scrub, established by *Alchemilla elgonesis, A. johnstonii* and *Valeriana kilimandscharica*, as has been described by Hedberg (1964) from an area near Maji ya Moto, could not be found along the Koitoboss transect. This difference may be rather due to the sizes of plots employed by Hedberg (1964), 1 x 1m) and in the present work (10 x 10m), than to clearcut changes of the vegetation. In spite of a more or less closed and monotonous layer of Alchemilla scrubs various plant communities belonging to the vegetation formation Alchemilla scrub could be differentiated by the presence of other conspicuous species. Where Everlastings other than *H. amblyphyllum* were as frequent as the *Alchemilla* species (plots 15 and 20) the vegetation was designated as Helichrysum scrub which predominantly covers rocky ground. It should be noted that the Helichrysum scrub described in this work differs from that mentioned by Hedberg (1964) in that the ubiquitous *H. amblyphyllum* is of minor importance and by the absence of *Alchemilla johnstonii, Dendrosenecio elgonensis, Peucedanum kerstenii* and *Carduus keniensis*. However, even the pure Helichrysum scrub described here for Mt. Elgon is almost identical (allowing for vicarious species such as *Alchemilla argyrophylla* and *elgonensis*) with a mixed vegetation of Helichrysum scrub, Alchemilla scrub and Ericaceous bush (cf. Table 2 in Beck et al. 1983) on Mt. Kilimanjaro. The Helichrysum scrub shown by Hedberg for Mt. Elgon (cf. Fig. 89 in Hedberg 1964) will be described in the present work as *Dendrosenecio elgonensis*-Community. Another plant community abstracted from the Alchemilla scrub was designated as Euryops bush. It is characterized by the occurence of the conspicuous bushes of *Euryops elgonensis* together with both *Alchemilla* species, as well as by the absence of a moss layer plots 17, 18, 21) and was usually observed bordering the *Dendrosenecio elgonensis*-Community versus mires or tussock grassland. The Euryops bush of Mt. Elgon is completely different from the *Festuca abyssinica-Euryops dacrydiodes* Community (Beck et al. 1983) reported for Mt. Kilimanjaro, as grasses are of minor importance or even lacking. The occurrence of *Peucedanum kerstenii* and *Carduus keniensis* in the Euryops bush as well as the localization of this community close to the grassland suggest that its origin may be linked to occasional fires.

d) Dendrosenecio woodlands

The most conspicuous vegetation formations of the alpine belt of Mt. Elgon are those characterized by the trees of giant groundsels. According to Hedberg (1964) they were combined by the term Dendrosenecio woodlands. Like at Mts. Kenya and Kilimanjaro (Rehder et al. 1981, Beck et al. 1983), *Dendrosenecios* occur at Mt. Elgon in a field layer either of *Alchemilla* species or of tussocks. Since in the latter case the scattered occurence of giant groundsels contradicts the idea of a woodland, such a plant community was described as Carex bog (type 2) which is shown in plots 23 and 26. Thus the Dendrosenecio woodlands of Mt. Elgon, described in this work, consistently exhibit an understorey of Alchemilla scrub, and thus closely resemble the *Alchemilla-Dendrosenecio johnstonii*-Community described for the Shira plateau of Mt. Kilimanjaro (Beck et al. 1983). Two types of Dendrosenecio woodlands can easily be differentiated on Mt. Elgon. The lower girdle of that vegetation formation is characterized by the less branched trees of *Dendrosenecio elgonensis* and by the considerable contribution of *Alchemilla johnstonii* to the field layer. The fact that the latter species prefers at least occasionally wet soil, together with the occurrence of *Ranunculus oreophytus, Lobelia lindblomii* and *Swertia crassiuscula* indicates that a moist substrate is a prerequisite for the Dendrosenecio elgonensis-Community (plots 16 and 22). This idea is corroborated by the capability of *D. elgonensis* to advance into boggy areas. Completely different from that community is the second type of Dendrosenecio Woodlands which was designated as Dendrosenecio barbatipes-Community (plots 6 - 10) and was recorded on well drained slopes. It is characteristic of the upper alpine zone of Mt. Elgon where the rather dense stands of widely branched *Dendrosenecio barbatipes* trees provide an aspect which is unique for the steep slopes of the caldera (Fig. 4).

Since *Lobelia telekii,* although not specified as a differential species, was consistently found to accompany *Dendrosenecio barbatipes* (Fig. 5). A striking physiognomic similarity of the Dendrosenecio barbatipes-Community with the Dendrosenecio woodlands of Mt. Kenya (Rehder et al. 1981) was established. The latter is characterized by *D. keniodendron, L. telekii* and *Alchemilla argyrophylla.*

Vegetation patches composed of species of both types of Dendrosenecio woodlands of Mt. Elgon have also been recorded, predominantly and expectedly at intermediate levels (plot 11) but, interestingly, also on the large summit plateau of Koitoboss (plot 5). The latter, due to poor drainage, is inhabitated by hydrophilic species like *Ranunculus oreophytus* and *Lobelia lindblomii.*

CONCLUDING REMARK

The vegetation units described in this work may be typical of the area of the National Park, which apart from fire, appears as widely uninfluenced by man. In contrast to these, heavily grazed areas with different grass communities must be expected to occur on the drier hills inside the crater (Hedberg 1964). Even the Dendrosenecio woodlands appear to be of less importance outside the National Park as it is documented by a photo (Hamilton 1982) showing only scattered groundsel trees in the region between lake Kimilili and Sudek (14,140 ft.). Therefore the altitudinal transect reported herein by no means should be generalized for the whole alpine belt of Mt. Elgon.

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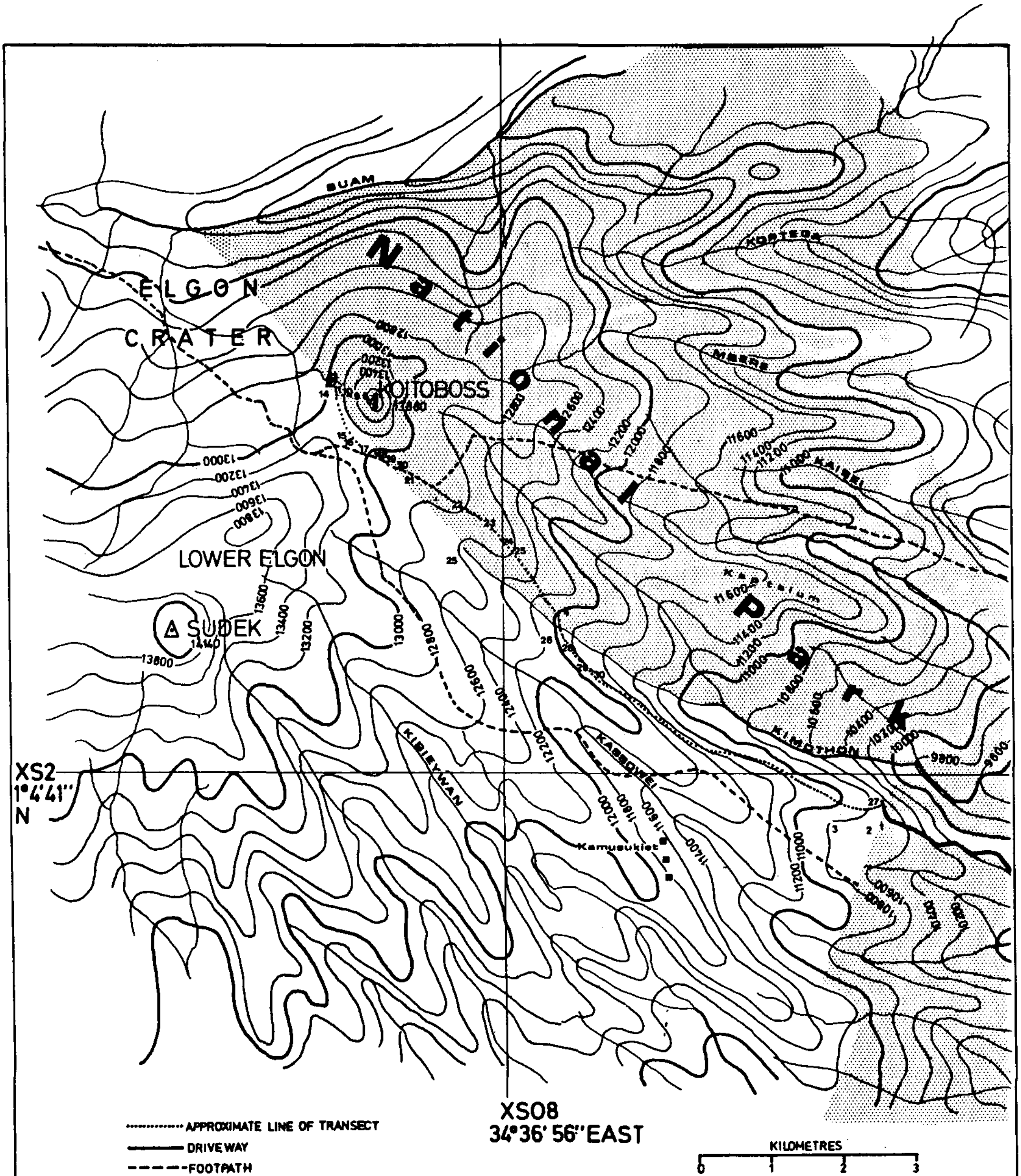

Fig. 1 Map of the Kenyan sector of Mt. Elgon, redrawn and magnified from the Sheet Kapenguria, Series Y 503, Sheet NA-36-12, Edition 2 - 5K, published by Survey of Kenya (Nr. 2400/8/73). The altitudinal transect was made along a faint footpath, the approximate alinement of which is given by the dotted line. The figures represent the numbers of plots of vegetation analysis which are described in detail in Tables 1 and 2.

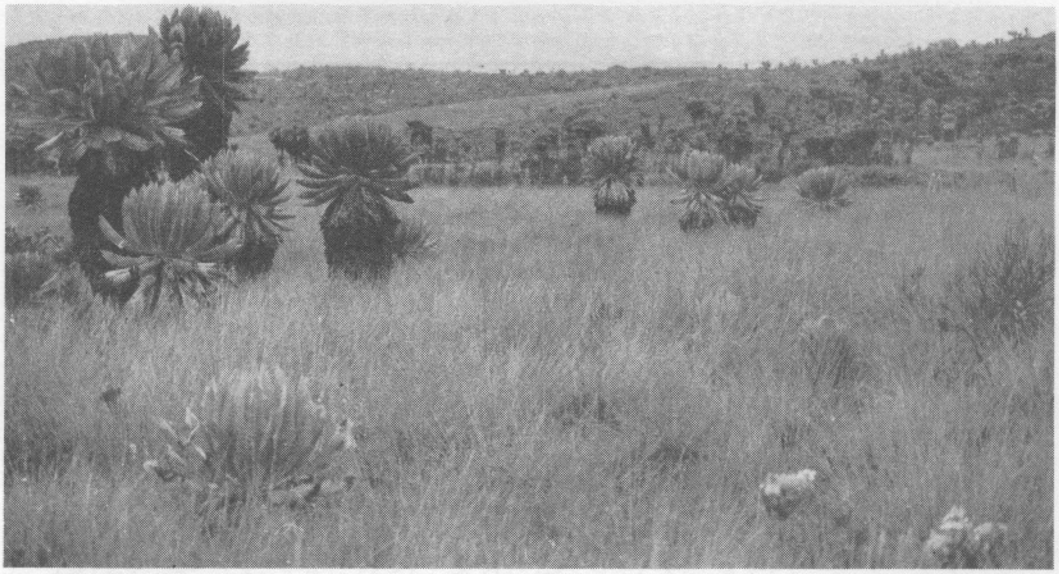

Fig. 2 *Carex runssorensis* bog (Carex bog type 2, cf. Table 2, plot 23) with *Dendrosenecio johnstonii* ssp. *elgonensis, Lobelia elgonensis* and scattered specimens of *Helichrysum amblyphyllum*. The slopes in the background are covered by the Dendrosenecio elgonensis-community. (Foto: E. Beck, March 15th, 1983).

Fig. 3 *Carex runssorensis* bog (Carex bog type 1, cf. Table 2, plot 13) in the caldera of Mt. Elgon (Koitoboss swamp). Patches of *Alchemilla johnstonii* can be detected between the Carex tussocks. The slopes in the background are covered by the *Dendrosenecio barbatipes*-Community (Foto: E. Beck, March 15th, 1983).

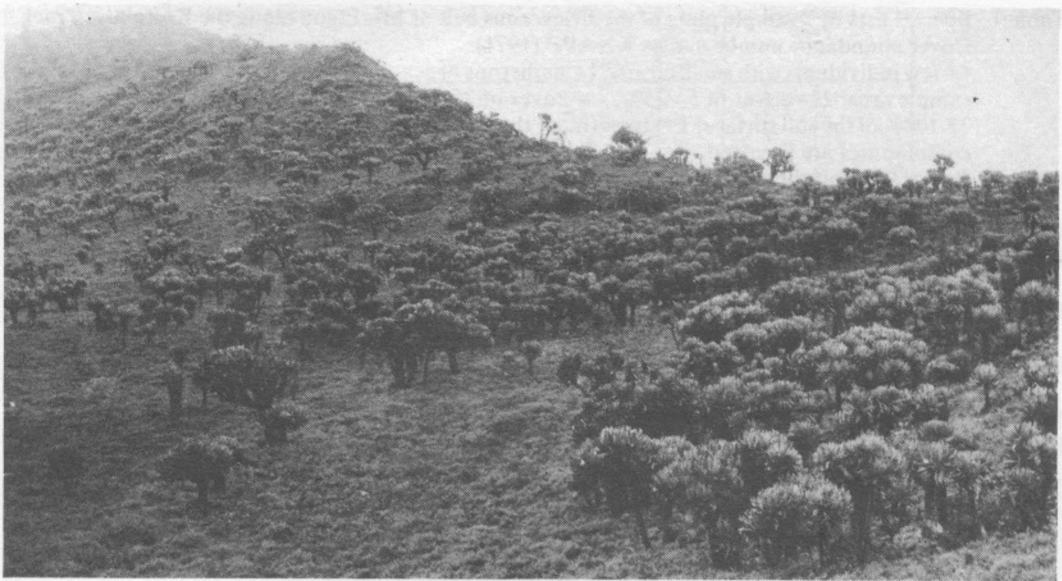

Fig. 4 Dendrosenencio woodlands: *Dendrosenecio barbatipes*-Community on the southeastern slopes of Lower Elgon at an elevation of 13,000 ft. The field layer consists predominantly of *Alchemilla elgonensis* (Foto: E. Beck, March 15th, 1983).

Fig. 5 Close up the *Dendrosenecio barbatipes*-Community at the western slopes of Koitoboss summit (cf. plot 8 in Table 2). *D. barbatipes, Lobelia telekii* and *Alchemilla elgonesis* and *Helichrysum amblyphyllum* can be detected on the photo as important representatives of this community (Foto: E. Beck, March 15th, 1983).

Table 1	Species lists of 7 sample plots of the Ericaceous belt of Mt. Elgon along the Koitoboss Track. Cover abundance numbers after KNAPP (1971): + = few individuals with small covers; 1 = numerous or scattered individuals cover up to 5% of the sample area: 2 = cover of 5 - 25%; 3 = cover of 25 - 50%; 4 = cover of 50 - 75%; 5 = cover of 75-100% of the soil surface; T = trees (more than 3 m high). Transitorial features in regeneration communities are screened.
Plot 1	End of the Koitoboss driveway at an altitude of 10,750 ft.; 20 × 20 m; tree layer with 60% cover; 14th March 1983;
Plot 2	50 m W of Plot 1 at 10,810 ft. altitude; 20 × 20 m; tree layer with 30% cover; 14th March 1983;
Plot 3	Rocky outcrop near the End of the Koitoboss driveway at an elevation of 10,750 ft.; 20 × 20 m; volcanic rock covered by mosses; 14th March 1983;
Plot 27	Regeneration stage of Ericaceous bush 50 m N of the end of the driveway at an altitude of 10,800 ft. 10 × 10 m; 16th March 1983;
Plot 28	Footpath to Koitoboss at an altitude of 11,870 ft.; 50 m S of the valley floor; 10 × 10 m; 15th March 1983;
Plot 29	Footpath to Koitoboss, upper part of the slope; 11,670 ft.; 10 × 10 m; 15th March 1983;
Plot 30	Footpath to Koitoboss, close to Plot 29; 11,670 ft.; 10 × 10 m; 15th March 1983;

Table 2	Species list of 23 sample plots of the alpine zone of Mt. Elgon representing an altitudinal transect from the caldera up to the summit of Kotoboss and down to the end of the Koitoboss driveway. Cover abundance numbers as in Table 1; n(n) indicates two layers, usually a tree and a shrub or herb layer. Typical communities are screened; Hatching in the heading indicates mixed vegetation. All analyses were made on March 15th, 1983.
Plot 12	W-slope of Koitoboss, 50 ft. above the floor of the crater 13,040 ft., 10 × 10 m;
Plot 14	Bog in the caldera below Koitoboss summit; 12,970 ft., 10 × 10 m;
Plot 13	Swamp at the E-rim of the caldera below Koitoboss summit; 13,000 ft.; 10 × 10 m;
Plot 19	Spring area close to Koitoboss track, 12,970 ft., 10 × 10 m;
Plot 9	Boulder stream on the W-slope of Koitoboss summit at 13,380 ft.; 15 × 15 m;
Plot 10	Boulder stream on a flattening of the W-slope of Koitoboss summit; 13,340 ft.; 10 × 10 m;
Plot 7	NW slope of Koitoboss summit on a plant-covered scree stream; 13,750 ft.; 10 × 10 m;
Plot 6	As in plot 7 on a shallow ledge; 13,680 ft.; 3 × 12 m;
Plot 8	W-face of Koitoboss summit with 20% bare rock; 13,800 ft.; 5 × 5 m;
Plot 11	W-slope of Koitoboss; 110 ft. above caldera; 13,100 ft.; 10 × 10 m;
Plot 5	Plateau representing the summit of Koitoboss, 13,880 ft.; 15% bare rock; 10 × 10 m;
Plot 16	Flattening on a rock table E of the saddle W of Koitoboss; 13,130 ft.; 6 × 12 m;
Plot 22	Along Koitoboss footpath at 12,830 ft.; 10 × 10 m;
Plot 23	As in plot 22, 12,740 ft.; border of a mire; 10 × 10 m;
Plot 26	Mire at an altitude of 12,060 ft. in the grassland area; 10 × 10 m;
Plot 4	100 m N of the footpath (middle of the slope) at 12,230 ft. altitude; 10 × 10 m;
Plot 17	S-slope of a wide gully on the footpath at 13,070 ft. altitude; 10 × 10 m;
Plot 18	SE-slope of the same gully as in plot 17; 10 × 10 m;
Plot 21	50 m SW of Koitoboss footpath at 12,870 ft.; 10 × 10 m;
Plot 15	Rock outcrop at the saddle W of Koitoboss summit; 13,160 ft.; pure rock 10%; 15 × 15 m;
Plot 20	Rock outcrop 15 m N of Koitoboss footpath at 12,930 ft.; bare rock 10%; 8 × 8 m;
Plot 25	Gentle slope on shallow soil 20 m W of Koitoboss footpath at 12,600 ft.; some charred trunks indicate former burning; 10 × 10 m;
Plot 24	100 m W of plot 25 at 12,670 ft.; no direct evidence of former fire; 10 × 10 m;

TABLE I	Ericaceous Woodland			Ericaceous Bush			
	Transition Zone Forest-Heath		Exo-theca-Agrostis Commun.	Regeneration Types			
Number of plot	1	2	3	27	28	29	30
Altitude x 1,000 (ft.)	10.7	10.7	10.8	10.7	11.8	11.6	11.6
Exposition	NE	NE	NE	NE	NE	N	N
Slope (°)	10	5	10	20	5	5	5
Plant cover (%)	90	95	80	90	85	97	95
Number of species (Mosses = 1)	34	33	26	17	22	25	20
Philippia keniensis S.Moore	3T	1T+1	2T+2	2	3		+
Anthospermum usambarensis K.Schum.	1	1	1	2		+	2
Helichrysum odoratissimum (L.)Less.	1	2	1		1	2	1
Artemisia afra Willd.	1	2		2	2	2	2
Leucas spec. A Agnew	1	1	1	1			
Stoebe kilimandscharica O.Hoffm.	1T+2	1T+3	1	1		+	
Hebenstretia cf. angolensis Rolfe	1	+		1	1		
Satureja biflora (D.Don.)Benth.	+	1	+		+	+	
Andropogon lima (Hack.)Stapf	1	+	+	+	2	1	2
Kniphofia snowdenii C.H.Wright	+	1			+	+	+
Olea kilimandscharica Knobl.	+	+T					
Erlangea fusca S.Moore		1	+				
Hypericum kiboense Oliv.	+	1		+			
Luzula johnstonii Buchen.	1	1					
Caucalis incognita Norman	1	+					
Swertia kilimandscharica Engl.	1	+					
Juniperus procera Hochst. ex Endl.		1T					
Rapanea cf rhododendroides (Gilg)Mez		1T+1					
Agauria salicifolia (Comm. ex Lam.)Hook.f.	3T						
Nidorella arborea R.E.Fries	1						
Senecio rhammatophyllus Mattf.	+						
Hagenia abyssinica (Bruce)J.F.Gmel.		+T					
Helichrysum formosissimum (Sch.Bip.)A.R.	1						
Erica arborea L		1	2T				
Viola eminii (Engl.)R.E.Fries	+						
Cerastium afromontanum T.C.E.Fries&Wei.	+						
Hypericum keniense Schweinf.		1					
Protea kilimandscharica Engl.	+		+	3			
Bartsia kilimandscharica Engl.	1	+	1				
Helichrysum nandense S.Moore	1	+	+				
Lithospermum afromontanum Weim.	+	+	+				
Piloselloides hirsuta (Forsk.)C.Jeffr.	+	+	1				
Exotheca abyssinica (A.Rich.)Anderss.			+				
Agrostis gracilifolia C.E.Hubb.			+		1		
Agrostis kilimandscharica Mez			+				
Dierama pendulum (L.f.)Bak.			+				
Dendrosenecio johnstonii ssp. elgonensis (T.C.E.Fries)B.Nord.						1	2
Helichrysum globosum Sch. Bip.			+			1	1
Anthoxanthum nivale K.Schum.						+	+
Hypericum spec.				+		2	2
cf Scirpus spec.B						2	1
Anagallis serpens D.C.					2	2	2
Conyza subscaposa O.Hoffm.					2	+	1
Carduus keniensis R.E.Fries					+	1	2
Senecio snowdenii Hutch.					+		+
Swertia crassiuscula Gilg					+	+	
Veronica glandulosa Benth.					1	1	
cf Dichrocephala alpina R.E.Fries					+	+	
Cineraria grandiflora Vatke	+						
Galium ruwenzoriense (Cort.)Chiov.	+		+	+	+		+
Galium glaciale K. Krause		+					
Sonchus bipontini Aschers.	+		+				
Geranium ocellatum Cambess.		+		+		+	+
Geranium elamellatum Kokwaro	+						
Satureja cf kilimandschari (Guerke)Hed.				+			
Satureja uhligii Guerke		+		+			
Haplocarpha rueppellii (Sch.Bip.)Beauv.						+	
cf Wahlenbergia arabidifolia (Engl.)Br.				+			
Mariscus spec.	1						
Agrostis spec.	2						
Conyza welwitschii (S.Moore)Wild						+	
Deschampsia caespitosa (L.) PB.	1						
Alchemilla cryptantha A.Rich.						+	
Alchemilla elgonensis Mildbr.		2					
Alchemilla johnstonii Oliv.		+			2	2	2
Festuca abyssinica A. Rich.	1		+	2	1	+	
Euryops elgonensis Mattf.			+				
Helichrysum forskahlii (Gmel.)Hill.&Burt.			+		+		
Lobelia elgonensis R.E.& T.Fries jr.		1					
Cirsium buchwaldii O. Hoffm.		+					
Geranium kilimandscharicum Engl.					+		
Sedum ruwenzoriense Bak.			1				
Carex ninagongensis (Kuk.)Rebyns		+				+	
Crassula pentandra (Edgeworth)Schonl.		+					
Mosses			3		2	1	2

TABLE 2		Carex bog (1)		Dendrosenecio Woodlands										Carex bog (2)			Euryops-Bush			Helichrysum Scrub		Tussock Grassland	
Type					D. barbatipes community						D. elgonensis community												
Number of plot	12	14	13	19	9	10	7	6	8	11	5	16	22	23	26	4	17	18	21	15	20	25	24
Altitude x 1000 (ft.)	13.0	12.9	13.0	12.9	13.4	13.5	13.7	13.7	13.8	13.1	13.9	13.1	12.8	12.7	12.0	11.9	13.1	13.1	12.8	13.1	12.9	12.6	12,6
Exposition	W	-	-	-	SW	W	W	W	W	W	-	-	SE	E	N	SSW	S	SE	E	-	NE	E	SSE
Slope (°)	3	0	0	0	5	5	20	30	50	10	0	0	5	5	7	10	<5	<5	5	0	<5	<5	5
Plant cover (%)	95	98	100	95	80	60	95	95	80	90	85	90	95	95	95	90	90	90	95	90	90	95	90
Number of species (Mosses = 1)	4	9	7	5	16	12	11	10	14	9	17	14	11	9	18	27	12	14	6	23	20	15	12
Alchemilla elgonensis Mildbr.	3			2	2	1	5	3	2	2	3	4	5	2		2	3	3	3	2	2		
Lobelia telekii Schweinf.				2	3	1	+	+	1		1						+	+		+	+		
Helichrysum amblyphyllum Mattf.					1	+	+	1	+		2	2		+		2	2	1		+	1		
Festuca abyssinica A. Rich.					+			+	1		+	+	+				1	+		1	1		
Valeriana kilimandscharica Engl.					+	+	1	1	1	1		1	+				1				+		
Dendrosenecio johnstonii ssp. barbatipes (Hedb.) B. Nord.				1(+)	3(3)	5(2)	2	2	1	2(1)	2	1(1)					+			(+)			
Bartsia kilimandscharica Engl.					+		+	1	1		+										1		
Swertia subnivalis T. Fries jr.					+	1	+				1												
Senecio sotikensis S. Moore					1	2				+													
Sedum ruwenzoriense Bak.					+	1	+																
Poa leptoclada Hochst.					+	+				+													
Xiphopteris flabelliformis (Poiret) Schelpe					+	+			+														
Heracleum elgonense (Wolff) Bullock					1				+														
Swertia uniflora Mildbr.												+	+							+			
Ranunculus oreophytus Del.											1	+											
Lobelia lindblomii Mildbr.											+	+								+			+
Dendrosenecio johnstonii ssp. elgonensis (T.C.E.Fries) B.Nord.											1	1(1)	1	1	2	3	+	1					
Lobelia elgonensis R.E.&T.Fries jr.		+	2											2	2	2							
Carex runssoroensis K. Schum.	3	3	5	4										5									
Carex ninagongensis (Kuk.) Rebyns															1	1							
Montia fontana L.			+											+									
Ranunculus volkensii Engl.		1																					
Eriocaulon volkensii Engl.		3																					
Lycopodium saururus Lam.		+														+							
Crassula granvikii Mildbr.			1																				
Sibthorpia europaea L.														+									
Alchemilla johnstonii Oliv.	3	2	2	2						4		4	2	3	2	1	3	3	4				
Euryops elgonensis Mattf.																3	2	3	4				
Peucedanum kerstenii Engl.											+					1		+	+				
Carduus keniensis R.E.Fries													+		+	1	2	2					
Pentaschistis minor (Ballard & C.E.Hubbard) Ballard & C.E. Hubbard											+							+		1			
Cerastium octandrum (Hochst.ex) A.Rich.						+				+										+	+		
Helichrysum citrispinum Del.																				1	1		
Crassula spec. B. Agnew									+		+									+	+	+	
Geranium kilimandscharicum Engl.													+			+				+	+	+	
Senecio snowdenii Hutch.											+					+	+	+		+	1	+	+
Helichrysum newii Oliv. & Hiern.																				3	3	2	1
Helichrysum forskahlii (J.G.Gmelin) Hilliard & Burtt.																		+		1	1	1	1
Festuca pilgeri St. Y.												+								2	3	4	5
Pentaschistis borussica (K. Schum.)Pilg.																						2	1
Koeleria capensis (Steud.) Nees																						+	+
Cirsium buchwaldii O. Hoffm.																						1	2
Conyza subscaposa O. Hoffm.																+						1	2
Mosses	+		3		3	2	5	5	3	2	4		+		1	2				3	2	4	4
Blaeria johnstonii Engl.																				+		+	
Galium ruwenzoriense (Cort.)Chiov.																1					+		
Galium glaciale K. Krause										+													
Agrostis gracilifolia C.E. Hubb.		+	+					1			1		+	+	+	2	+	+	+	2			
Agrostis kilimandscharica Mez				1				1				+			+	+		+				2	1
Luzula abyssinica Parl.											+	+								2	1	1	2
Swertia crassiuscula Gilg.		1					+		+			+				2							
Sagina abyssinica A. Rich.									+											+			
Trifolium cryptopodium A. Rich.																				1			
Veronica glandulosa Benth.													1		1				+				
Haplocarpha rueppellii (Sch. Bip.) Beauv.							+													1			
Haplosciadium abyssinicum Hochst.									1														
Satureja kilimandschari (Guerke) Hedb.																					+		
Helichrysum spec. (seedlings)		+																					
Cineraria grandiflora Vatke.																				+			
Anthospermum usambarensis K. Schum.																					+		
Piloselloides hirsuta (Forsk.) C. Jeffrey																					+	+	
Philippia keniensis S. Moore																2							
Artemisia afra Willd.																1							
Helichrysum odoratissimum (L.) Less.															+	1							
Hebenstretia cf. angolensis Rolfe															+	+							
Andropogon lima (Hark.)Stapf																+							
Scirpus spec. A															1	2							
Scirpus spec. B															4								
Veronica gunae Engl.																1							
Anagallis serpens D. C.															1	2							
Anthoxanthum nivale K. Schum.																+							
Cerastium afromontanum T.C.E.Fries & Weimark															+								
Festuca mekiste W.D.Clayton															+								
Hypericum kiboense Oliv.															+								