

Lichens from Tanzania and Kenya III. Macrolichens and calicioid lichens

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Abstract – 156 species of macrolichens and calicioid lichens are reported from Tanzania and Kenya. 28 species are new for Tanzania and 2 for Kenya. New for Africa are *Hypotrachyna novella*, *H. physcioides*, *Melanelia panniformis*, *Physcidia squamulosa*, and *Xanthoparmelia microspora*.

Biogeography/ Macrolichens / Caliciales / Kenya / Tanzania

INTRODUCTION

The Eastern Arc is an ancient mountain chain now broken up into a number of mountain blocks, among which the Udzungwa Mts., Uluguru Mts. and Usambara Mts. are well-known for a great number of endemic species of plants and animals. The aim of the present study was to investigate whether endemic lichens were also abundant.

MATERIALS AND METHODS

The material was collected by the first author: the Tanzanian material in 1996-2000; the Kenyan collections are from 1987-1988 [NB: numbers without a prefix from this period were identified by André Aptroot], and 2000-2001. Most

of the collections are from the Uluguru Mts. and the Udzungwa Mts., but other mountain areas and lowland localities were also sampled.

P.K. Divakar identified the parmelioid lichens, S. LaGreca the genus *Ramalina*, R. Moberg the Physciaceae, and L. Tibell the calicioid lichens unless otherwise stated. All other lichens were identified by the first author.

The material was studied using standardized methods of microscopy and thin-layer chromatography when relevant.

RESULTS AND DISCUSSION

Our results indicate a low level of endemism among the groups dealt with so far, only one undescribed species of Caliciales and two of *Cladonia* (to be described separately), were found. Recently Frisch (2006) described two new species in Thelotremaaceae from the Eastern Arc.

Time will show whether any of them are endemic. On the other hand many floristically interesting, but non-endemic, species have been found. Parmelioid lichens constitute the major part of the macrolichen flora. The majority of the species (130 species) were found in mountain areas, 21 of these species were also found at lower elevations, while 20 species were found only at intermediate levels, mostly in rather dry situations, and 6 species are distinctly coastal. Previous contributions to the knowledge of the lichen flora in the area were published by Farkas (1987), Krog (2000), Timdal & Krog (2001), Alstrup & Aptroot (2005) and Alstrup & Christensen (2006).

LOCALITIES

Tanzania:

Bagamoyo district, Mapinga village, **Changwahela**, 06°31'S, 39°04'E, mangrove and shrub on dune sand, alt 0-5 m.

Dar Es Salaam district, University of **Dar Es Salaam** campus, c. 07°05'S, 39°00'E, alt. 100 m, shade trees.

Kigoma district, **Gombe** Stream National Park, 04°50'S, 29°32'E, riverine forest.

Iringa district, Udzungwa Mts., **Idete**, 08°10'S, 36°01'E, alt. 1600-1700 m, agricultural landscape, road sides.

Iringa district, Udzungwa Mts., **Ilutile**, 08°11'S, 35°57'E, alt. 1900 m, village area with scattered trees.

Iringa district, Udzungwa Mts., **Ilutile Forest**, 08°12'S, 35°58'E, alt 1900 m, mountain rain forest.

Iringa district, Udzungwa Mts., **Itonya** village, 08°11'S, 35°58'E, alt. 1500 m, agricultural area with scattered trees and disturbed forest remnant.

Iringa district, Udzungwa Mts., **Itonya Forest**, 08°12'S, 36°02'E, alt. 1500-1700 m, mountain rain forest.

Bagamoyo district, **Kaole**, Kaole Ruins, c. 06°30' S, 38°55'E, on wall of ruin.

Kigoma district, **Kigoma**, about 10 km N of town, on shore of lake Tanganyika, 04°58'S, 29°32'E, rocks and shrub.

Iringa district, Udzungwa Mts., between **Kivulamo** and Idunda villages, 08°08'S, 36°04'E, alt. 1600-1700 m, mountain rain forest.

Morogoro district, Uluguru Mts., **Luhangalo** Plateau, 07°07'S, 37°35-38'E, alt. 2300-2450 m, remnants of mountain rain forest, freestanding trees, soil and rock.

Morogoro district, Udzungwa Mts., **Luhega** Forest Reserve, c. 08°25'S, 36°00-10'E, alt. 300-900 m, mountain rain forest.

Iringa district, Udzungwa Mts., c. 5 km E **Massisiwe**, 08°23'S, 36°01'E, alt. 2200-2500 m, mountain rain forest.

Kyela district, Livingstone Mts., **Matema Beach**, 09°30'S, 39°30'E, forested slope at Lake Nyassa.

Bagamoyo district, peninsula opposite **Mbeganif**, c. 06°30'S, 39°00'E, alt. 0-5 m, dune shrub.

Mikumi district, 10 km S of **Mikumi** town, c. 07°30'S, 36°45'E, trees and rocks along river.

Monduli district, **Monduli** village, c. 03°18'S, 36°28'E, road-side trees.

Morogoro district, **Morogoro**, c. 06°18'S, 37°40'E, forested valleys in the outskirts of town.

Iringa district, Lukosi River Valley, **Mtandike**, 07°31'S, 36°32'E, alt. 550 m, riverine shrub, rocks and valley slope with *Adansonia digitata*.

Mbeya district, **Ngazi** Crater near Tukuyu, c. 09°08'S, 33°25'E, mountain forest.

Kissarawa district, **Pugu Hills**, c. 3 km W Kissarawa, c. 06°54'S, 39°05' E, alt. c.300 m.

Morogoro district, Udzungwa Mts., **Sanje** Waterfall, c. 07°43'S, 36°55'E, mountain rain forest.

Morogoro district, Uluguru Mts., **Tschenzema**, 07°07'S, 37°34'E, alt. 1900-2200 m, agricultural area with scattered trees.

Kenya:

Ngong district, near **Kajiado** on the Nairobi-Namanga road, c. 02°45'S, 37°00'E, road-side trees.

Nairobi, **Kamera** Forest, c. 01°30'S, 37°00'E, lowland forest.

Kitui district, **Kathunga**, c. 02°20'S, 37°30'E, bushland.

Kitui district, 3 km east of **Kitui**, c. 01°30'S, 38°10'E, rock outcrop and forest remnants.

Kitui district, 5 km S **Mutito** on road to Zombe, semi-arid bushland.

Nairobi district, **Nairobi** University Campus, c. 01°30'S, 37°00'E, shade trees.

Kitui district, **Ngomeini**, c. 01°00'S, 37°30'E, dry bush and rock outcrop.

Ngong district, **Ngong**, c. 01°23'S, 36°38'E, trees at police office.

Ngong district, **Ngong Hills**, c. 01°24'S, 36°36'E, alt. 2000-2300 m, shrub, rocks and remnants of mountain rain forest.

SPECIES

** = species new to East Africa.

* = species new to either Tanzania or Kenya.

Bulbothrix isidiza (Nyl.) Hale

Nairobi K351.

A pantropical species already known from Kenya and Tanzania.

Chemistry: Atranorin and salazinic acid.

Bulbothrix aff. *meizospora* (Nyl.) Hale

Luhangalo TZ 2958b.

This is primarily an Asian species, distributed in Africa, India, Nepal and Pakistan.

Chemistry: Atranorin and salazinic acid.

Bulbothrix pustulata (Hale) Hale

Massisiwe TZ1081, TZ1098 TZ1020.

The species is endemic to Africa.

Chemistry: Atranorin and salazinic acid.

Bulbothrix sensibilis (Steiner & Zahlbr.) Hale

Ilutile TZ619.

The species is found in Africa, India and South America.

Chemistry: Atranorin and salazinic acid.

****Bulbothrix suffixa*** (Stirton) Hale

Ilutile Forest TZ901; Luhangalo TZ3473.

The species was known from Kenya, Mauritius, South Africa, S and C America. Chemistry: Atranorin and gyrophoric acid.

Bulbothrix tabacina (Mont. & v. d. Bosch) Hale

Luhangalo TZ 3423; Ilutile TZ714; Ilutile Forest TZ758a (with *Parmelinopsis minarum*); Idete TZ525, TZ552, TZ550; Itonya TZ1772.

A pantropical species already known from Kenya and Tanzania.

Chemistry: Atranorin, salazinic and consalazinic acids.

Bunodophoron melanocarpus (Swartz) Wedin

Luhangalo TZ2726, TZ5634 (det. VA).

Worldwide distributed in tropical to temperate oceanic areas.

****Calicium diploellum*** Nyl.

Luhangalo TZ2736.

In Africa previously only reported from high altitude in Kenya (Tibell 2001). Otherwise only known from Europe.

Calicium hyperelloides Nyl.

Idete TZ528, TZ584; Massisiwe TZ1004, TZ1154; TZ1163; Luhangalo TZ2782a, TZ2835, TZ3201.

Widely distributed in tropical to warm temperate/subtropical areas of both hemispheres (Europe, Asia, the Americas, and Australasia). In Africa known from moderate to high altitudes in Equatorial Guinea and Tanzania (Tibell 1981, 2001). Also reported from 'East Africa' by Swinscow & Krog (1988).

Calicium salicinum Pers.

Massisiwe TZ1003.

Very widely distributed in cool to temperate areas of both hemispheres (Europe, Asia, the Americas, and Australasia). In Africa occurring at moderate to high altitudes from Algeria to South Africa (Kenya, Malawi, Tanzania, Uganda; Tibell 2001). Also reported from 'East Africa' by Swinscow & Krog (1988).

Candelaria concolor (Dickson) B. Stein

Mtandike TZ1945; Morogoro TZ3407; Luhangalo TZ2730; Kivulamo TZ4186; Mutito 1559.

Widespread in tropical and temperate regions.

Candelaria fibrosa (Fr.) Müll. Arg.

Monduli TZ5781; Ngong Hills K6436.

Widespread in tropical and subtropical areas.

Candelaria fruticans Poelt & Oberwinkler

Ngong Hills 1514.

Already known from Kenya and tropical America.

*****Canoparmelia concrescens*** (Vain.) Elix & Hale

Luhega TZ2033, TZ2077.

The species is new record for East African lichen flora. It was previously known from South Africa (Hale 1976). The species has a distribution restricted to Africa. Chemistry: Atranorin and divaricatic acid.

Canoparmelia crozalsiana (B. de Lesd.) Elix & Hale
Kamera K336; Kitui 1532.

This is a widely distributed species known from Africa, America, Asia and Europe.
Chemistry: Atranorin and stictic acid.

Canoparmelia texana (Tuck.) Elix & Hale
Massisiwe TZ1039; Kitui 1532.

It is widely distributed in tropical and subtropical regions.
Chemistry: Atranorin and divaricatic acid.

****Canoparmelia zimbabwensis*** (Hale) Elix & Hale
Luhega TZ 2230.

This is new for Tanzania, already known from Kenya. It is endemic to Africa and known from East and South Africa.
Chemistry: Atranorin and protocetraric acid.

*****Cetraria aculeata*** (Schreb.) Fr.
Luhangalo TZ3461.

New to E Africa. The species has a worldwide distribution especially in colder areas.

****Cetrelia braunsiana*** (Müll. Arg.) W. Culb. & C. Culb.
Luhangalo TZ3021.

This species was known from Kenya, Asia and New Zealand.
Chemistry: Atranorin, alectoronic and α -collatolic acids.

Chaenotheca furfuracea (L.) Tibell
Luhangalo TZ2808.

Widespread in temperate to arctic regions. In Africa previously known from moderate to high altitudes in Rwanda, Tanzania and Zaire (Tibell 2001). Also reported from 'East Africa' by Swinscow & Krow (1988).

Chaenotheca hygrophila Tibell
Ilutile TZ678.

Widely distributed in Europe, Asia, North America, and Australasia. Previously known from high altitudes in East Africa (Uganda; Tibell 2001). Also reported from 'East Africa' by Swinscow & Krog (1988).

Dibaeis baeomyces (L.f.) Rambold & Hertel
Luhangalo TZ2737.

Widespread in temperate to low arctic regions.

Dirinaria aegialita (Ach.) Moore
Mikumi TZ2412; Ngong Hills K316; Kitui 1549.
A pantropical species.

Dirinaria applanata (Fée) Awasthi
Mtandike TZ1949; Luhega TZ2256, TZ2307 (cfr.). Changwahela TZ4139 (cfr.);
Kivulamo TZ4183; Mutito K1557; Kitui 1531, 1548.
The species has pantropical distribution.

Dirinaria confluens (Fr.) Awasthi

Ilutile TZ706; Changwahela TZ4140; Kivulamo TZ4185.

Widespread in tropical and warm temperate regions.

Dirinaria picta (Swartz) Clements & Shear.

Dar TZ5546; Changwahela TZ4043, TZ4087; Kathunga 1580.

Worldwide in tropical and subtropical regions.

****Everniastrum africanum*** (W. Culb. & C. Culb.) Sipman

Kivulamo TZ1523, TZ1595; TZ1818 p.p.; Ilutile Forest TZ618 p.p.; Itonya TZ1877; Massisiwe TZ1014, TZ1135; Luhangalo TZ2853, TZ3061, TZ3102; Ngong Hills 1499.

New to Kenya. The species is endemic to Africa and is known from Kenya and Tanzania only.

Chemistry: Atranorin, alectoronic and echinocarpic acids.

Everniastrum sorocheilum (Vainio) Hale ex Sipman

Luhangalo TZ2854.

Widespread in tropical and warm temperate regions.

Chemistry: Atranorin and salazinic acid.

Everniastrum vexans (Zahlbr.) Hale ex Sipman

Massisiwe TZ1101, TZ1102; Itonya Forest TZ1887.

Reported from Kenya, Tanzania, Central and South America and Asia.

Chemistry: Atranorin and salazinic acid.

Flavoparmelia caperata (L.) Hale

Luhangalo Plateau TZ2747, TZ 2746.

This is a cosmopolitan, mainly temperate species.

Chemistry: Usnic, protocetraric and caperatic acids.

****Heterodermia chilensis*** (Kurok.) Swinscow & Krog

Ilutile TZ879.

The species is doubtfully reported from Kenya (Swinscow & Krog 1988). Otherwise it is known from S Africa and Chile.

Heterodermia comosa (Kurok.) Swinscow & Krog

Ilutila TZ716; Kitui1535; Ngong Hills K1512.

This is a widespread tropical species.

Heterodermia diademata (Taylor) Awasthi

Ilutile TZ802, TZ902; Massisiwe TZ1138; Luhangalo TZ2856, TZ3225; Ngong Hills K366; 1519.

Circumpolar tropical distribution.

Heterodermia hypoleuca (Ach.) Trevisan

Ilutile TZ874a; Massisiwe TZ1019, TZ1071; Luhangalo TZ2765, TZ2857, TZ2877 (cfr.), TZ3000, TZ3102; Ngozi TZ3521; Kivulamo TZ1521.

Distribution: E Africa, Asia and N America.

Heterodermia isidiophora (Vainio) Awasthi

Massisiwe TZ1015, TZ1033; Luhangalo TZ2890 (cfr.); Ngong K308.

Pantropical.

Heterodermia japonica (Sato) Swinscow & Krog
 Idete, TZ591; Ilutile TZ684, TZ864, TZ882. Itonya TZ1731, TZ1764; Massisiwe TZ1040 p.p., TZ1065, TZ1074.; Luhega TZ2034; Luhangalo TZ2765a, TZ2855, TZ3018; Tschenzema TZ3348; Ngozi TZ3520; Ngong Hills K307, 1515.
 Distribution: Africa, Asia, New Zealand.

****Heterodermia lepidota*** Swinscow & Krog
 Massisiwe TZ1040 p.p., TZ1065; Kivulamo TZ1522; Luhangalo TZ3462; Ngong K308.

The species was known from Ethiopia, Kenya and Uganda.

Heterodermia leucomela (L.) Poelt
 Idete TZ518, Ilutile TZ630, TZ715, TZ761; Itonya TZ1762, TZ1817; Kivulamo TZ1520; Massisiwe TZ1066, TZ1067, TZ1136; Luhangalo TZ2764, 4533, 4541; Ngozi TZ3501, TZ3524; Changwahela TZ4120; Kivulamo TZ4187; Ngong Hills K309, K310, 1550; Kitui 1539.

A pantropical to warm-temperate species.

Heterodermia microphylla (Kurok.) Skorepa
 Luhega TZ2032, TZ2195, Luhangalo TZ3463 (cfr.); Ilutila TZ796 (cfr.).
 The species is known from E Africa, Asia and New Zealand.

Heterodermia obscurata (Nyl.) Trevisan
 Ilutile TZ885; Luhega TZ2035.
 A pantropical species extending into the temperate zone.

****Heterodermia pseudospeciosa*** (Kurok.) W. Culb.
 Ilutile TZ776.
 The species was known from Kenya, N America, Asia and Australia.

Heterodermia speciosa (Wulfen) Trevisan
 Ilutile TZ688; Massisiwe TZ1057.
 This is a widespread species in tropical to warm temperate regions.

Hyperphyscia* cfr. *adglutinata (Flörke) Mayrh. & Poelt
 Mtandike TZ1946, TZ1967.
 Widespread in tropical to temperate regions.

Hyperphyscia pandani (H. Magn.) Moberg
 Gombe TZ3548.
 Known from E Africa and Pacific Islands.

Hyperphyscia syncolla (Nyl.) Kalb
 Kivulamo TZ1607; Mtandike TZ1947; Mutito 1552.
 Distribution: E Africa, the Americas, and Asia.

****Hyperphyscia tuckermannii*** (Lynge) Moberg
 Mikumi TZ2564.
 The species was known from Kenya and S America.

Hypotrachyna brevirhiza (Kurok.) Hale

Luhangalo TZ3215.

Widely distributed in tropical regions. Known from Australia, south east Asia South America, Kenya and Tanzania.

Chemistry: Atranorin and salazinic acid

Hypotrachyna gondylophora (Hale) Hale

Idete TZ748.

The species is known from East Africa, southern United States and tropical America. Chemistry: Atranorin, fumarprotocetraric acid and skyrin (in traces).

Hypotrachyna neodissecta (Hale) Hale

Ngong Hills K300.

It has a pantropical distribution.

Chemistry: Atranorin and gyrophoric acid.

*****Hypotrachyna novella*** (Vain.) Hale

Idete TZ557.

This is a new record for East African lichen flora. It was previously known from Brazil and Venezuela (Hale 1975).

Chemistry: Lichexanthone, colensoinic acid, norcolensoinic acid, 4-O-demethylphysodic acid, lividic and physodic acids.

Hypotrachyna orientalis (Hale) Hale

Luhangalo Plateau TZ 2868.

The species is found in East Africa and Asia.

Chemistry: Atranorin, barbatic acid, 4-O-demethylbarbatic acid, traces of obtusatic and norobtusatic acids.

Hypotrachyna ossealba (Vain.) Park & Hale

Ilutile Forest TZ604, TZ613; Massisiwe TZ1006; Itonya Forest TZ1819, TZ 1743; Luhangalo TZ2869.

Widely distributed in subtropical and temperate regions.

Chemistry: Lichenoxanthon, physodic and lividic acids.

*****Hypotrachyna physcioides*** (Nyl.) HaleLuhangalo TZ3507 (with *Parmotrema nilgherrense*).

It is new for East African lichen flora. The species was previously known from Asia, Australia, central and south America.

Chemistry: Atranorin, barbatic, 4-O-demethyl barbatic, obtusatic and echinocarpic acids.

Hypotrachyna polydactyla (Krog & Swinscow) Nash

Ilutile Forest TZ900.

The species is known from East Africa and North America.

Chemistry: Atranorin, lividic acid complex and skyrin.

Hypotrachyna revoluta (Flörke) Hale

Idete TZ551.

Widespread in temperate and tropical regions.

Chemistry: Atranorin and gyrophoric acid.

Hypotrachyna rockii (Zahlbr.) Hale

Luhangalo TZ2878.

Widespread in subtropical and warm temperate zones, montane in East Africa.
Chemistry: Atranorin, evernic and lecanoric acids.***Imshaugia aleurites*** (Ach.) S.L.F. Meyer

Idete TZ550; Luhangalo TZ 2875.

Widespread in temperate and boreal regions, montane in Africa. Already known from Kenya and Tanzania.

Leprocaulon arbuscula (Nyl.) Nyl.

Itonya TZ1756.

A pantropical species.

*****Melanelia panniformis*** (Nyl.) Essl.

Massisiwe TZ1019.

New for East African lichen flora. Circumpolar in northern hemisphere, north America, north and central Europe, South America, south east Asia.

Chemistry: Perlatolic acid.

Menegazzia* aff. *terebrata (Hoffm.) A. Massal.

Luhangalo TZ2852 (det. J. W. Bjerke). Apothecia and soralia absent.

Chemistry: atranorin, stictic, constictic, cryptostictic, menegazziaic acids, norstictic acid (tr.) one unidentified substance UV+ orange before charring.

Krog (2000) reported *M. terebrata* from Tanzania.***Normandina pulchella*** (Borrer) NylKivulamo TZ1509, (with *Candelariella* sp.), TZ1560; Luhangalo TZ3104; Ngong Hills 1506.

A widespread species in the tropical and temperate zones.

Parmelinella simplicior (Hale) Elix & Hale

Ilutile Forest TZ722.

The species is distributed in India, Ethiopia, Uganda and Tanzania.

Chemistry: Atranorin and salazinic acid.

Parmelinella wallichiana (Taylor) Elix & Hale

Luhangalo TZ2866, TZ3214; Ilutile TZ770; Luhega TZ2199; Mutito 1533; Kitui 1543; Ngong Hills 1507.

The species is widespread in E Africa and Asia.

Chemistry: Atranorin, secalononic acid A, salazinic and consalazinic acids.

Parmelinopsis afrorevoluta (Krog & Swinscow) Elix & Hale

Massisiwe TZ1052.

Widespread in temperate regions, montane in E Africa.

Chemistry: Atranorin and gyrophoric acid.

Parmelinopsis minarum (Vainio) Elix & Hale

Idete TZ579, TZ581; Massisiwe TZ1000, TZ 1035; Ilutile Forest TZ758.

A species of world-wide distribution in tropical and temperate regions.

Chemistry: Atranorin and gyrophoric acid.

Parmelinopsis* aff. *neodamaziana (Elix & J. Johnst.) Elix & Hale
Luhangalo TZ2958B.

The species is known from Kenya, S America and Australia.

Chemistry: Atranorin and gyrophoric acid.

Parmelinopsis spumosa (Asah.) Elix & Hale

Idete TZ553; Ilutile TZ765.

A widespread tropical species.

Chemistry: Atranorin and gyrophoric acid.

Parmotrema amaniense (Steiner & Zahlbr.) Krog & Swinscow

Itonya Forest TZ1812; Itonya TZ1766; Kivulamo TZ1577.

The species is endemic to Africa.

Chemistry: Atranorin, protocetraric and protolichesterinic acids.

Parmotrema andinum (Müll. Arg.) Hale

Ilutile Forest TZ742; Kajiado K349, Nairobi K350; Kitui 1533.

Distribution: C and E Africa, Asia and S America.

Chemistry: Atranorin and lecanoric acid.

****Parmotrema araucariarum*** (Zahlbr.) Hale

Ngozi TZ3506a.

It is new for Tanzania. The species is reported from Kenya and South America.

Chemistry: Atranorin and protolichesterinic acid.

Parmotrema austrosinense (Zahlbr.) Hale

Kivulamo TZ4182; Changwahela TZ 4039; Ngong Hills 1521; Kitui 1540.

The species is widespread in tropical and temperate regions.

Chemistry: Atranorin and lecanoric acid.

Parmotrema cetratum (Ach.) Hale

Ilutile TZ704, TZ801, TZ802; Ilutile Forest TZ704, TZ880; Massisiwe TZ1099, TZ1137, TZ1134; Ngozi TZ3504; Ngong Hills 1502.

This species is widespread in temperate regions and montane in E Africa.

Chemistry: Atranorin and salazinic acid.

Parmotrema crinitum (Ach.) M. Choisy

Luhangalo TZ2861, TZ3216, TZ3106; Massisiwe Village TZ1042; Massisiwe TZ1082; Ngong Hills 1526.

Widespread in temperate and tropical regions.

Chemistry: Atranorin, stictic and constictic acid.

Parmotrema dilatatum (Vainio) Hale

Luhangalo TZ2865b.

Pantropical, known from Africa, Asia and S America.

Chemistry: Atranorin and protocetraric acid.

Parmotrema hababianum (Gyelnik) Hale

Kivulamo TZ1499; Luhangalo TZ3513a.

Distributed in E Africa, Asia and the Americas.

Chemistry: Atranorin and protolichesterinic acid.

Parmotrema leonis (Swinscow & Krog) Swinscow & Krog

Mutito 1554; Kitui 1542; Ngomeini 1778.

The species is endemic to Africa and known from Kenya and Tanzania.

Chemistry: Atranorin and protolichesterinic acid.

Parmotrema nilgherrense (Nyl.) Hale

Ngozi TZ3506, TZ3507; Kivulamo TZ4181; Ilutile Forest TZ755; Luhangalo TZ2858, TZ2863, TZ3467, TZ3471; Itonya Forest TZ1889, TZ1890.

The species is known from E Africa and Asia.

Chemistry: Atranorin, alectoronic and α -collatolic acids.***Parmotrema perlatum*** (Osbeck) M. Choisy

Ngong Hills 1508.

Pantemperate.

Chemistry: Atranorin, stictic and constictic acids.

Parmotrema praesorediosum (Nyl.) Hale

Kigoma TZ3550; Luhega TZ2198.

Widespread in tropical and warm temperate regions.

Chemistry: Atranorin, protopraesorediosic acid and praesorediosic acid (in trace).

Parmotrema pseudoeunetum Sérus.

Kivulamo TZ1495; Idete TZ774a, TZ5556, TZ580, TZ755a; TZ 1851; Massisiwe TZ1072; Ilutila Forest TZ621, TZ726.

The species is endemic to Africa.

Chemistry: Atranorin and gyrophoric acid.

Parmotrema pseudonilgherrense (Asahina) Hale

Luhangalo TZ3305.

The species is reported from Kenya and Tanzania under synonymy of *Parmotrema lobulascens* (Steiner) Hale (Krog & Swinscow 1981). It is also distributed in Australia and Asia.Chemistry: Atranorin, alectoronic and α -collatolic acid.***Parmotrema reticulatum*** (Taylor) M. Choisy

Idete TZ523, TZ589; Ilutile Forest TZ612b, TZ698, TZ768; Massisiwe TZ1053, TZ1085, TZ1092; Sanje TZ3619; Luhega TZ2046; Luhangalo TZ2915, TZ3020a; Ngozi TZ3505a, TZ3511, TZ3513; Ngong Hills K301, K302; Kamera K335.

Widely distributed in tropical and temperate regions.

Chemistry: Atranorin, salazinic and consalazinic acids.

Parmotrema sanctae-angelii (Lynge) Hale

Luhangalo TZ2859, TZ2860, TZ2862, TZ2872, TZ2874, TZ3469, TZ3472; Ngozi TZ3512, TZ3505b; Kivulamo TZ1497, TZ1498; Massisiwe TZ1032, TZ1031, TZ1030, TZ1042b.

A widespread tropical species.

Chemistry: Atranorin and gyrophoric acid.

Parmotrema subarnoldii (des Abb.) Hale

Ilutile Forest TZ727, TZ737, TZ882; Ngozi TZ3510; Luhega TZ2198.

Distribution: E Africa, Madagascar, tropical Asia and America.

Chemistry: Atranorin, protocetraric and protolichesterinic acids.

Parmotrema subsidiosum (Müll. Arg.) Hale
Luhangalo TZ3470, TZ2871, TZ2876, TZ3020; Itonya TZ1781; Ilutile Forest TZ612. Widespread in tropical and warm temperate regions.
Chemistry: Atranorin and salazinic acid.

Parmotrema subschimperi (Hale) Hale
Luhangalo TZ3468.
The species is known from E Africa only.
Chemistry: Atranorin and gyrophoric acid.

Parmotrema subsumptum (Nyl.) Hale
Ilutile Forest TZ700.
Widespread in tropical and warm temperate regions.
Chemistry: Atranorin, salazinic and protolichesterinic acids.

Parmotrema subtinctorum (Zahlbr.) Hale
Ilutile Forest TZ720.
Widespread in tropical and warm temperate regions.
Chemistry: Atranorin and salazinic acid.

Parmotrema tinctorum (Nyl.) Hale
Ilutila Forest TZ736, TZ607, TZ598; Gombe TZ3549; Sanje TZ3626, TZ 3653;
Ilutile Forest TZ881; Luhega TZ2324.
Widespread in tropical and temperate regions.
Chemistry: Atranorin and lecanoric acid.

Parmotrema sp. A. in Swinscow & Krog (1988).
Pugu TZ2563 (with *Relicinopsis malaccensis*). It is known from E Africa only.
Chemistry: Atranorin and protocetraric acid.

Phaeophyscia adiaistola (Essl.) Essl.
Mtandike TZ1946.
Distribution: E Africa and N America.

*****Phaeophyscia endococcina*** (Körb.) Moberg
Luhangalo TZ2851.
New to E Africa. Widespread in temperate and boreal areas.

Phaeophyscia hispidula (Ach.) Moberg
Ilutile TZ787.
The species is widespread in tropical and subtropical regions.

Phyllopsora albicans Müll. Arg.
Luhangalo TZ5521.
The species is known also from South Africa, Australia and Asia.

Phyllopsora confusa Swinscow & Krog
Tschenzema TZ3322.
Known from East Africa, N and S America, and Papua New Guinea.

Phyllopsora corallina (Eschw.) Müll. Arg.
Luhega TZ2192.
Widespread in tropical areas.

Phyllopsora halei (Tuck.) Zahlbr.

Mikumi TZ2420.

The species is known from N America.

Phyllopsora haemophaea (Nyl.) Müll. Arg.

Matema TZ3540.

Known from E Africa, S America and Japan.

Phyllopsora kiiensis (Vain.) Gotth. Schneider

Luhega TZ2193.

Known from E Africa and Asia.

Phyllopsora mediocris Swinscow & Krog

Kivulamo TZ1597.

This species is only known from Tanzania.

Phyllopsora pannosa Müll. Arg.

Luhangalo TZ5510; Matema TZ3485; Nairobi K373.

Known from E Africa, Papua New Guinea, Taiwan and Brazil.

****Phyllopsora santensis*** (Tuck.) Swinscow & Krog

Luhangalo TZ5517.

The species was known from Kenya, Uganda, southern USA and Mexico.

****Phyllopsora thaleriza*** (Stirton) G. Sneider

Kivulamo TZ1609; Nairobi K374.

Known from Ethiopia, Kenya and S Africa.

Physcia albata (F. Wilson) Hale

Ilutile TZ775, TZ777, TZ780; Luhangalo TZ2879.

The species is known from E Africa, Australia and New Zealand.

****Physcia biziana*** (A. Massal.) Zahlbr.

Mtandike TZ1948. Monduli TZ401 (cfr.).

Known from Ethiopia, Kenya, S Africa, Europe, western USA and Mexico.

Physcia* cfr. *crispa Nyl.

Changwahela TZ4020.

Physcia crispa is known from E Africa and Pacific Islands.***Physcia dilatata*** Nyl.

Ngong Hills 1528.

Known from E Africa and Central America.

Physcia dimidiata (Arnold) Nyl.

Ngong Hills 1529.

Known from Ethiopia, Kenya and Europe.

Physcia integrata Nyl.

Kivulamo TZ1601.

Distribution: E Africa and Mexico.

Physcia krogiae Moberg

Luhega TZ2249.

Widespread in tropical and subtropical regions.

Physcia poncinsii Hue

Ngong K318.

A widely distributed species already known from Kenya.

Physcia* cf. *sorediosa (Vain.) Lynge

Morogoro TZ3409; Sanje Waterfall TZ3614.

P. sorediosa is a widely distributed species, but so far not reported from Tanzania.*****Physcidia squamulosa*** Tuck.

Ilutila, TZ 656, TZ 695; Itonya TZ1850.

New to E Africa, known from N and C America.

Pseudoparmelia sphaerospora (Nyl.) Hale

Luhangalo TZ2745, TZ2748, TZ3122; Ilutile Forest TZ 699.

The species is known from Africa and the Americas.

Chemistry: Atranorin.

Punctelia borreri (Sm.) Krog

Ngong Hills 1527.

Widespread in tropical and temperate regions.

Chemistry: Atranorin and gyrophoric acid.

Punctelia neutralis (Hale) Krog

Luhangalo TZ2793, TZ2804.

Distribution: E and S Africa and Asia.

Chemistry: Atranorin and caperatic acid.

Punctelia subpraesignis (Nyl.) Krog

Ngong Hills K306.

It is known from E Africa and the Americas.

Chemistry: Atranorin and gyrophoric acid.

Pyxine cocoes (Swartz) Nyl.

Mtandike TZ1950, TZ1965.

A pantropical-subtropical species.

Pyxine katendei Swinscow & Krog

Mutito 1556.

Only known from E Africa.

Pyxine kibweziensis Swinscow & Krog

Luhega TZ2196.

The species is only known from E Africa.

****Pyxine lyei*** Swinscow & Krog

Luhega TZ2231 (det. Divakar).

New to Tanzania, known from Kenya and Uganda.

****Pyxine* cfr. *microspora*** Vainio

Luhega TZ2223.

Pyxine microspora is known from Uganda and the Philippines.

Pyxine petricola Nyl.

Mtandike TZ1956 (det. Divakar); Luhega TZ2167 (det. Divakar); Gombe TZ3547.

Ngong K317, K365; Kitui 1534.

A pantropical species.

Pyxine subcinerea Stirton

Luhega TZ2230, TZ2232. Ngong K315.

Widespread in tropical to warm temperate regions.

Ramalina africana (B. Stein.) Dodge

Ngong K384; Kajiado K401.

Known from E Africa, Asia and S America.

Chemistry: Sekikaic acid, homosekikaic acid and one unidentified compound (trace only).

Ramalina apera Räsänen

Mutito 1555; Kitui 1537.

Distribution: Africa and S America.

Ramalina asperula Krempelh.

Ilutile TZ616; Itonya TZ1866; Kivulamo TZ1536; Luhangalo TZ3475; Kitui 1537.

Known from E Africa and S America.

Chemistry: Divaricatic acid and stenosporic acids; sometimes with traces of salizinic acid and usnic acid.

Ramalina calcarata Krog & Swinscow

Ilutile, TZ754, TZ774; Itonya TZ1742; Luhangalo TZ2795; Tschenzema TZ3337; Ngozi TZ3528 (p.p.).

The species is known only from E Africa.

Chemistry: Divaricatic acid, sometimes with traces of usnic acid or an unidentified compound.

Ramalina celastri (Sprengel) Krog & Swinscow

Kajiado K402. Ngong Hills 1524.

Pantropical.

K402 contains usnic acid (trace only).

Ramalina* cfr. *disparata Krog & Swinscow

Ilutile TZ784.

Known only from E Africa.

Ramalina* cfr. *hoehneliana Müll. Arg.

Ilutile TZ573, TZ800.

Known only from E Africa.

Ramalina* cfr. *holstii Krog & Swinscow

Kivulamo TZ1536.

Known only from E. Africa.

Ramalina nervulosa (Müll. Arg.) des Abb.

Changwahela TZ4055, TZ4138 (det. VA).

Distributed in Africa, Asia and Australia.

Chemistry of TZ4055: Homosekikaic and sekikaic acids, with one sekikaic-related acid and traces of unidentified compounds.

Ramalina pusiola Müll. Arg.

Idete TZ522; Ilutile TZ739, TZ759, TZ876; Kivulamo TZ1533, TZ1535. Itonya Forest TZ1738, TZ1816; Itonya TZ1816, TZ1865; Massisiwe TZ1013.

Known only from E Africa.

Chemistry: homosekikaic and sekikaic acids, with one sekikaic-related acid and traces of unidentified compounds (one only seen in longwave UV). Sometimes containing traces of usnic acid.

Ramalina sprengelii Krog & Swinscow

Ilutile TZ782; Kivulamo TZ1534, TZ4188; Itonya TZ1745; Tschenzema TZ3336; Ngozi TZ3528 (p.p.).

Distribution: Known only from E and S Africa.

Chemistry: No secondary lichen substances detected, except in TZ3336 and TZ782 which contained traces of usnic acid.

Ramalina sp.

Kajiado K403.

Chemistry: Divaricarinic and usnic acids.

****Relicinopsis malaccensis*** (Nyl.) Elix & Verdon

Pugu TZ 2563.

New for Tanzania, known from Kenya, W Africa and Asia.

Chemistry: Usnic and protocetrarinic acids.

Roccella endocrocea M. Choisy

Mbeganiiff TZ 3561; Changwahela TZ4057; Dar TZ5560.

The species is known from Kenya and Tanzania.

Roccella montagnei Bél.

Mbeganiiff TZ3562; Changwahela TZ4056; Kaole TZ4112.

Known from E Africa and India.

Teloschistes exilis (Michaux) Vainio

Ngong Hills 1510.

Distribution: E Africa, the Americas.

Teloschistes flavicans (Swartz) Norman

Itonya, TZ563, TZ1737; Ilutile TZ786; Kivulamo TZ1565, TZ1566; Luhangalo TZ4538; Kivulamo TZ4190; Kitui 1541.

Widespread in tropical and warm temperate regions.

Teloschistes perrugosus Müll. Arg.

Luhangalo TZ2816; Ngong K314; Kathunga 1580, Kitui 1535.

Known from E and S Africa and possibly Mexico.

Tylophoron protrudens Nyl.

Ilutile TZ649.

Widely distributed in the tropics of both hemispheres. In Africa previously reported from moderately high altitudes in Guinea, Kenya, Rwanda, Tanzania, and Zaire (Tibell 2001).

Usnea complanata (Müll. Arg.) Mot.

Kitui 1538.

According to Swinscow & Krog (1988) probably widespread in Africa.

Usnea exasperata (Müll. Arg.) Mot.

Luhangalo TZ4534, TZ4546; Ngong Hills 1504.

Distribution: E and southern Africa.

Usnea maculata Stirton

Luhangalo TZ4549.

Distribution: Subsaharan Africa.

Xanthoparmelia annexa (Kurok.) Elix

Tschenzema TZ3352.

Widely distributed in eastern and southern African regions, already known from Kenya and Tanzania.

Chemistry: Atranorin and lecanoric acid.

*****Xanthoparmelia antleriformis*** (Elix) Elix & Johnston

Luhangalo Plateau TZ2838.

New for East Africa. Previously known from Australia, South Africa (Elix 1994) and India (Divakar & Upreti 2005).

Chemistry: Usnic consalazinic, salazinic acid and norstictic acid (in trace).

*****Xanthoparmelia* aff. *keralensis*** Hale

Luhangalo TZ2836.

It is a new record for East African lichen flora, previously it was known from India and South Africa (Divakar & Upreti 2005). The species can easily be distinguished in having isidiate upper surface, small lobes (up to 0.5mm wide), black lower surface and stenosporonic acid as medullary secondary metabolite.

Chemistry: Usnic acid, stenosporonic acid, colensoic acid (in trace) and gyrophoric acid (in trace).

****Xanthoparmelia mexicana*** (Gyelnik) Hale

Luhega TZ2245.

New for Tanzania, known from Kenya, southern N America, Australia, New Zealand and India.

Chemistry: Usnic consalazinic, salazinic acid and norstictic acid (in trace).

*****Xanthoparmelia microspora*** (Müll. Arg.) Hale

Ngong Hills K303.

New for East Africa. Previously known from South America (Hale 1990).

Chemistry: Usnic and salazinic acid.

*****Xanthoparmelia mongaensis*** (Elix) Elix

Luhangalo TZ2870.

New for East Africa. Previously known from Australia and South Africa (Elix 1994). Chemistry: Atranorin, stenosporic acid, colensoic acid and divaronic acid (in trace).

*****Xanthoparmelia pseudocongensis*** Hale

Luhega TZ2238.

New for East Africa. Previously known from South Africa (Hale 1990) and India (Divakar & Upreti 2005).

Chemistry: Usnic and salazinic acid.

Xanthoparmelia tinctina (Maheu & A. Gillet) Hale

Tschenzema TZ3351.

The species is widespread in tropical and warm temperate regions.

Chemistry: Usnic, salazinic and consalazinic acid.

****Xanthoparmelia verruculifera*** (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch

Ngong Hills K304.

New for Kenya, known from Tanzania, Uganda, Europe and North America, widely distributed species in northern hemisphere.

Chemistry: Divaricatic acid.

Xanthoparmelia weberi (Hale) Hale

Kathunga 1577.

Widespread in tropical regions.

Chemistry: Usnic, hypoprotocetraric and 4-O-demethyl notatic acid.

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