

Bryophytes of Uganda. 1. BBS Tropical Bryology Group expeditions, 1996-1998. Introduction and collecting sites.

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Abstract. The British Bryological Society Tropical Bryology Group (TBG) undertook three expeditions to Uganda, in Jan-Feb 1996, Jan-Feb 1997 and June-Jul 1998. Collections were made from 134 sites, mainly from national parks and forest reserves in western and southern Uganda

Introduction

The Afromontane region is bryologically rich, some areas having been well-studied; for example, the Bale Mountains, Ethiopia (Miehe & Miehe 1994), Rwanda and eastern Zaire (Fischer, 1993), and Kilimanjaro, the Usagara and Uluguru ranges, Tanzania (e.g. Pócs, 1990). Yet much of the archipelago remains relatively poorly-known, as attested by the relative ease of finding in this region species new to individual country lists or to continental Africa.

Many botanists have collected bryophytes in Uganda over the past hundred years, the most significant mentioned here. Some of the earliest collections were from the Rwenzori mountains made by G.F. Scott-Elliott in 1893/4 and G. Gola in 1907 (Gola 1907, 1909) and from Mt. Elgon

by R. Dümmer in 1918 (Dixon 1918, 1920). In 1948 O. Hedberg made large collections in the Rwenzori (mainly above the forest zone) and on Mt. Muhavura, his findings being published in Arnell (1956) and Potier de la Varde (1955). E.W. Jones made small collections in Budongo and Mpanga forests in 1955 in the course of his forestry work, and described new species from his own collections and from those of other Uganda-based botanists in the 1950s including G.K. Berrie, R. Gittins, E.M. Lind and G.H.S. Wood (e.g. Jones 1954, and later papers in his 'African Hepatics' series). Moss collections by Lind and Wood were published in Potier de la Varde (1956). F. Rose's large collections from Mt. Elgon still await study after 38 years. K.A. Lye has collected widely in Uganda, some of whose records were published by Jones in his

African Hepatics series, with many other liverwort records published in Lye & Pócs (1997). Other recent collections are by A.C. Crundwell and R. Ochyra. In 1997, T. Pócs and K.A. Lye collected in many sites not covered by the Tropical Bryology Group: some results of their surveys are given in this volume.

Notwithstanding this apparently large bulk of bryological work, many collections from Uganda are small or were made incidentally during silvicultural or other botanical studies, with some remaining unnamed in various herbaria. Geographical coverage was also very patchy, and it was clear that much remained to be learned of Uganda's bryophyte flora. The present project was initiated for this reason, and that it would appropriately continue the Tropical Bryology Group's theme of Afromontane surveys, previous expeditions having been to Mulanje Mountain, Malawi in 1991 (Longton, 1993) and the Drakensberg mountains of Lesotho and South Africa in 1995 (Hodgetts *et al.*, in press).

The initial main objective of the current project, supported by the British Government's Darwin Initiative Fund, was to undertake bryological surveys of submontane and montane forests, seeking to identify centres of bryological diversity as a contribution to their conservation. This objective was later widened to include the full range of montane to alpine habitats at visited sites. In addition to field survey, the Darwin funding also supported an introductory course on bryology for local botanists.

Three field expeditions were made to the study areas. The first, in January and February 1996, was to the Bwindi Impenetrable Forest in southwestern Uganda, where we carried out surveys of selected areas in and adjacent to the National Park. In addition to general collecting, a phytosociological study was made of the bryophytes within a range of altitudinal plots, including the characterisation of epiphytic communities on tree trunks using mini-quadrats. On the second expedition, in January and February 1997, we made representative collections from medium- and high altitude protected forests in western Uganda, including

Budongo, Kibale, Itwara, Kasyoha-Kitomi and Mgahinga. We had intended that the third expedition, in Jul 1998, would concentrate on the forest belt of the Rwenzori Mountains, for which there are very few bryological data. However, because of political instability in neighbouring Congo and the occurrence of armed incursions into the National Park, it was closed to researchers and visitors alike. The final expedition was therefore re-directed at short notice, and we surveyed some little-known areas of Mt. Elgon, a remaining large area of Afromontane Uganda which we had not visited hitherto. Botanists from Makerere University participated in the surveys of some sites.

In January 1998, the TBG ran a 7-day introductory course on bryophyte biology, ecology and identification, based at Kibale Forest Field Station, under the tutelage of J.W. Bates (University of London Imperial College), M.C.F. Proctor (University of Exeter) and A.R. Perry (National Museum of Wales). There were seventeen participants from institutions in Uganda and Kenya, including staff from Makerere University, Kampala, and the University of Nairobi.

The bulk of this paper gives details of the numbered collecting sites: the site number will be given in place of full locality details in future papers in this series. Collecting sites are listed in an approximate geographical sequence: from our most northwesterly site in Murchison Falls National Park, southwards in western Uganda to Mgahinga National Park in the extreme southwest, thence eastwards to Kampala, Jinja and Mt. Elgon National Park. The locations of sites were mostly determined in the field from 1:50000 Ordnance Survey of Uganda maps, though a hand-held GPS (Garmin 40) was used to fix or confirm positions where necessary. Most sites are defined in terms of a 1' square of latitude and longitude in order to facilitate any future mapping. Both latitude/longitude coordinates and UTM grid references are given, the latter often being more precise.

The number of packets are given in parentheses after the date in order to give some indication of

collecting effort at particular sites. It should be noted, however, that many of our packets contain mixed collections, since the degree to which individual species, tufts or clumps were placed in separate bags differed widely between collectors and sites, and at different times. For example, there might be 20 taxa stuffed into a single bag at a quick roadside stop, and be somewhat misleadingly shown as only (1) collection in the list below. In contrast, more careful collections from national parks and forest reserves were often single species into one bag. Table 1 gives an estimate of collecting effort in broad habitat types, with by far the largest number of collections made in the forest biome. The number of collections from each of the visited national parks and forest reserves is given in Table 2, the figures, generally speaking, being more a reflection of man-hours spent at any one site rather than its inherent bryological richness. In the Queen Elizabeth and Lake Mburu National Parks, savanna is predominant, a much neglected habitat bryologically in Africa, and one which would repay study if visited during or shortly after the rainy season.

Taxonomic results of this project will be published at intervals as the collections are identified, the first being in this volume (Porley, *et al.* 1999). In addition, the data will be held in the Uganda National Biodiversity Database at Makerere University Institute of Environment and Natural Resources (MUIENR). Collections will be housed at the Royal Botanic Gardens, Edinburgh, and at Makerere University, Kampala.

Sampled habitats

A very brief description is given of the broad habitats examined during the expeditions. Information on forest types and trees is largely culled from Eggeling (1947), Howard (1991), and Osmaston (1959). The altitudinal limits of medium- and high altitude forest types vary from one site to another, the high altitude types occurring over c. 1500 m (Langdale-Brown *et al.*, 1964).

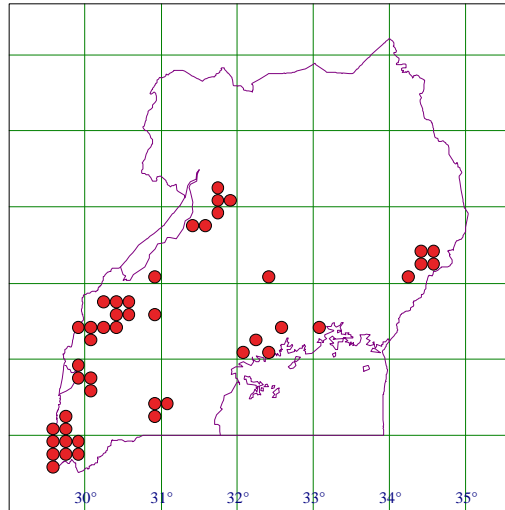
A high proportion (39%) of our collections were

from medium-altitude moist semi-deciduous and evergreen forest occurring up to c. 1750 m. Most of the samples were from Budongo FR, Itwara FR, Kibale NP, Kalinzu FR, Kasyoha-Kitomi FR and Bwindi NP. These forests encompass a wide range of types, with composition and canopy dominants depending on environmental and topographical factors. A great variety of dipterocarpous trees are represented, many of which are capable of growing into large canopy trees with buttresses (e.g., *Cynometra alexandri*, *Newtonia buchananii*, *Parinari excelsa*, *Chrysophyllum* sp.). Other frequent species include *Aningeria altissima*, *Carapa grandiflora*, *Olea welwitschii* and *Strombosia scheffleri*. *Parinari excelsa* is the canopy dominant in many forests, with *Cynometra alexandri* tending to be characteristic of drier areas at lower elevations, and *Pterygota mildbraedii*, *Celtis* and *Khaya* in marginally wetter areas.

High altitude moist evergreen forest was the next most frequently sampled formation, comprising c. 18% of the total. Forest types dominated by *Newtonia buchananii* and *Chrysophyllum* spp. are characteristic of altitudes at and above c. 1750 m in Bwindi NP, but further east in Mt. Elgon NP, high altitude forest between 2400 and 3000 m is characterised by *Hagenia abyssinica*-*Rapanea rhododendroides* forest with *Olea africana* and *Dombeya*, and *Podocarpus milanjianus* forest. Mt. Elgon shares many tree species with other eastern and northeastern forests of Uganda, including *Juniperus procera*. Valley groves of *Cyathea* sp. were of particular bryological interest at several localities, with *Rhizofabronia persoonii* var. *sphaerocarpa* characteristic on its trunks.

Above c. 2500 m, extensive bamboo (*Arundinaria alpina*) forest occurs locally, and was sampled in Bwindi NP and Mgahinga NP. Although typically low in bryophyte diversity, twiggy growths at the nodes often provided rich pickings, including *Daltonia* and many Lejeuneaceae. Montane heath, characterised by *Erica*, *Philippia* and *Hypericum*, was sampled on Sabinio (Mgahinga NP) and on Mt. Elgon (c. 11%). At the highest altitudes on Sabinio and Mt. Elgon (and the Rwenzori range - not

sampled) species of *Senecio* (*Dendrosenecio*) and *Lobelia* are prominent. A detailed study was made of the epiphytes of *Senecio johnstonii* on the caldera rim of Mt. Elgon.



A number of other habitats were examined in passing when the opportunity arose, including cultivations and tea plantations, roadside banks, built-structures, and non-forest trees. Isolated trees in particular, such as along roadsides in Fort Portal, were sometimes found to support a rich epiphytic flora, including species of *Forsstroemia*, *Orthotrichum* and *Syntrichia*. And we briefly examined presumed metal-rich deposits at Kilembe copper mines where the limited bryophyte flora included the copper-tolerant species *Scopelophila ligulata*.

Abbreviations:

NP: National Park
FR: Forest Reserve

COLLECTING SITES

MASINDI DISTRICT

1. Murchison Falls NP, The Falls: 2°16'N,

31°40'E; 36N/0302/5352; 655 m; 16 Feb 1996. Micaceous rocks near the falls. (1)

2. Murchison Falls NP, 5 km S of the Falls: 2°14'N, 31°40'E; 36N/0302/5339; 720 m; 16 Feb 1996. Rocky bank. (1)

3. Murchison Falls NP, Rabongo Forest: 2°05'N, 31°52'E; 36N/0302/7229, 7230, 7329, 7429; 915 m; 17-19 Feb 1996. Medium altitude moist semi-deciduous mixed forest dominated by *Cynometra alexandri*. (19)

4. Budongo FR, Royal Mile: 36N/0301/3788, 3789, 3790; 1065-1080 m; 21 Feb 1996, 24 Jan 1997. Forest bordering the road to Sonso Saw Mill. An 'avenue' of medium-aged to mature trees, mostly *Cynometra alexandri*, where shrubs and saplings have been removed in a 10-15 m zone on each side of the road. Forest habitats and roadside banks. (105)

4a. Royal Mile (S.): 1°42'N, 31°32'E. North to UTM 374898. (96)

4b. Royal Mile (N.): 1°43'N, 31°32'E. North from UTM 374898. (9)

5. Budongo FR, path from Royal Mile to boundary of Nyakafunjo Nature reserve: 990-1090 m; 24 Jan 1997. Medium altitude moist semi-deciduous mixed forest, extensively logged pre-1950. (19)

5a. path (E.): 1°42'N, 31°32'E; 36N/0301/368896 to 375891; 1000-1090 m. (5)

5b. path (W.): 1°42'N, 31°31'E; 36N/0301/364896 to 368896; 990-1000 m. (14)

6. Budongo FR, Nyakafunjo Nature Reserve: 1°42'N, 31°31'E; 36N/0301/3589, 3689; 1045-1075 m; 24 Jan 1997. Most collections near the main track between UTM 346900 and 363896. Medium altitude moist semi-deciduous mixed forest, dominated by *Khaya anthotheca*, *Entandrophragma* sp. and *Cynometra alexandri*, with *Alstonia*, *Chrysophyllum* and *Trichilia*. *Celtis* and *Lasiodiscus* locally abundant in the understory. (106)

7. Budongo FR, Sonso: 1°43'N, 31°33'E; 36N/0301/3891; 1075 m; 26 Jan 1997. Medium altitude moist semi-deciduous mixed forest along track NW from saw-mill, mainly between UTM 368911 and 393917 (Block N31). (27)

8. Budongo FR, 0.5 km S of Sonso mill, E of road: 1°43'N, 31°32'E; 36N/0301/377903; 1040 m; 26 Jan 1997. Swamp forest and mires, with *Raphia*. (41)

9. Budongo FR, 0.5 km S of Sonso mill, W of road: 1°43'N, 31°32'E; 36N/0301/374904; 1040 m; 26 Jan 1997. Forest, swamp and streamside near bridge at N end of Royal Mile. (23)

10. Budongo FR, Pabidi Forest: 25 Jan 1997. Medium altitude moist semi-deciduous mixed forest dominated by *Cynometra alexandri*. (47)

10a. main forest block: 1°55'N, 31°43'E; 36N/0301/5712, 5811, 5812, 5813; 975-990 m. Forest habitats on ± level ground, including streambanks and swamps. (38)

10b. main forest block (S.): 1°54'S, 31°43'E; 36N/0301/5811; 975-990 m. Forest habitats on ± level ground, including streambanks and swamps. (2)

10c. Pabidi Hill: 1°54'N, 31°43'E; 36N/0301/5811, 5911; 1000-1060 m. Epiphytes from dry *Combretum* - *Terminalia* - *Annona* open dry woodland on lower slopes of the hill. (7)

11. Nyabyeya Forest School, Budongo: 1°40'N, 31°32'E; 36N/0301/3785; 1040 m; 25 Jan 1997. Ruderal habitats. (1)

12. Masindi to Butiaba road, Nyabigoma, Kalyonpalala R., S of Budongo FR: 1030 m; 25 Jan 1997. (20)

12a. Bridge over river: 1°39'N, 31°30'E; 36N/0301/349841. (3)

12b. Swampy valley on N side of road: 1°39'N, 31°31'E; 36N/0301/3584. (17)

13. Budongo FR, Busingiro: 1°43'N, 31°28'E; 36N/0301/3089, 3090; 1000 m; 25 Jan 1997. Forest, N of the Butiaba road near the eco-tourism centre. (46)

14. between Biso and Butiaba: 1°45'N, 31°22'E; 36N/0301/1894; 880 m; 27 Jan 1997. Roadside cliff on side of Rift valley. (2)

KIBALE DISTRICT

15. between Pachwa and Kagadi: 1°05'N, 30°55'E; 36N/0201/6820; 1075 m; 27 Jan 1997. Small roadside forest patch. (1)

KABAROLE DISTRICT

16. 8 km E of Matira: 0°34'N, 30°50'E; 36N/0200/5961; 1260 m; 28 Jan 1997. Forest adjacent to the Mubende to Fort Portal road, between Kakabara and Matiri. Epiphytes from trunks and branches of mature forest trees. (18)

17. between Kyenjojo and Butiti: 0°39'N,

30°30'E; 36N/0100/2273; 1356 m; 28 Jan 1997. Steep and high grassy roadside embankment with rock exposures by main Fort Portal road. (4)

18. Fort Portal: 0°40'N, 30°16'E; 36N/0100/9774; 1555 m; 28 Jan 1997. Epiphytic bryophytes from trunks of mature trees on roadside near Mountains of the Moon Hotel, from UTM 973743 to 976744. (33)

19. Fort Portal: 0°40'N, 30°17'E; 36N/0100/977744; 1555 m; 28, 30 Jan 1997. Various habitats in the grounds of the Mountains of the Moon Hotel. (9)

20. Fort Portal: 0°39'N, 30°16'E; 36N/0100/966727; 1510 m; 28 Jan 1997. Tree trunks along Kyembambe road in the town centre. (2)

21. Fort Portal, Municipal Office (Boma): 0°40'N, 30°16'E; 36N/0100/9773; 1520 m; 29 Jan 1997. Trees near the offices. (4)

22. near Kichwamba: 0°44'N, 30°11'E; 36N/0100/870814; 1520 m; 26 Feb 1996. Rocky and earth bank by road from Fort Portal to Bundibugyo, c. 9 km from Fort Portal. (4)

23. Itwara FR: 0°47'N, 30°30'E; 36N/0200/2188, 2288; 1300-1370 m; 29 Jan 1997. The eastern side of the Forest Reserve, particularly the more humid forest in the vicinity of, and by, Sogohi stream at about UTM 216886. Medium altitude moist evergreen forest dominated by *Olea welwitschii*, with such species as *Aningeria altissima*, *Carapa grandiflora*, *Newtonia buchananii*, *Parinari excelsa* and *Strombosia scheffleri*. (91)

24. near Itwara FR: 0°47'N, 30°30'E; 36N/0200/2288; 1440 m; 29 Jan 1997. Soil banks, etc. in tea plantations adjacent to the forest. (3)

25. W. of Kyakatoma, near Mahoma River crossing: 0°29'N, 30°16'E; 36N/0100/962539; 1300 m; 30 Jan 1997. Stony soil banks by road. (12)

26. Tributary of Mahoma River, Mupanga Falls: 0°29'N, 30°15'E; 36N/0100/946530; 1250 m; 30 Jan 1997. Disturbed forest, river margins and small waterfall in valley. (15)

27. Kabata, Mahoma River, upper waterfall: 0°29'N, 30°16'E; 36N/0100/963532; 1300 m; 30 Jan 1997. Rocks, riverine and forest habitats near waterfall. (46)

28. above Lake Nyinambuga: 0°29'N, 30°17'E; 36N/0100/9854; 1340 m; 2 Feb 1998. E-facing slopes above the lake, and road cutting nearby.

Collections from trees and soil. (15)

29. Kasenda Estate: 0°26'N, 30°16'E; 36N/0100/973494; 1220 m; 2 Feb 1998. Stonework of bridge over stream. (7)

30. Kibale NP, Sebitoli Forest Station and Ranger Post: 0°38'N, 30°23'E; 36N/0200/089717; 1500 m; 28 Jan 1997. Trees near the buildings. (2)

31. Kibale NP, Sebitoli: 36N/0200/0872, 0971, 0972. Forest N of the Fort Portal to Mubende road and S of R. Mpanga. Medium altitude moist evergreen forest dominated by *Parinari excelsa*, with *Carapa grandiflora* and *Strombosia scheffleri*. (165)

31a. Sebitoli (E.): 0°38'N, 30°23'E; 36N/0200/0971; 1400-1420 m; 28 Jan 1997. Forest N to UTM northing 718. (156)

31b. Sebitoli (W.): 0°39'N, 30°23'E; 36N/0200/0872, 0972; 1400-1420 m; 27 Feb 1996. Forest N. of UTM northing 718. (9)

32. Kibale NP, Kanyawara: 1485-1560 m; Jan-Feb 1996-1998. Forest habitats at various sites within c. 1 km of Makerere University Biological Field Station (MUBFS). Medium altitude moist evergreen forest dominated by *Parinari excelsa*, with *Celtis* spp., *Olea welwitschii*, *Strombosia scheffleri*, etc., some logged. (344)

32a. Kanyawara (S): 0°33'N, 30°21'E; 36N/0200/0562, 0661, 0662; 1470-1530 m; 24 Feb 1996, 1 Feb 1997, 22-31 Jan 1998, 2 Feb 1998. Collections from forest habitats in this lat.-long. square. (293)

32b. Kanyawara (N): 0°34'N, 30°21'E; 36N/0200/0563, 0663; 1500-1560 m; 25, 28 Jan 1998. Collections from forest and ride habitats in this lat.-long. square. (51)

33. near Kibale NP, Rwetero: 0°29'N, 30°19'E; 36N/0200/0255; 1500 m; 25 Feb 1996.

Soil bank by Fort Portal to Bigodi road. (1)

34. between Isunga and Dura River: 0°28'N, 30°21'E; 36N/0200/0652; 1270 m; 1 Feb 1998. Roadside banks. (22)

35. Kibale NP, Dura River: 0°28'N, 30°22'E; 36N/0200/0851; 1245 m; 25 Feb 1996, 31 Jan 1997, 1, 3 Feb 1998. Forest and riversides on the E. and W. banks of the Dura River, S of the bridge. Also roadside gully nearby in UTM 0850. (129)

36. Kibale NP, Kanyanchu: 0°26'N, 30°23'E; 36N/0200/0948, 1048; 1225-1250 m; 31 Jan

1997. Forest E of the eco-tourism camp, S of Kanyantale. Medium altitude mixed moist semi-deciduous forest characterised by such species as *Aningeria altissima*, *Celtis* spp., *Chrysosphyllum* spp., *Diospyros abyssinica*, *Markhamia platycalyx*, *Newtonia buchanani*, *Olea welwitschii* and *Strombosia scheffleri*. (39)

37. Kibale NP, Kanyanchu: 0°26'N, 30°23'E; 36N/0200/1048; 1225 m; 25 Feb 1996. Forest near the 'Grassland Trail', close to eco-tourism camp. (1)

38. Kibale NP, Kanyanchu: 0°26'N, 30°23'E; 36N/0200/095482; 1220 m; 31 Jan 1997, 3 Feb 1998. W. side of the Bigodi road, near Kanyanchu river. Medium altitude mixed evergreen forest, some swamp forest with *Phoenix reclinata*. (77)

39. Ibanda to Nyabitaba path, Rwenzori NP: 2 Feb 1997. Collecting in all available habitats (forest, grassland, tracksides, riverine rocks, etc.) in the vicinity of the road and path from Ibanda to the slopes below Nyabitaba hut. The sub-sites below are defined on the basis of 1' squares of latitude and longitude, and the National Park boundary. (94)

39a. W. of Ibanda: 0°20'N, 30°02'E; 36N/0100/7038; 1615 m. Steep shaded roadside banks c. 2 km W of Ibanda at c. UTM 704384. (3)

39b. Ibanda to Rwenzori NP boundary: 0°21'N, 30°01'E; 36N/0100/687396-697387; 1650-1730 m. Tracksides including from shaded soil banks up to the Rwenzori NP boundary. (8)

39c. Rwenzori NP: 0°21'N, 30°01'E; 36N/0100/678401-687936; 1730-1920 m. Forest bordering the main path within Rwenzori NP in this 1' lat.-long. square. (14)

39d. Rwenzori NP to near Mahoma River: 0°21'N, 30°00'E; 36N/0100/660403-678401; 1920-2100 m. Forest bordering the main path within Rwenzori NP in this 1' lat.-long. square. (35)

39e. Rwenzori NP, Mahoma River: 0°21'N, 29°59'E; 35N/0800/336404; 2100 m. Where the main path crosses the river, shortly before the path steeply ascends to Nyabitaba hut. From rocks, from riverbanks, and epiphytes from trees and shrubs. (69)

39f. Rwenzori NP, path to Nyabitaba hut:

0°21'N, 29°59'E; 35N/0800/329404-336404; 2100-2350 m. Habitats along the steep path which ascends to Nyabitaba hut, including forest patches, tracksides, grassland, etc. (1)

40. Rwenzori NP, near John Mate Hut: 0°23'N, 29°55'E; 35N/0800/268426; 3320 m; 14 Feb 1997. Trees and shrubs in *Philippia* zone. (4)

41. Rwenzori NP, near Elena Hut: 0°22'N, 29°52'E; 35N/0800/206416; 4580 m; 16 Feb 1997. Rocks, and peaty humus in crevices and hollows in rocks. (9)

42. Rwenzori NP, Scott Elliot Pass: 0°21'N, 29°53'E; 35N/0800/2140; 4115 m; 17 Feb 1997. Epiphytes on small tree. (1)

43. Rwenzori NP, near Bujongolo: 0°21'N, 29°54'E; 35N/0800/2338; 3960 m; 18 Feb 1997. 'Dripping' rock cliff by trail. (5)

44. Rwenzori foothills, Kighuma trail W of Kazingo: UTM 36N/0100/87; 1080-2075 m; 31 Jan 1998. Trail from Kazingo (0°39'N, 30°10'E) to Mountains of the Moon campsite. Tracksides and streamside habitats. (29)

KASESE DISTRICT

45. Kilembe Copper/Cobalt Mine, level 45: 0°13'N, 30°00'E; 36N/0100/6623; 1360 m; 1 Feb 1997. Soil banks, stream banks, rocks and grassy slopes near mine. (38)

46. Queen Elizabeth NP, Lake Kitagata crater: 0°03'S, 29°59'E; 35M/0899/3192; 990 m; 1 Mar 1996. Soil and rocks near lake shore. (3)

47. Queen Elizabeth NP, above Lake Kitagata: 0°03'S, 29°59'E; 35M/0899/3192; 1060 m; 7 Feb 1996. Soil and rocks in rocky open grassland. (5)

48. Queen Elizabeth NP, Mweya: 0°11'S, 29°53'E; 35M/0899/2279; 945 m; 7 Feb 1996. Open soil in rough ground near the Ecology Institute buildings and Mweya lodge. (7)

BUSHENYI DISTRICT

49. Kalinzu FR, near Nkombe sawmill: 0°23'S, 30°05'E; 36M/0199/7557; 1440 m; 4 Feb 1997. Logged and degraded medium altitude forest near logging camp, and more natural *Cyathea* stands and streamsides. (103)

50. Kalinzu FR, felling site: 0°22'S, 30°04'E; 36M/0199/7557; 1450 m; 4 Feb 1997. From large fallen *Parinari excelsa* in forest clearing,

and epigeic collections nearby. (20)

51. E. of Kalinzu FR, Rushisha stream: 0°22'S, 30°06'E; 36M/0199/7857; 1430-1440 m; 4 Feb 1997. Degraded forest in small valley immediately downslope from Forest Department house on the main Bushenyi to Kasese road, S. of Kayanga. (52)

52. E. of Kalinzu FR: 0°22'S, 30°06'E; 36M/0199/7857; 1480 m; 4 Feb 1997. Rock cuttings by the road, and adjacent arable fields, c. 100 m S of forest office. (11)

53. Kasyoha-Kitomi (North Ankole) FR: 0°18'S, 30°07'E; 36M/0199/8065; 1350 m; 5 Feb 1997. Forest, near tributary of Chamburu river. (91)

54. near L. Mugogo, near Kasyoha-Kitomi FR: 0°17'N, 30°07'E; 36M/0199/803671; 1350 m; 5 Feb 1997. Non-forest habitats. (1)

RUKUNGIRI DISTRICT

55. Bwindi, Meizimeru camp: 1°01'S, 29°40'E; 35M/0798/9786; 2050 m; 27, 28 Jan 1996. Forest habitats. (49)

56. Bwindi NP, valley E of Kasiru: 1°01'S, 29°38'E; 35M/0798/9386; 2050-2110 m; 28 Jan 1996. Forest habitats. (57)

57. Bwindi NP, Kasiru: 1°01'S, 29°39'E; 35M/0898/9586; 2050-2110 m; 28 Jan 1996. Forest habitats between Meizimeru camp and valley E of Kasiru. (30)

58. Bwindi NP, Bukirobwomogogo and path to Meizimeru camp: 1°01'S, 29°40'E; 35M/0798/9886; 1750 m; 29 Jan 1996. Forest habitats. (37)

59. Bwindi NP, Hayomugando R. area: 1°01'S, 29°41'E; 35M/0798/9988; 1860 m; 29 Jan 1996. Forest habitats. (17)

60. Bwindi NP, Bitanwa: 1°00'S, 29°42'E; 35M/0898/0088; c. 1790 m; 27 Jan 1996. Forest habitats. (5)

61. E. of Rwenkubiro: 1°00'S, 29°44'E; 35M/0898/0489; 1980 m; 30, 31 Jan 1996. Steep roadside bank, between Ruhijja and Kitahurira Bridge, just N of the Bwindi NP boundary. (5)

62. near Mburameizi: 1°00'S, 29°45'E; 35M/0898/0687; 2080 m; 1 Feb 1996. Steep roadside bank, between Ruhijja and Kitahurira Bridge, just N of the Bwindi NP boundary. (2)

63. Mubar-Kanyamisinga area: 0°59'S, 29°42'E; 35M/0898/0190; 1710 m; 31 Jan 1996. Near-vertical faces of road cutting. (2)

64. Bwindi NP, near Kitahurira: 1480-1520 m; 30-31 Jan 1996. (68)

64a. Kitahurira Bridge: 0°59'S, 29°41'E; 35M/0798/9991; 1480 m. Stonework of bridge, ruderal habitats bordering the road, forest and riverine habitats from the bridge N to UTM 994913. (24)

64b. N. of Kitahurira Bridge: 0°58'S, 29°41'E; 35M/0798/9991; 1480-1520 m. Medium altitude moist mixed evergreen forest habitats, *Cyathea* stands and riverine habitats, from UTM 994913 to 996919. Research plot 4 at UTM 996919, 1500 m. (44)

65. Bwindi NP, 1 km N of Kitahurira Bridge: 0°59'S, 29°41'E; 35M/0798/9991; 1480-1520 m; 1 Feb 1996. Steep roadside bank, and epiphytes from fallen branches from large tree adjacent to the road. (27)

66. Bwindi NP, 1.5 km N of Kitahurira Bridge: 0°58'S, 29°41'E; 35M/0798/9991; 1480-1520 m; 1 Feb 1996. Near-vertical roadside banks, partly vegetated. (2)

67. near Kayonza: 0°55'S, 29°39'E; 35M/0798/961974; 1200 m; 1 Feb 1996. Epiphytes on trees in clearing by stream; by road c. 12 km N of Kitahurira Bridge. (3)

68. Bwindi NP, path from Buhoma towards Rukubira: 0°59'S, 29°36'E; 35M/0798/8889; 1600-1680 m; 2-3 Feb 1996. Forest habitats near the path from c. UTM 910910 to 894906. (35)

69. Bwindi NP, near Rukubira: 0°59'S, 29°35'E; 35M/0798/8889; 1600-1690 m; 3 Feb 1996. Hill forest near the border with Congo (Zaire). Research plot 5 at UTM 886896, 1680 m. (79)

70. Bwindi NP, Buhoma, main path, and path to waterfall: 1°00'S, 29°37'E; 35M/0798/9288; 1550-1720 m; 31 Jan 1996, 7-8 Feb 1997. Medium altitude moist mixed evergreen and semi-deciduous forest habitats, and associated banks, pathsides, river rocks, etc. from c. 915880 to waterfall estimated to be at UTM 923883. (336)

71. Bwindi NP, Buhoma, S of tourist camp towards waterfall trail: 0°59'S, 29°36'E; 35M/0798/9189, 9190; 1480-1520 m; 1-2 Feb 1996. Forest habitats near the main path. (20)

72. Buhoma, near tourist camp: 0°59'S, 29°36'E; 35M/0798/8991, 9091, 9191; c. 1400 m; 1-4 Feb 1996, 1-8 Feb 1997. N of Bwindi NP boundary. Downslope from tourist camp and

along the Munyaga River Trail: from streamside rocks, pathsides, grassland, trees and shrubs. Also W of the camp, tea plantations, and forest in this lat.-long. square. (49)

73. Bwindi NP, Kigina stream: 1°01'S, 29°37'E; 35M/0798/913865; 1620 m; 8 Feb 1997. Forest habitats, and stream banks and rocks, c. 5 km S of Buhoma. (34)

74. Buhoma, N of tourist camp: 0°58'S, 29°36'E; 35M/0798/9091; 1200 m; 3-4 Feb 1997. Tea plantation, roadside rocks, etc. (10)

75. Bwindi NP, Ishasha gorge: 35M/0799/9702, 9802; c. 1180 m; 7 Feb 1997. Degraded forest and open habitats on valley slopes of Ishasha gorge. (50)

75a. 0°53'S, 29°40'E. Collections in this 1' square. (46)

75b. 0°53'S, 29°41'E. Collections in this 1' square. (4)

76. N. of Kihihi, Kigezi Game Reserve: 0°42'S, 29°40'E; c. 1000 m; 5 Feb 1996. Roadside trees in dry savanna woodland. (1)

77. 3 km S of Kanugu: 0°54'S, 29°47'E; 35M/0899/0998; c. 1500 m; 9 Feb 1997. Earthy bank by Kabale road. (2)

KABALE DISTRICT

78. Bwindi NP, Kabale road: 1°05'S, 29°48'E; 35M/0898/1278; 2200 m; 27 Jan 1996. SE side of the forest: rock and earth cutting by road. (9)

79. Bwindi NP, Ruhijja: 1°02'S, 29°46'E; 35M/0898/0884, 0983, 0984; 2250-2420 m; 23-30 Jan 1996. From rocks, soil exposures, tree bases and trunks on roadsides in the vicinity of the Institute of Tropical Forest Ecology 'Guest House' at UTM 090839, and N to the ITFE headquarters buildings at UTM 085845. (116)

80. Bwindi NP, c. 8 km SE of ITFE Guest House: 1°04'S, 29°48'E; 35M/0898/1280; 2415 m; 26 Jan 1996. Higher altitude moist semi-deciduous forest, dominated by bamboo *Sinarundinaria alpina*. Research plot 1 at UTM 121808. (56)

81. Bwindi NP, Mubwindi swamp path: 26 Jan 1996. Most of the track is within latitude 1°3'S, with the southern ½ km in 1°4'S. (108)

81a. track from road to 1°03'S, 29°46'E; 35M/0898/092837 to 083820; 2130-2410 m. Forest, scrub, swamps and grassy tracks and glades in the vicinity of the track. (44)

81b. S. end of the track to the edge of the swamp: 1°04'S, 29°46'E; 35M/0898/080816 to 083820; 2070-2130 m. Forest, shrub, swamps and grassy tracks and glades. (64)

82. Bwindi NP, near Ruhijja, nature reserve path: 1°03'S, 29°46'E; 35M/0898/0982, 0983; 2270-2300 m; 25, 27 Jan 1996. Higher altitude mixed forest habitats. Research plot 2 at UTM 092828. (97)

83. Bwindi NP, near Ruhijja, 'Kaserasere path': 29 Jan 1996. Path running W. from road c. 1 km N of the ITFE 'Guest House', 2 km to the stream. (69)

83a. path (west): 1°02'S, 29°45'E; 35M/0898/0684, 0784; 1950-2100 m. High altitude mixed forest habitats from UTM 080842 to swamp and stream at UTM 068840 (i.e., in the above lat.-long square). Research plot 3 at UTM 076840. (50)

83b. path (east): 1°02'S, 29°46'E; 35M/0898/0884; 2100-2280 m. Forest habitats from start of path at c. UTM 084844 to 080842 (i.e., in the above lat.-long. square). (19)

84. near Rutoma, Kabale to Kanungu road: 1°04'S, 29°54'E; 35M/0898/2382; 2000 m; 9 Feb 1997. Near-vertical rock scar by road. (5)

85. near Karengyere, c. 4 km N of Echuya Forest: 1°13'S, 29°48'E; 35M/0898/1265; 2500 m; 9 Feb 1997. Concrete drainage culvert by road. (1)

86. Kabale, White Horse Inn: 1°15'S, 29°59'E; 35M/0898/329614; 1875 m; 11 Feb 1997. Trees, soil, walls, etc. in hotel grounds. (1)

KISORO DISTRICT

87. Echuya FR: 1°15'S, 29°47'E; 35M/0898/1061; 2430 m; 9 Feb 1997. Roadside soil exposures and banks, none from the bamboo forest bordering the road. (7)

88. Mgahinga NP, tourist camp: 1°21'S, 29°37'E; 35M/0798/914504; 2300 m; 9 Feb 1998. On rocks by bandas. (2)

89. Mgahinga NP, slopes and summit of Sabinio: 10 Feb 1997. Forest and scrub, grassland, tracksides on flat ground between the NP headquarters and the slopes of Sabinio. One group collected on the lower and mid-slopes of Sabinio, along the border with Congo, (Zaire) (the 'Gorilla Grid trail') and along paths to the

east. The other group ascended to the summit of Sabinio by a path still further east, with most collecting at the highest altitudes. Six sub-sites according to 1' squares of latitude and longitude. (262)

89a. between HQ and lower slopes: 1°21'S, 29°36'E; 35M/0798/8949, 9050; 2400-2620 m. Herb-rich grassland, scrub, mire and forest on flat or gently sloping ground below Sabinio slopes, and bamboo zone from c. 2500 m in the vicinity of the path from UTM 905504 to 894488. (94)

89b. mid-slopes: 1°22'S, 29°35'E; 35M/0798/8848, 8948; 2620-2710 m. Bamboo forest on lower- and mid-altitude slopes, trackside grassy banks and rocks, etc. in the vicinity of the path from UTM 894488 to 893484 and 890488. (31)

89c. border path: 1°21'S, 29°35'E; 35M/0798/8849, 8950; 2350-2620 m. Open forest and scrub by Congo (Zaire) border path from UTM 890488 to 894507. Some collecting also in Congo (Zaire). (44)

89d. lower forest: 1°20'S, 29°36'E; 35M/0798/8950, 8951; 2290-2350 m. Forest on gently sloping or flat ground below Sabinio slopes, and more open grassy/rocky banks by track, from UTM 894507 to c. 896513. (17)

89e. NW slopes: 1°22'S, 29°36'E; 35M/0798/8947, 9047, 9048; c. 2600-3050 m. Bamboo forest, and rocks & soil by path. (19)

89f. summit area of Sabinio: 1°23'S, 29°35'E; 35M/0798/8846, 8946; 3050-3416 m. Montane heath and grass communities of summit area. (57)

MBARARA DISTRICT

90. Lake Mburu NP, Warukiri Track: 0°39'S, 30°59'E; 36M/0299/7528; 1280 m; 23 Feb 1997. Open savanna woodland, epiphytic species on tree trunks and branches. (8)

91. Lake Mburu NP, Kigambira Loop: 0°41'S, 30°56'E; 36M/0299/710240; 1250 m; 20 Jul 1998. Termite mounds. (3)

92. Lake Mburu NP, Runoni Rocks: 0°33'S, 31°1'E; 36M/0399/8037; 1400 m; 20 Jul 1998. Damp depressions in rock kopje. (1)

LUWERO DISTRICT

93. near Kakooge: 1°01'N, 32°28'E; 36N/0401/4012; 1064 m; 15 Feb 1996. Epiphytes from

small tree in swampy savanna grassland near main Luwero road, c. 7 km N of Kakooge. (3)

MPIGI DISTRICT

94. Mpanga Forest nature reserve: 0°12'N, 32°18'E; 36N/0400/2223; 1190 m; 4 Mar 1996. Forest habitats in small nature reserve c. 3 km W of Mpigi town, on the N side of Kampala to Masaka road. (36)

95. Equator, S of Buwama: 0°00'N/S, 32°02'E; 36N/0300/928000; 1190 m; 23 Jan 1996. Stone steps by house. (1)

96. Entebbe Botanic Garden: 0°04'N, 32°28'E; 36N/0400/4207; 1130 m; 21 Jan 1996, 22 Jan 1997, 12 Mar 1997. Mostly from damp soil and stones by paths and a stream in forest patches, and from termite mounds and tree trunks. (18)

97. Kawanda Agricultural Research Station: 0°24'N, 32°32'E; 36N/0400/4845; 1160 m; 9 Feb 1996. Epiphytes from tree in the grounds. (4)

KAMPALA DISTRICT

98. Makerere University campus, Kampala: 0°20'N, 32°34'E; 36N/0400/5237; 1235 m; 21-23 Jan 1996, 22 Jan 1997. Epiphytic and epigeic species near the University Guest House, and in Garden Hill. (14)

99. Kampala, grounds of the Nile Grill, Kampala Road: 0°18'N, 32°34'E; 36N/0400/535347; 1160 m; 20 Jan 1998. On thatch. (1)

JINJA DISTRICT

100. Bujagali Falls: 0°29'N, 33°9'E; 36N/0500/1753; 1090 m; 24 Feb 1997. Rocks in spray zone by the rapids. (2)

MPALE DISTRICT

101. Bulwalasi: 1°09'N, 34°13'E; 36N/0601/32; 500 m; 2 Jul 1998. Roadside soil banks. (6)

102. Keserum: 1°19'N, 34°20'E; 36N/0601/484456; 1450 m; 3 Jul 1998. Roadside banks. (12)

103. Sipi: 1°20'N, 34°21'E; 36N/0601/509475; 1800 m; 3 Jul 1998. Roadside cliffs. (7)

104. Mise Cave: 1°24'N, 34°22'E; 36N/0601/539477; 1850 m; 3 Jul 1998. Basaltic rocks by cave. (17)

105. Mt. Elgon Hotel, Mbale: 1°4'N, 34°10'E; 36N/0601/31; 1150 m; 2 Jul 1998. Tree trunk in hotel grounds. (1)

KAPCHORWA DISTRICT

106. Kapchorwa: 1°24'N, 34°26'E; 36N/0601/602551; 1900 m; 3 Jul 1998. Roadside cliffs. (17)

107. Mt. Elgon NP. Kapkwata Forest Station: 1°21'N, 34°38'E; 36N/0601/821499; 2165 m; 4 Jul 1998. Trees, rocks and soil. (21)

108. Mt. Elgon NP. Kapkwata to Piswa trail: 1°N, 34°E; 36N/0601/84; 5 Jul 1998. Forest and heath habitats. (4)

109. Mt. Elgon NP. Kapkwata to Piswa trail: 1°20'N, 34°35'E; 36N/0601/762482; 2610 m; 5 Jul 1998. Open flushed rocky area. (2)

110. Mt. Elgon NP. Kapkwata to Piswa trail: 1°19'N, 34°34'E; 36N/0601/743460; 2750 m; 5 Jul 1998. Trees on open area. (2)

111. Mt. Elgon NP. vicinity of Piswa Hut: 1°19'N, 34°33'E; 36N/0601/729459; 2900 m; 5-6 Jul 1998. Montane habitats. (164)

112. Mt. Elgon NP. S of Piswa Hut: 1°18'N, 34°33'E; 36N/0601/7244, 7245; 2780-2900 m; 6, 12, 15 Jul 1998. *Olea africana* forest with *Podocarpus*, and old-growth riverine *Podocarpus-Olea* forest with *Lobelia*. (78)

113. Mt. Elgon NP, W of Piswa Hut: 36N/0601/7045, 7145; 2700-2900 m; 6 Jul 1998. Afromontane habitats.

113a. 1°18'N, 34°32'E.

113b. 1°19'N, 34°32'E.

114. Mt. Elgon NP, Piswa to Hunter's Cave trail: 1°16'N, 34°32'E; 36N/0601/7240; 3170 m; 11 Jul 1998. Afromontane habitats.

115. Mt. Elgon NP, Piswa to Hunter's Cave trail: 1°16'N, 34°33'E; 36N/0601/7240; 3250-3500 m; 7, 13 Jul 1998. Open ericaceous heath forest, with *Senecio*, and rocky gully. (88)

116. Mt. Elgon NP, Piswa to Hunter's Cave trail: 1°13'N, 34°32'E; 36N/0601/720358; 3435 m; 7-8 Jul 1998. (2)

117. Mt. Elgon NP, vicinity of Hunter's Cave: 1°12'N, 34°33'E; 36N/0601/7233; 3600-3850 m; 7 Jul 1998. Montane habitats, streamside near Hunter's Cave (2)

118. Mt. Elgon NP, Hunter's Cave to caldera trail: 1°11'N, 34°33'E; 36N/0601/727313; 3890

Table 1. Number of collections from broad habitat types

Medium altitude forest communities (below c. 1750 m)	1921 (38.6 %)
High altitude forest communities, including bamboo and low-canopy montane (above c. 1500 m)	929 (18.6 %)
Swamp forest and streamsides	361 (7.2 %)
Savanna habitats	33 (0.7 %)
Other grassland & scrub, including roadside banks	105 (2.1 %)
Riverine habitats	250 (5.0 %)
Montane heath, moor and rock (c. 2000-3500 m)	557 (11.2 %)
Alpine heath, moor and rock (>3500 m)	414 (8.3 %)
Lowland soil banks and rock, including cliffs and caves	265 (5.3 %)
Urban and gardens	97 (1.9 %)
Cultivated land	25 (0.5 %)
Man-made structures	24 (0.5 %)
total number of collections (packets)	4981

Table 2. Number of collections from National Parks and Forest Reserves

Murchison Falls National Park (mainly Rabongo Forest)	21
Budongo Forest Reserve	414
Itwara Forest Reserve	91
Kibale National Park	779
Rwenzori Mountains National Park	149
Queen Elizabeth National Park	15
Kalinzu Forest Reserve	123
Kasyoha-Kitomi Forest Reserve	91
Bwindi Impenetrable Forest National Park	1319
Mgahinga Gorilla National Park	264
Lake Mburu National Park	12
Mt. Elgon National Park	1019
number of collections from NP and FR (90.2 % of the total)	4496

m; 8-10 Jul 1998. Open rocky areas with abundant (*Dendro*)*senecio*. (29)

119. Mt. Elgon, Hunter's Cave to caldera trail: 1°11'N, 34°33'E; 36N/0601/727322; 3790 m; 8 Jul 1998. Afroalpine habitats. (1)

120. Mt. Elgon NP, caldera rim: 1°10'N, 34°33'E; 36N/0601/728306; 4010-4025 m; 8 Jul

1998. Rock outcrops in afroalpine zone. (38)

121. Mt. Elgon NP, caldera floor, below rim: 1°10'N, 34°33'E; 36N/0601/7230; 3960-3990 m; 8 Jul 1998. Afroalpine habitats. (50)

122. Mt. Elgon NP, Mubiyi, caldera rim: 1°10'N, 34°32'E; 36N/0601/7029; 4210 m; 9 Jul 1998. Rocky peaks and boulder scree. (83)

123. Mt. Elgon NP, caldera rim: 1°11'N, 34°32'E; 36N/0601/73; 10 Jul 1998. (22)

123a. 36N/0601/715310-717312; 3990 m. *Senecio* forest habitats.

123b. 36N/0601/714309; 3960 m. Rock habitats.

124. Mt. Elgon NP, below caldera rim: 1°10'N, 34°32'E; 36N/0601/715302; 4035 m; 9 Jul 1998. Afroalpine habitats. (2)

125. Mt. Elgon NP, Hunter's Cave to Piswa trail: 1°13'N, 34°33'E; 36N/0601/723345; 3490 m; 11 Jul 1998. Moorland habitats. (1)

126. Mt. Elgon NP, Hunter's Cave to Piswa trail: 1°14'N, 34°32'E; 36N/0601/710368; 3385 m; 11 Jul 1998. Rocks by small waterfall. (19)

127. Mt. Elgon NP, Hunter's Cave to Piswa trail: 1°15'N, 34°32'E; 36N/0601/7238; 3310-3500 m; 11 Jul 1998. Streambanks in open moorland and habitats nearby. (20)

128. Mt. Elgon NP, Piswa: 1°16'N, 34°33'E; 36N/0601/730410; 3100 m; 13 Jul 1998. *Hagenia* - *Rapanea* forest. (17)

129. Mt. Elgon NP, Piswa: 1°17'N, 34°33'E; 36N/0601/732420; 2970 m; 14 Jul 1998. *Hagenia* - *Rapanea* - *Olea africana* forest. (62)

130. Mt. Elgon NP, valley of E-W stream from the Atari River - slopes below Piswa: 36N/0601/46; 13 Jul 1998.

130a. 1°19'N, 34°30'E; 2550-2650 m.

130b. 1°19'N, 34°31'E; 2650-2850 m.

131. Mt. Elgon NP, NE of Piswa: 1°19'N, 34°33'E; 36N/0601/7346, 7347; 2800-2900 m; 14 Jul 1998.

132. Mt. Elgon NP, waterfall S of Piswa: 1°16'N, 34°32'E; 36N/0601/721415; 3080 m; 15 Jul 1998. Rocks by waterfall, epiphytes, etc. (72)

133. Mt. Elgon NP, Siti River: 1°17'N, 34°34'E; 36N/0601/743428; 2800 m; 16 Jul 1998. Rocks and cliffs by river, and flood-plain habitats. (78)

134. Mt. Elgon NP, near Kapkwata Forest Station: 1°20'N, 34°37'E; 36N/0601/84; 2200-2500 m; 15 Jul 1998.

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