



sommerfeltia

28

H. Krog

**Corticolous macrolichens of low montane
rainforests and moist woodlands of
eastern Tanzania**

2000



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A total of 224 species of corticolous macrolichens are recorded from low montane rainforests and moist woodlands in the West Usambara Mountains, the Nguru Mountains, the Uzungwa Mountains, the Poroto Mountains, and the Rungwe volcano in eastern Tanzania. Local distribution data are provided. The new species *Hypotrachyna olivetorica* Krog, *Parmotrema iringense* Krog, and *Ramalina dissimilis* Krog are described. *Heterodermia dissecta*, *H. fragilissima*, *Parmelinopsis expallida*, and *Phyllopsora kiiensis* are reported as new to Africa.

Cetrariastrum africanum, *Pannaria santessonii*, *Parmotrema degelianum*, *P. fragilescens*, *P. hicksii*, *P. iringense*, *P. laciniatulum*, *Ramalina dissimilis*, *R. pocsii*, and *Usnea antiqua* are at present known only from eastern Tanzania. Some of them may possibly belong to an endemic element in the montane lichen flora of the country.

Hypotrachyna olivetorica, *Lobaria holstiana*, *Phyllopsora africana*, *P. dolichospora*, and *P. mauritiana* are known only from eastern Tanzania and the Mascarenes.

Keywords: Lichens, rainforests, endemism, Tanzania, the Mascarenes.

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CONTENTS

INTRODUCTION	5
PREVIOUS COLLECTORS AND RESEARCH	6
THE INVESTIGATION AREA	7
MATERIALS AND METHODS	9
RESULTS AND DISCUSSION	11
TAXONOMY	11
<i>Hypotrachyna olivetorica</i> Krog sp. nov.	11
<i>Parmotrema iringense</i> Krog sp. nov.	12
<i>Ramalina dissimilis</i> Krog sp. nov.	13
DISTRIBUTION	14
<i>Variation in local distribution of species</i>	15
The West Usambara Mountains	15
The Mufindi escarpment in the Uzungwa Mountains	15
The Rungwe volcano	16
<i>A possible endemic element in the low montane lichen flora of eastern Tanzania</i>	16
<i>Affinity between the lichen flora of eastern Tanzania and that of the Mascarenes</i>	17
LIST OF SPECIES, WITH DATA ON LOCAL DISTRIBUTION	18
ACKNOWLEDGEMENTS	73
REFERENCES	74

INTRODUCTION

This study of corticolous macrolichens of some low montane rainforests and moist woodlands of eastern Tanzania originated during a visit to that country in October of 1988. I had previously established contact with the Hungarian bryologist Professor Dr Tamás Pócs, then on the staff of Sokoine University at Morogoro, who had suggested that we might make a joint inventory of the bryophytes and lichens in his study areas in the Morogoro District during my sabbatical leave from the University of Oslo in 1989. However, on my arrival in Morogoro I found that, for administrative reasons, a research permit for that particular District was unobtainable at the time, and my plans had to be changed accordingly. The remaining two weeks of my 1988 visit were spent collecting lichens in the vicinity of the Mazumbai University Forest Station in the West Usambara Mountains. During this period the idea was conceived to undertake a survey of the epiphytic macrolichen flora not only in that area but also in some moist submontane and low montane forests and woodlands of other parts of eastern Tanzania.

On the basis of my field observations in the Usambara Mountains I planned two periods of field work in Tanzania in 1989, one in the Nguru Mountains in March-April and one in the Southern Highlands in August. On the first of those two visits I was allowed to join, as associate member, a group of botanists from Hungary, Norway, Sweden, and Tanzania, engaged in a study of catchment forests. Part of the field work was carried out in lowland forests (not included in this study), but excursions were made also to higher altitudes in the Nguru Mountains. I spent a further week on a preliminary collecting trip to the Southern Highlands Province in the company of Dr and Mrs T. Pócs and Dr Edith Farkas; it included i.a. a visit to the Poroto Mountains and the Rungwe volcano.

The field work in August of the same year was mainly centered on the Uzungwa Mts in the Iringa District of the Southern Highlands, where I had agreed to take part in an air pollution study for Brook Bonde Tea, division Tanzania, in the Mufindi escarpment area.

These three collecting periods in eastern Tanzania in 1988 and 1989 form the framework for the project as here defined.

After the conclusion of the field work in Tanzania, I spent three weeks in Mauritius in 1991 and two weeks in La Réunion in 1996, collecting lichens in the company of Dr Einar Timdal, the University of Oslo. One purpose was to establish whether there was an affinity between the lichen flora of eastern Tanzania and that of the Mascarenes. (General accounts of the lichen flora of Mauritius and La Réunion are separate projects which will be published on elsewhere.)

The aim of this study is to record the present status of the macrolichen flora of some low montane rainforests and moist woodlands of eastern Tanzania. Although a great deal of research remains to be carried out on the composition and distribution of Tanzanian forest lichens, it is hoped that this account may function as a basis for future studies on the lichen flora of eastern Tanzania, especially of the Eastern Arc mountains. It may also serve as a basis for the recording of future changes in the lichen flora of these mountains.

PREVIOUS COLLECTORS AND RESEARCH

In the last three decades of the nineteenth century and the first half of the twentieth century many visitors to East Africa collected lichens in various parts of the region, and the species were largely reported on by contemporary lichenologists (see Swinscow & Krog 1988). Only a minor part of these collections came from Tanzania, and only those from the Usambara Mountains were from the areas in eastern Tanzania covered in the present study. They include, for example, specimens collected by H. Meyer (Stein 1889, Müller 1890) and C.H.E.W. Holst, F. Fischer, and G.A. Fischer (Müller 1894). Most of these records were included in an account by Stizenberger (1890, 1891, 1893, 1895) of lichens known from Africa at that time. Later on, J. Brunnthaler and B. Schröder (Zahlbruckner 1926, 1932) and F. Tobler (Zahlbruckner 1932) followed.

In more recent years a number of visitors have collected lichens in Tanzania. Specimens were sometimes sent to specialists on certain genera, but many of them were also placed at the disposal of T.D.V. Swinscow and H. Krog for their studies leading up to the publication of 'Macrolichens of East Africa' which appeared in 1988. For the purpose of a flora, the occurrence of species in the individual country could only be given summarily as, for example, 'T' for Tanzania, but in a number of preliminary publications on various genera by the same authors, more detailed information on collectors and local distribution was offered (for bibliographic references, see Swinscow & Krog 1988).

THE INVESTIGATION AREA

A special topographic feature of eastern Tanzania is a series of isolated mountainous areas from the Usambara and Pare mountains in the north to the Poroto and Livingstone mountains near Lake Malawi in the south, including the Nguru Mountains west of Turiani and the Uluguru Mountains south of Morogoro. Parts of the Usambara Mountains are only 40 km from the coast, while the Nguru and Uluguru mountains are 130-140 km. A warm ocean current along the east African coast south of the Equator generates high air humidity which is carried inland by easterly winds, causing high precipitation and more or less permanent mist and cloud formation on the eastern slopes and summits of these mountains. The Poroto Mountains and Rungwe volcano are farther from the coast, but the nearness of Lake Malawi and local climatic conditions lead to high annual rainfall, close to 4000 mm on the wetter side of Mt Rungwe.



Fig. 1. Map of Tanzania (position within Africa shown in insert map) with some mountains in the Eastern Arc system, referred to in this paper: 1 - West Usambara, 2 - East Usambara, 3 - Nguru, 4 - Ukaguru, 5 - Uluguru, 6 - Uzungwa. The volcanic mountains in the Rungwe/Mbeya Districts of the Southern Highlands are indicated in black.

The disjunct arc of mountains from the Taita Hills in south-east Kenya to the Uzungwa Mountains in Tanzania, consisting of precambrian crystalline bedrock, is known as the Eastern Arc mountains (Fig. 1). The mountains and ridges are surrounded by woodland and savanna, so that the forest flora of each ridge has developed independently over a very long time (Pócs 1976a, 1999, Rodgers & Homewood 1982, Lovett 1993). These mountains are noted for their high level of endemism and species richness. Pócs (1976a) recorded 40 endemics among woody plant species in the Uluguru Mountains. In the Usambara Mountains 169 endemic vascular plant taxa and a further 487 near-endemics were reported by Iversen (1991). The bryophyte flora of these mountains has been shown to be different from that of the high volcanic mountains. Many species which occur in the former but not in the latter are also found in Madagascar and the Mascarenes (Pócs 1976a, 1999).

The mountainous areas in the Mbeya/Rungwe region of the Southern Highlands are of volcanic origin. Their vascular plant flora deviates from that of the Eastern Arc mountains, and has a lower species richness (Bjørndalen 1992).

MATERIALS AND METHODS

This report is based mainly on personal field observations and own collections. The collecting areas are indicated in Fig. 2, and collecting locality numbers with co-ordinates and dates of collecting are set out in Tab. 1. Voucher specimens are deposited in O. Some additional records are based on herbarium specimens and on specimens kindly made available by other collectors. Of particular value were the collections made by T. Pócs, especially in the Uluguru Mountains (VBI, EGR). Also included are some recent collections made by E. Farkas (VBI), R. Moberg (UPS), L. Ryvarden (O), R. Santesson (UPS), O. Vitikainen (H), and the late E. Dahl (O). Collections older than c. 50 years are not included here. Thus some early described species which have their type locality in, for example, the Usambara Mountains, are not included unless they have been collected again in more recent years.

It was decided to restrict this study to epiphytic macrolichens collected in moist, shady forests and woodlands at c. 900-2500 m alt. Cultivations were generally avoided, although lichens from solitary trees at the edge of plantations were sometimes included, as were some lichens from occasional roadside trees and trees surrounding forest clearings.

Chemical data were obtained by thin-layer chromatography by means of standard techniques (White & James 1985). Sections of thalli and apothecia were cut by microtome. Spores and conidia were studied in squash preparations in Melzer's reagent and water, respectively.



Fig. 2. Map of Tanzania with own collecting localities indicated: 1 - West Usambara, 2 - Nguru, 3 - Uzungwa, 4 - Poroto, Mt Rungwe.

Tab. 1. Locality numbers, geographical divisions, co-ordinates, and collecting dates.

Locality	Province	District	Co-ordinates	Date
2T 05	Tanga	Lushoto	4° 48' S 38° 30' E	10/1988
2T 06	Tanga	Lushoto	4° 46' S 38° 33' E	10/1988
2T 07	Tanga	Lushoto	4° 48' S 38° 30' E	10/1988
2T 08	Tanga	Lushoto	4° 48' S 38° 30' E	10/1988
2T 09	Tanga	Lushoto	4° 49' S 38° 30' E	10/1988
2T 10	Tanga	Lushoto	4° 48' S 38° 29' E	10/1988
2T 11	Tanga	Lushoto	4° 48' S 38° 29' E	10/1988
2T 12	Tanga	Lushoto	4° 49' S 38° 30' E	10/1988
2T 13	Tanga	Lushoto	4° 49' S 38° 30' E	10/1988
3T 03	Eastern	Morogoro	6° 07' S 37° 34' E	03/1989
3T 14	Eastern	Morogoro	6° 00' S 37° 43' E	03/1989
3T 23	S. Highl.	Iringa	8° 36' S 35° 37' E	04/1989
3T 24	S. Highl.	Rungwe	9° 00' S 33° 33' E	04/1989
3T 25	S. Highl.	Rungwe	9° 05' S 33° 37' E	04/1989
4T 10	S. Highl.	Iringa	8° 40' S 35° 20' E	08/1989
4T 12	S. Highl.	Iringa	8° 35' S 35° 15' E	08/1989
4T 14	S. Highl.	Iringa	8° 35' S 35° 15' E	08/1989
4T 15	S. Highl.	Iringa	8° 40' S 35° 20' E	08/1989
4T 16	S. Highl.	Iringa	8° 36' S 35° 18' E	08/1989
4T 17	S. Highl.	Iringa	8° 35' S 35° 15' E	08/1989
4T 22	S. Highl.	Rungwe	9° 08' S 33° 40' E	08/1989
4T 23	S. Highl.	Iringa	8° 39' S 35° 14' E	08/1989
4T 25	S. Highl.	Iringa	8° 40' S 35° 15' E	08/1989

The nomenclature conforms to that of 'Macrolichens of East Africa' (Swinscow & Krog 1988), with the exception that, for practical reasons, all recent splits within the genus *Parmelia* s. lat. have been adopted. In a few cases changes in nomenclature are due to recent taxonomic revisions, for example, in the Sphaerophoraceae (Wedin 1993, 1995), the genera *Pannaria* and *Parmeliella* (Jørgensen & Galloway 1992), and *Phyllopsora* (Brako 1991, Timdal & Krog, in prep.). In each case when a name in the present 'List of species' differs from that of the Flora, the name in the latter has been included for the convenience of lichenologists relying on that handbook in the determination of specimens. Synonyms are generally not given.

The geographical divisions (Provinces, Districts) conform to those applied in 'Flora of Tropical East Africa' (Polhill 1988).

RESULTS AND DISCUSSION

TAXONOMY

In preliminary reports (Krog 1990, 1991) *Parmotrema fragilesceus*, *P. hensseniae*, and *P. laciniatulum* were described as new. In the following, three additional species in the genera *Hypotrachyna*, *Parmotrema*, and *Ramalina* are newly described. The genus *Phyllopsora* is being treated separately by Timdal & Krog (in prep.), who describe four new species, *P. africana*, *P. dolichospora*, *P. nemoralis*, and *P. swinscowii*, of relevance to the study area.

Hypotrachyna olivetorica Krog sp. nov.

Fig. 3.

Thallus corticola vel saxicola, adnatus, cinereoalbicans, 3-5 cm diametro, lobis sublinearibus, 1-2 mm latis, superne pustulatus, esorediatus, subtus niger, rhizinosus, rhizinis nigris, tenuis, dichotome ramosis. Acidum olivetoricum et atranorinum continens.

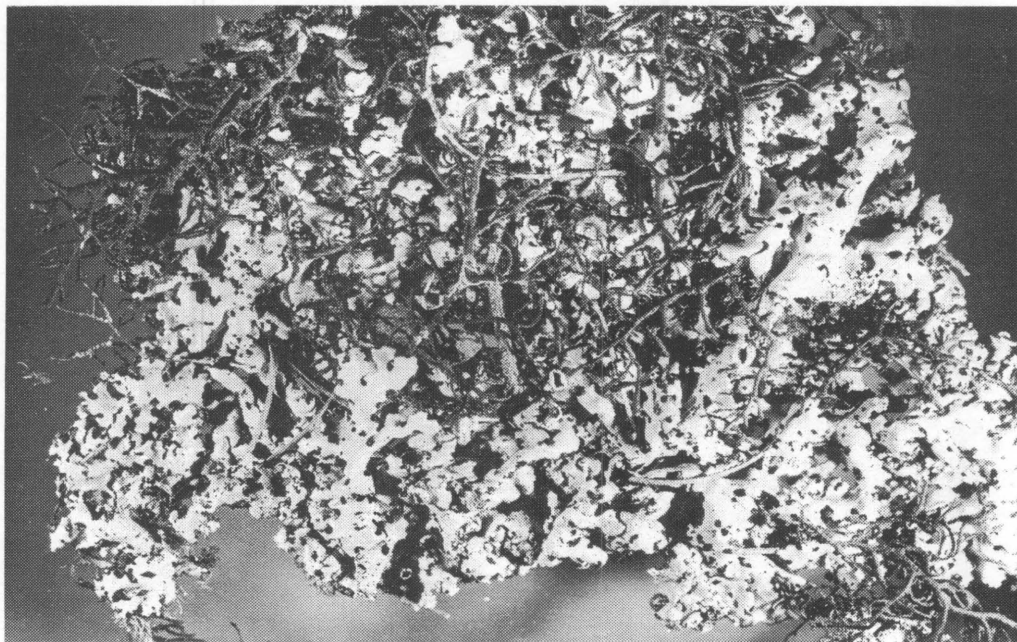


Fig. 3. *Hypotrachyna olivetorica* Krog, holotype (O). Rule = 1 cm.

Thallus corticolous or saxicolous, adnate, 3-5 cm in diameter. Lobes sublinear, 1.2-2 mm broad, with non-sorediate sublaminar and laminal pustules. Medulla white. Underside black, moderately rhizinate, rhizines thin, sparsely dichotomously branched. Apothecia with crenulate margin, few, probably immature. Spores not seen. TLC: Olivetoric acid, atranorin.

Holotype: La Réunion. Fôret de Bélouve, track from Gite de Bélouve to viewpoint, 21°03'S, 55°32'E, 1500-1550 m alt., 9/1996, coll. H. Krog & E. Timdal RE 25/14 (O).

The mainly African species *H. leiophylla* (Kurok.) Hale resembles *H. olivetorica* morphologically, but differs in producing 4-O-demethylmicrophyllinic acid and a related substance in the medulla instead of olivetoric acid. Another African species, *H. lividescens* (Kurok.) Hale, not yet known from Tanzania, resembles *H. olivetorica* in containing olivetoric acid, but differs in producing laminal and subapical orbicular soralia instead of laminal non-sorediate pustules.

Specimens examined: **Tanzania**. Tanga Province, Lushoto District, West Usambara Mts between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/013 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 12/017 (O). **La Réunion**. Fôret de Bélouve, track from Gite de Bélouve to viewpoint, 1500-1550 m alt., Krog & Timdal RE 25/10 (O), RE 25/14 (O - holotype); Cirque de Cilaos, along road to Bras Sec, at intersection with canyon of Bras de Benjoin, on rock, 1360 m alt., Krog & Timdal RE 35/02 (O).

***Parmotrema iringense* Krog sp. nov.**

Fig. 4.

Thallus corticola, albido-griseus, laxe adnatus. Lobi 0.8-1.2 cm lati, ciliis tenuibus, 1-2 mm longis. Cortex superior fragilis, disruptens, interdum ciliatus. Pseudoisidia marginalia vel submarginalia, saepe breviter ciliata. Acidum gyrophoricum, acidum protocetraricum et atranorinum continens.

Thallus corticolous, pale grey, loosely attached. Lobes 0.8-1.2 mm wide, rounded, weakly crenate, ciliate, cilia slender, 1-2 mm long. Upper cortex fragile and here and there cracking and flaking, occasionally with cilia. Pseudoisidia dissolving into coarse granules, marginally and submarginally situated, often shortly ciliate. Medulla white. Underside black with a brown, naked marginal zone, rhizines short, sparse, in groups. Apothecia and pycnidia not seen. TLC: Gyrophoric acid, protocetraric acid, atranorin.

Holotype: Tanzania. Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 8°35'S, 35°15'E, 1970 m alt., 8/1989, coll. H. Krog 4T 17/014 (O).

Parmotrema lophogenum is morphologically similar to *P. iringense*, but differs mainly in producing an array of fatty acids instead of protocetraric acid in the medulla. *Parmotrema umbrosum* agrees with *P. iringense* chemically, but its upper cortex is not notably fragile, it has abundant long, slender rhizines, and produces marginal, linear soralia instead of pseudoisidia and coarse granules.

Parmotrema iringense is so far known only from the type locality.

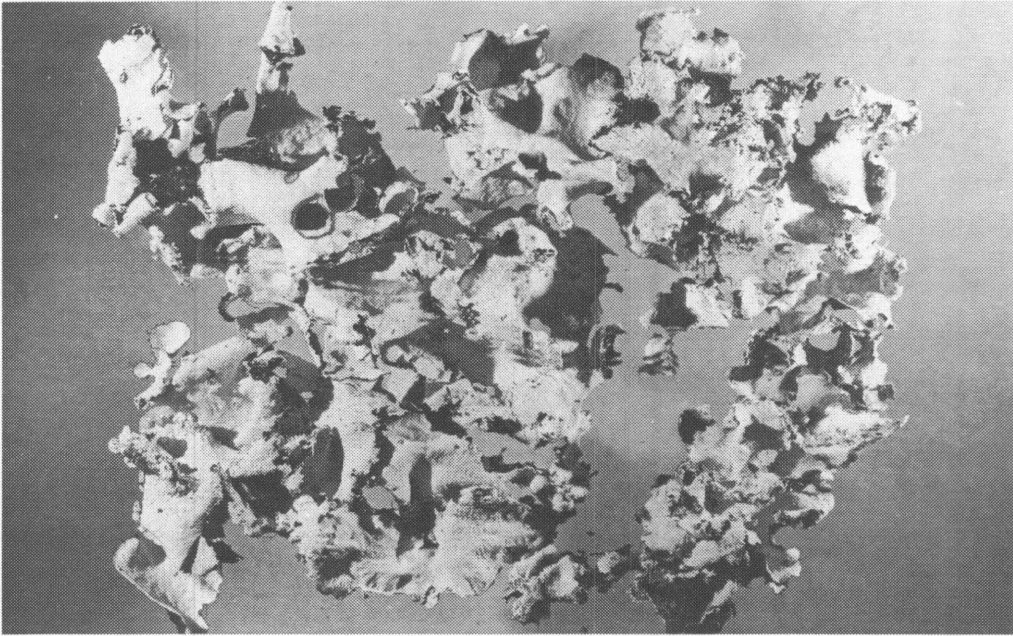


Fig. 4. *Parmotrema iringense* Krog, holotype (O). Rule = 1 cm.

***Ramalina dissimilis* Krog sp. nov.**

Fig. 5.

Thallus corticola, fruticosus, 3-4 cm altus, ramis canaliculatis, pseudocyphellis planis, orbicularis. Soredia nulla. Apothecia lateralia, excipulo thallino interdum lobis, sporis 12-14 x 4-5 µm. Acidum divaricaticum et acidum stenosporicum continens.

Thallus corticolous, fruticose, 3-4 cm high, moderately to densely branched. Branches 0.5-1(2) mm wide, stramineous to pale greenish grey, solid, bilateral, canaliculate, apices finely divided. Cortex smooth. Pseudocyphellae few, scattered, laminal or marginal, orbicular, flat, slightly elevated. Soredia absent. Apothecia lateral, disc flat, thalline margin sometimes lobate, spores 12-14 x 5 µm, one-septate. TLC: Divaricatic and stenosporic acids.

Holotype: Tanzania. Tanga Province, Lushoto District, West Usambara Mountains, Mazumbai University Forest Station, in tea plantation with scattered trees, 4°48'S, 38°30'E, 1560 m alt., 10/1988, coll. H. Krog 2T 05/056 (O).

Ramalina asperula Kremp. is another primary pseudocyphellate species with divaricatic acid, but it differs from *R. dissimilis* in several characters. It has rugose and reticulately ridged flat branches which are up to 4.5 mm wide, the pseudocyphellae are punctiform, numerous on both sides of the branch, the spores are slightly larger, and it lacks stenosporic acid.

Ramalina dissimilis is one of those species which appear to prefer habitats with high

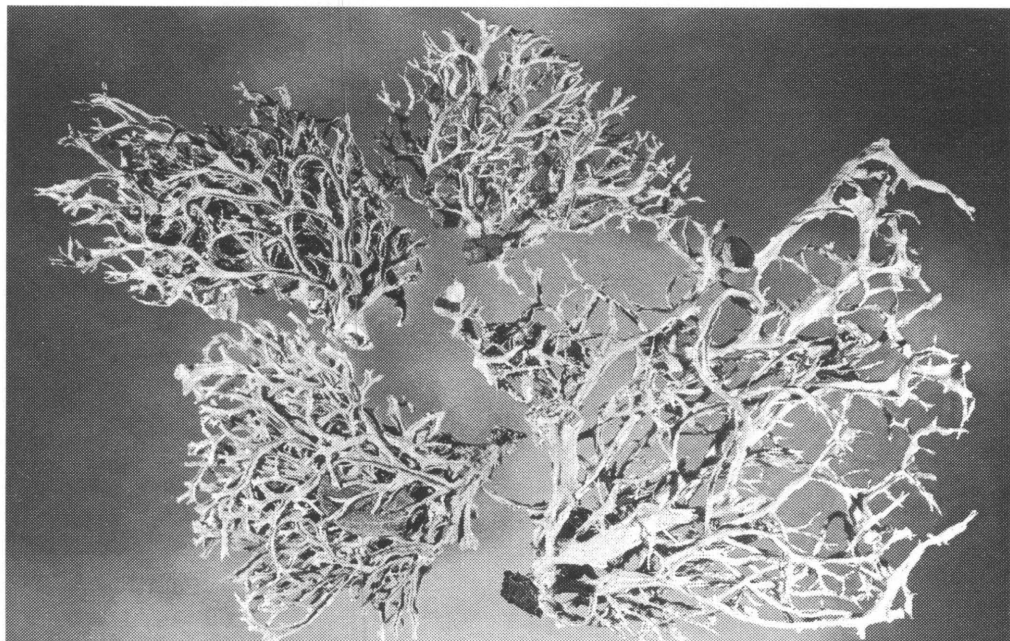


Fig. 5. *Ramalina dissimilis* Krog, holotype (O). Rule = 1 cm.

humidity, but at the same time require fairly good light conditions.

Specimens examined: **Tanzania**. Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Station, tea plantation with scattered trees, 1560 m, Krog 2T 05/056 (O - type collection), West Usambara Mts, Kwagoroto Mt., SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/007 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/031 (O). Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, in mist-affected *Brachystegia* woodland by Nzawa sailing camp, 1860 m, Krog 3T 22/046 (O), Uzungwa Mts, Lulando Forest at the NE edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/038 (O).

DISTRIBUTION

Of the 224 epiphytic rainforest and woodland lichens recorded during this project, about 20% were new to Tanzania, which is not surprising, since the lichen flora of this country is still poorly known. In a preliminary publication (Krog 1991) *Erioderma leylandii*, *Hypotrachyna pseudosinuosa*, *Menegazzia terebrata*, *Phyllopsora mauritiana*, and *Relicina planiuscula* were reported as new to continental Africa. Additional species new to Africa are *Heterodermia dissecta*, *H. fragilissima*, *Parmelinopsis expallida*, and *Phyllopsora kiiensis*.

Variation in local distribution of species

In the Tropics, as elsewhere, the local distribution of lichens is mainly governed by the microclimate, the main delimiting factors being temperature (related to altitude), moisture (not only rainfall but more commonly diurnal mists and fog), and, for forest lichens, the availability of light. Thus considerable variation may be observed among various collecting localities within the same general area. A few examples are given in the following.

The West Usambara Mountains

The southwestern slopes of the West Usambara Mountains receive an annual rainfall upwards to 2000 mm, with no month having less than 75 mm. The eastern slopes of the mountains receive the highest rainfall, which regularly exceeds 2000 mm per year, and mist and clouds envelope the mountains most days of the year. Frost occurs in the cold season above c. 2000 m. At Amani in the East Usambara the mean humidity has been measured to 87% in the morning and 75% at midday, with morning fog and mists recorded on 130 days annually (Iversen 1991).

The study areas in the West Usambara were situated between 1300 and 1980 m alt.

Gonja Mountain was a mist mountain rising c. 100 m above the surrounding planes, reaching close to 1700 m alt. It was probably clothed in mists and clouds most days of the year, and was covered by microphyllous evergreen forest to the summit. The epiphytic flora of lichens and bryophytes was very rich. Whole tree trunks were seen covered in *Physcidia wrightii*, a moisture requiring lichen species which is widespread in the Tropics but is rare in continental East Africa, being known there only from the Uluguru and Usambara Mountains. Noteworthy was also the occurrence of eight different species of *Phyllopsora* inside this rather limited area. Other species of particularly moist and shady habitats were *Parmotrema hicksii*, *P. laciniatulum*, and *Sticta papyracea*.

Within walking distance from Mazumbai University Forest Station (1560 m alt.) were Sagara Ridge (1950 m) and Kwagoroto Summit (1980 m). The forests leading up to the mountains were dense rainforests where little light penetrated, but at higher altitudes the trees gradually thinned out, with increasing lichen cover, and at c. 1800-1900 m gave way to elfin forest rich in epiphytes, on Sagara Ridge mixed with ericaceous scrub and rock outcrops. The apparent treeline was probably not the natural upper limit of the high forest; the stunted vegetation at and near the summits might result from an interaction of low temperatures, occasional high winds, and unfavorable soil conditions, comparable to the conditions described for the Uluguru Mountains by Pócs (1976b). Both localities were rich in species, but there was a certain difference between the two. Noteworthy species on Sagara Ridge were *Menegazzia terebrata*, *Parmotrema hicksii*, *Relicina planiuscula*, *Siphula decumbens*, and *Sticta papyracea*. On Kwagoroto Summit were found *Erioderma leylandii*, *E. sorediatum*, and *Pannaria lurida*. Both localities had *Anzia afromontana*, *Hypotrachyna leiophylla*, *Pannaria santessonii*, *Parmotrema degelianum*, *P. fragileszens*, *P. hensseniae*, and *P. laciniatulum*.

The Mufindi escarpment in the Uzungwa Mountains

This study area, in the Iringa District of the Southern Highlands, was situated between 1750 and 1900 m alt., with a single collecting locality at 1450 m. The area receives an annual rainfall of c. 2000 mm. Relative humidity is low in daylight hours from June to November, but almost invariably

reaches dew point at night, it is high from December to February, and very high from March until May (M.S. Keeley, pers. comm.). There was no primary forests or old, undisturbed rainforests comparable to those found in the Usambara Mountains. However, the mixed evergreen forests, occasionally with some bamboo, provided good habitats for epiphytic lichens.

Noteworthy species from the Mufindi escarpment area were *Cetrariastrum africanum*, *C. vexans*, *Erioderma leylandii*, *Lobaria discolor*, *Pannaria elatior*, *Parmotrema iringense*, *Pseudocyphellaria clathrata*, *P. intricata*, *Ramalina dissimilis*, *R. pocsii*, *Sticta papyracea*, and *S. sublimbata*.

The Rungwe volcano

This collecting area in the Rungwe District of the Southern Highlands was situated between 2300 and 2500 m alt. on the north side of the Rungwe volcano, where the natural treeline was depressed to 2400-2500 m, partly owing to an annual precipitation of close to 4000 mm (T. Pócs, pers. comm.).

Among the species collected on this mountain, mainly in ericaceous heath at 2400 m, there were several belonging in the upper montane forest element, not encountered in the Usambara Mountains or on the Mufindi escarpment. Noteworthy species here were *Cetrariastrum sorocheilum*, *Erioderma meiocarpum*, *Hypotrachyna brevirhiza*, *H. densirhizinata*, *H. ducalis*, *Imshaugia aleurites*, *Leptogium burgessii*, *L. laceroides*, *Nephroma tropicum*, *Parmotrema lobulascens*, *P. nilgherrense*, and *Usnea bicolorata*.

A possible endemic element in the low montane lichen flora of eastern Tanzania

Since the lichen flora of the Tropics is poorly known in general, taxa which at present appear to have narrow geographical ranges may, with further data available, prove to have a considerably wider distribution. This applies in particular to species which recently have been described as new to science.

The following species are at present known only or mainly from the low montane forests of eastern Tanzania:

Cetrariastrum africanum Hale, known from the Nguru, Uluguru, and Uzungwa mountains.

Pannaria santessonii Swinscow & Krog, known from the Usambara and Uluguru mountains.

Parmotrema degelianum Krog & Swinscow, known from the Usambara and Nguru mountains.

Parmotrema fragilescens Krog, known from the Usambara Mountains.

Parmotrema hensseniae Krog, known from the Usambara Mountains and Mt Rungwe, extending into Kenya (two collections from the lower montane forests on Mt Kenya).

Parmotrema hicksii Krog & Swinscow, known from the Usambara and Nguru mountains.

Parmotrema iringense Krog, known from the Uzungwa Mountains.

Parmotrema laciniatulum Krog, known from the Usambara Mountains.

Ramalina dissimilis Krog, known from the Usambara and Uzungwa mountains.

Ramalina pocsii Krog & Swinscow, known from the Nguru, Uluguru, and Uzungwa mountains and Mt Rungwe.

Usnea antiqua Swinscow & Krog, known from the Usambara Mountains.

The eleven species cited above are all found in one or more of the Eastern Arc mountains.

Parmotrema hensseniae, the only one of these species known to extend into Kenya, is a secondary species considered to be the sorediate counterpart of the primary species *P. degelianum* (Krog 1990).

Some of these species may prove to belong to an endemic element in the Tanzanian lichen flora, a hypothesis supported by the fact that they were not recorded from Ethiopia, Kenya, or Uganda by Swinscow & Krog (1988), and none of them was discovered during recent field studies in Mauritius and La Réunion. However, one difficulty in discussing a possible endemic element in the lichen flora of eastern Tanzania is the almost total lack of recent information on the lichen flora of Madagascar.

Affinity between the lichen flora of eastern Tanzania and that of the Mascarenes

In contrast to the collecting areas in Tanzania, which were situated between 4°46' and 9°08'S, those of Mauritius and La Réunion were situated between 20°06' and 21°22'S. Therefore, the forested areas of these islands, corresponding to the low montane rainforests and moist woodlands of eastern Tanzania, were mainly found at somewhat lower altitudes, in Mauritius at c. 500-800 m.

The following species are at present known only or mainly from the mountains of eastern Tanzania and the Mascarenes:

Hypotrachyna olivetorica Krog, known from the Usambara Mountains and La Réunion.

Lobaria holstiana (Müll. Arg.) Zahlbr., known from the Usambara Mountains and Mauritius.

Phyllopsora africana Timdal & Krog (*in ed.*), known from the Usambara and Uzungwa mountains, Mauritius, and La Réunion.

Phyllopsora dolichospora Timdal & Krog (*in ed.*), known from the Usambara and Uzungwa mountains and Mauritius.

Phyllopsora mauritiana (Taylor) G. Schneider, known from the Usambara Mountains and Mauritius.

Phyllopsora nemoralis Timdal & Krog (*in ed.*), known from the Uzungwa Mountains, La Réunion, and South Africa.

A few species occurring in the Mascarenes and in the literature being reported from various other parts of the Tropics, appear to reach a western distribution limit in eastern Tanzania. This applies, for example, to *Erioderma sorediatum*, *Heterodermia dissecta*, *H. fragilissima*, *Physcidia wrightii*, *Pseudocyphellaria dozyana*, *Sticta dichotoma*, and *S. papyracea*. Some of these species may also extend to southern Africa.

LIST OF SPECIES, WITH DATA ON LOCAL DISTRIBUTION

Anzia afromontana R. Sant.

TLC: Divaricatic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/009 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/006 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/003 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/086 (O); Rungwe District, Poroto Mts, on the way to Ngozi Crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/007, 036 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/001 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/024 (O).

Bulbothrix coronata (Fée) Hale

TLC: Gyrophoric acid, atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/006 (O).

Bulbothrix isidiza (Nyl.) Hale

TLC: Salazinic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/017 (O).

Bulbothrix meizospora (Nyl.) Hale

TLC: Salazinic acid, atranorin.

Eastern Province, Morogoro District, Nguru Mts, Dikurura Valley, in mossy forest, 1700-1900 m, Farkas 89119/9, 10, 18 (VBI), Nguru Mts, Dikurura Valley, in elfin forest, 2000 m, Farkas 89120/3, 7, 9, 15-17, 19, 21, 23-25 (VBI).

Bulbothrix pustulata (Hale) Hale

TLC: Salazinic acid, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/101 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/014 (O).

Bunodophoron diplotypum (Vain.) Wedin

TLC: The stictic acid complex, sphaerophorin.

Eastern Province, Morogoro District, Nguru Mts, Dikurura Valley, in mossy forest, 1700-1900 m, Farkas & Pócs 89119/A (VBI), Nguru Mts, on the ridge above the 'Spirit Lake' at the N source of Chazi River, just above the huge Chazi Falls, in elfin forest, 2000-2100 m, Pócs & Knox 89053/Q (VBI), Nguru Mts, valley along the headwaters of Divue River, in montane mossy rainforest, 1800-2000 m, Pócs & Knox 89052/U (VBI), Uluguru Mts, above Morogoro, in elfin forest on the crest of Lupanga, 2100-2140 m, T. & B. Pócs 86101/K, 86108/O (VBI), Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvar den 11596 (O).

Bunodophoron melanocarpum (Sw.) Wedin s.lat.

TLC: The stictic acid complex, sphaerophorin.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/020 (O), West Usambara Mts, Shume-Magamba Forest Reserve, summit of Mlomboza, 2200-2300 m, Pócs 8448/AL (VBI), West Usambara Mts, SW ridge of Gonja NE of Mazumbai village, 1500-1700 m, Pócs 8504/G (VBI), West Usambara Mts, Mkusu Forest Reserve, near the top of Mkindoi, 1900 m, Pócs 8512/C (VBI). **Eastern Province**, Morogoro District, Dikurura Valley, in elfin forest, 1900 m, Farkas 89120 (VBI), Uluguru Mts, above Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvar den 11586 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/036, 039 (O).

[Swinscow & Krog (1988): *Sphaerophorus melanocarpus* (Sw.) DC.]

Canomaculina subsumpta (Nyl.) Elix

TLC: Salazinic acid, atranorin (trace).

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/055 (O).

[Swinscow & Krog (1988): *Parmotrema subsumptum* (Nyl.) Hale]

Canoparmelia caroliniana (Nyl.) Elix & Hale

TLC: Divaricatic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/066 (O), West

Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/036 (O).

[Swinscow & Krog (1988): *Pseudoparmelia caroliniana* (Nyl.) Hale]

Canoparmelia crozalsiana (Harm.) Elix & Hale

TLC: The stictic acid complex, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/061 (O).

[Swinscow & Krog (1988): *Pseudoparmelia crozalsiana* (Harm.) Hale]

Canoparmelia texana (Tuck.) Elix & Hale

TLC: Divaricatic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/063 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/043 (O). **Eastern Province**, Morogoro District, Uluguru Mts, rainforest above Morningside, 1300-1800 m, Dahl s.n. (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest, NE edge of the Mufindi escarpment, at the edge of a low montane rainforest, 1450 m, Krog 3T 23/021 (O).

[Swinscow & Krog (1988): *Pseudoparmelia texana* (Tuck.) Hale]

Cetrariastrum africanum Hale

TLC: Aleatoronic acid, echinocarpic acid, atranorin.

Eastern Province, Morogoro District, Uluguru Mts, eastern edge of Lukwangule Plateau, in subalpine elfin forest, 2400 m, Pócs & Csontos (BM - holotype). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/063, 066, 069, 078, 080, 106, 108, 119 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/010 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/013, 014 (O).

Cetrariastrum sorocheilum (Vain.) W.L. Culb. & C.F. Culb.

TLC: Salazinic acid, protolichesterinic acid, atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/004 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/017 (O).

Cetrariastrum vexans W.L. Culb. & C.F. Culb.

TLC: Salazinic acid, protolichesterinic acid, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/026, 029 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/003, 029 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/002 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/018 (O).

Cladonia diplotypa Nyl.

TLC: Thamnic acid.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/007 (O). **Southern Highlands Province**, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/039 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/031 (O).

Coccocarpia erythroxyli (Spreng.) Swinscow & Krog

TLC: None.

Tanga Province, Lushoto District, East Usambara Mts, Amani, Santesson 23376 (UPS); Pangani District, River Pangani c. 10 km W of Pangani, Santesson 23525 (UPS). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/121, 122, 124 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/019 (O).

Coccocarpia palmicola (Spreng.) Arv.

TLC: None.

Tanga Province, Lushoto District, East Usambara Mts, Amani, Santesson 23365 (UPS), West Usambara Mts, Magamba, Ryvardeen 10920 (O), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/022 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/012 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/006 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/123 (O).

Coccocarpia pellita (Ach.) Müll. Arg.

TLC: None.

Tanga Province, Lushoto District, East Usambara Mts, Amani, Santesson 23165, 23378, 23472 (UPS). **Eastern Province**, Kilosa District, Ukaguru Mts, Pócs et al. 6587/H (VBI).

Collema callibotrys Tuck.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Magamba, c. 4 km N of Lushoto, 1600-2000 m, Ryvarden 10915b (O).

Dictyonema sericeum (Sw.) Berk.

TLC: None.

Southern Highlands Province, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/001 (O).

Dirinaria applanata (Fée) D.D. Awasthi

TLC: Divaricatic acid, terpenoids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/019-021, 031 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/002 (O).

Dirinaria confluens (Fr.) D.D. Awasthi

TLC: Divaricatic acid, terpenoids, atranorin.

Eastern Province, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/001 (O).

Erioderma leylandii (T. Taylor) Müll. Arg.

TLC: Pannarin.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/005 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/002 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/154, 156 (O).

Erioderma meiocarpum Nyl.

TLC: Argopsin, norargopsin (trace).

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/003 (O).

Erioderma solediatum D.J. Galloway & P.M. Jørg.

TLC: Eriodermin.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/004 (O).

Flavoparmelia caperata (L.) Hale

TLC: Protocetraric acid, caperatic acid, usnic acid.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/035 (O).

[Swinscow & Krog (1988): *Pseudoparmelia caperata* (L.) Hale]

Heterodermia appendiculata (Kurok.) Swinscow & Krog

TLC: ± Norstictic acid, zeorin, additional terpenoids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/074 (O), West Usambara Mts, Magamba, Ryvarde 10917b (O).

Heterodermia casarettiana (A. Massal.) Trevis.

TLC: Salazinic acid, ± norstictic acid, zeorin, additional terpenoids, pigment, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, on path to Lulando Forest at the NE edge of the Mufindi escarpment, 1450 m, Krog 3T 23/037 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/023 (O).

Heterodermia diademata (T. Taylor) D.D. Awasthi

TLC: Zeorin, additional terpenoids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/044 (O).

***Heterodermia dissecta* (Kurok.) D.D. Awasthi**

TLC: Zeorin, additional terpenoids, dissectaic acid, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/049, 051 (O), Uzungwa Mts, Mufindi escarpment, 2 km NW of Buffalo Hill, 1850 m, Krog 4T 24/002 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/033, 036 (O).

***Heterodermia flabellata* (Fée) D.D. Awasthi**

TLC: Zeorin, additional terpenoids, pigments, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, on path to Lulando Forest at the NE edge of the Mufindi escarpment, 1450 m, Krog 3T 23/042 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/055, 158 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/021 (O).

***Heterodermia fragilissima* (Kurok.) J.C. Wei & Y.M. Jiang**

TLC: Zeorin, additional terpenoid (minor), atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/072 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/038, 039 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/044 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/060 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/055 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/050 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/043 (O).

***Heterodermia hypoleuca* (Ach.) Trevis.**

TLC: Zeorin, additional terpenoids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, along path to Gonja Mountain 5 km E of Mgwashi village, 1500 m, Krog 2T 06/036, 040 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/046 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/051 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/070 (O), West

Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/016 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/046 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/036, 052 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/009 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/006 (O), Uzungwa Mts, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/019 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/011 (O).

Heterodermia isidiophora (Nyl.) D.D. Awasthi

TLC: Zeorin, additional terpenoids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/075-077 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/043 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/067 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/057 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/047 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/046 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/024, 025, 049, 050 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/034, 035 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/050 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/010 (O).

Heterodermia japonica (M. Satô) Swinscow & Krog

TLC: Zeorin, ± norstictic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/064 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/046, 054 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/027, 032, 042, 048, 053 (O).

Heterodermia leucomelos (L.) Poelt

TLC: Zeorin, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/026 (O).

Heterodermia lutescens (Kurok.) Follmann

TLC: Zeorin, additional terpenoids, pigments, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/057, 058 (O).

Heterodermia magellanica (Zahlbr.) Swinscow & Krog

TLC: ± Norstictic acid, zeorin, additional terpenoids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, montane evergreen forest, 1600-1700 m, Krog 2T 06/032 (O). **Southern Highlands Province**, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/037 (O).

Heterodermia microphylla (Kurok.) Skorepa

TLC: Zeorin, additional terpenoids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/074 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/047 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/045, 055 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/012 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/007 (O).

Heterodermia obscurata (Nyl.) Trevis.

TLC: Zeorin, additional terpenoids, pigments, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/073 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/045 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/045 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/034 (O).

Heterodermia podocarpa (Bél.) D.D. Awasthi

TLC: Zeorin, additional terpenoids, ± norstictic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/041 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/041 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/012 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/032.

Heterodermia speciosa (Wulfen) Trevis.

TLC: Zeorin, additional terpenoids, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/005 (O).

Heterodermia usambarensis (Kurok.) Swinscow & Krog

TLC: Zeorin, additional terpenoids, pigments, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/035 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/042 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/048 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/042 (O).

Heterodermia vulgaris (Vain.) Follmann & Redón

TLC: Zeorin, additional terpenoids, pigments, atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/007 (O).

Hypotrachyna brevirhiza (Kurok.) Hale

TLC: Salazinic acid, norstictic acid (trace), atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/014 (O).

Hypotrachyna costaricensis (Nyl.) Hale

TLC: Fatty acids, atranorin.

Eastern Province, Morogoro District, Uluguru Mts, above Morningside, in rainforest at 1300-1800 m, Dahl s.n. (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/002 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/067, 073 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/009 (O).

Hypotrachyna densirhizinata (Kurok.) Hale

TLC: Alecoronic acid, α -collatolic acid, atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/002 (O).

Hypotrachyna ducalis (Jatta) Hale

TLC: Barbatic acid, 4-O-demethylbarbatic acid, atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/008, 010, 014 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/004, 007, 008, 012 (O).

Hypotrachyna endochlora (Leight.) Hale

TLC: Barbatic acid, obtusatic acid, secalonic acid A, echinocarpic acid, atranorin.

Southern Highlands Province, Mbeya District, between Kimondo and Kikondo, in montane rainforest at 2400 m, Dahl s.n. (O); Iringa District, Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/025 (O); Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/009, 031 (O).

Hypotrachyna immaculata (Kurok.) Hale

TLC: The lividic acid complex, skyrin, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/038 (O), Gonja Mountain 5 km E of Mgwashu village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/012 (O), between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/011 (O), along motor road from Mazumbai University Forest Station to the

edge of the forest reserve, 1500-1560 m, Krog 2T 08/027 (O), Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/011 (O), Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/016 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/058, 060 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/015 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/011, 012, 017 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2230-2580 m, Krog & Congdon 4T 22/003 (O).

Hypotrachyna leiophylla (Kurok.) Hale

TLC: 4-O-Demethylmicrophyllinic acid, an undetermined, probably related substance, skyrin, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/026 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/010 (O).

Hypotrachyna neodissecta (Hale) Hale

TLC: Gyrophoric acid and associated substance, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/059, 072 (O).

Hypotrachyna olivetorica Krog

TLC: Olivetoric acid, associated substance (+), atranorin.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, on twigs in montane rainforest, 1600-1700 m, Krog 2T 07/013 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/017 (O).

Hypotrachyna orientalis (Hale) Hale

TLC: Barbatic acid, 4-O-demethylbarbatic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/027 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog

4T 10/065, 074, 087, 094 (O); Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/013 (O).

Hypotrachyna osseoalba (Vain.) Park & Hale

TLC: The lividic acid complex, lichexanthone.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/039, 040 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi, 1600-1700 m, Krog 2T 06/010 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/012 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/029 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/025 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/014 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/004 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/010 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/004, 005 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/061, 071, 081, 083, 104 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/012, 020 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/004, 012, 013 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/018 (O).

[Swinscow & Krog (1988): *Hypotrachyna formosana* (Zahlbr.) Hale]

Hypotrachyna polydactyla (Krog & Swinscow) Nash

TLC: The lividic acid complex, skyrin, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Magamba, c. 4 km N of Lushoto, Ryvarden 10913 (O), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/037 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/012 (O). **Eastern Province**, Morogoro District, Uluguru Mts, above Morningside, in rainforest at 1300-1800 m, Dahl s.n. (O).

Hypotrachyna pseudosinuosa (Asahina) Hale

TLC: Protocetraric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University

Forest Station and Kambi Falls, on twigs in montane rainforest, 1600-1700 m, Krog 2T 07/010 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, on twigs in montane rainforest, 1700-1900 m, Krog 2T 11/003 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/088 (O).

Hypotrachyna rockii (Zahlbr.) Hale

TLC: Evernic acid, lecanoric acid, atranorin.

Southern Highlands Province, Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/008, 014 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/009 (O).

Imshaugia aleurites (Ach.) S.L.F. Mey.

TLC: Thamnic acid.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/027 (O).

[Swinscow & Krog (1988): *Parmeliopsis aleurites* (Ach.) Nyl.]

Leprocaulon arbuscula (Nyl.) Nyl.

TLC: Fumarprotocetraric acid, undetermined substances.

Tanga Province, Lushoto District, East Usambara Mts, Amani, 800-1000 m, Ryvarden 10742 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/023 (O).

Leptogium adpressum Nyl.

TLC: None.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/020 (O).

Leptogium austroamericanum (Malme) C.W. Dodge

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/026 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/004 (O).

Leptogium azureum (Sw.) Mont.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/029, 030 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/005-007, 009 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/013, 017, 020 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/009, 010 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/008 (O). **Eastern Province**, Morogoro District, Nguru Mts, Dikurura Valley, 3 km W of Mhonda Mission, in submontane rainforest, 900 m, Krog 3T 03/004 (O), SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/003 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of Mufindi escarpment, in low montane forest, 1450 m, Krog 3T 23/006 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/159, 167 (O).

Leptogium brebissonii Mont.

TLC: None.

Eastern Province, Morogoro District, Nguru Mts, Dikurura Valley, 3 km W of Mhonda Mission, in submontane rainforest, 900 m, Krog 3T 03/005 (O).

Leptogium burgessii (L.) Mont.

TLC: None.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/038, 039 (O).

Leptogium burnetiae C.W. Dodge

TLC: None.

Southern Highlands Province, Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/018 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/037 (O).

Leptogium caespitosum (T. Taylor) Swinscow & Krog

TLC: None.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/161, 162 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/020 (O).

Leptogium cochleatum (Dicks.) P.M. Jørg. & P. James

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/012 (O).

Leptogium coralloideum (Meyen & Flot.) Vain.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/022 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/009 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/007 (O). **Eastern Province**, Morogoro District, Uluguru Mts, E of Lukwangule Plateau, 2250 m, Pócs 88113/Y (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/157, 165, 169 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/028 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/031 (O).

Leptogium cyanescens (Rabenh.) Körb.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/008 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/015, 016 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/008 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/007, 011 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/004 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/160 (O).

Leptogium furfuraceum (Harm.) Sierk

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/014 (O).

Leptogium hibernicum P.M. Jørg.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/023 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/018 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/006 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/168, 170, 173 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/027, 028 (O).

Leptogium javanicum Mont.

TLC: None.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/155 (O).

Leptogium laceroides de Lesd.

TLC: None.

Eastern Province, Morogoro District, Uluguru Mts E of Lukwangule Plateau, 2250 m, Pócs 88113/Y (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/172 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/031 (O); Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/040 (O).

Leptogium marginellum (Sw.) Gray

TLC: None.

Tanga Province, Lushoto District, East Usambara Mts, Amani Forest Reserve, 1000 m, T. & S. Pócs 6100/E (BM).

Leptogium phyllocarpum (Pers.) Mont.

TLC: None.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/158, 163, 166, 174, 178 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/017 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/019 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/041 (O).

Leptogium sessile Vain.

TLC: None.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/171 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/019 (O).

Lobaria asperula (Stirt.) Yoshim.

TLC: Gyrophoric acid.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/025 (O).

Lobaria discolor (Delise) Hue

TLC: Gyrophoric acid.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/008 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/031 (O).

Lobaria holstiana (Müll. Arg.) Zahlbr.

TLC: Gyrophoric acid.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/006 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/015 (O), West Usambara Mts, SW of Ambangulu Tea Estate, 1200-1400 m, Pócs 8455/Z (VBI), West Usambara Mts, 2 km SW of the Shagein Peak, 2000-2150 m, Pócs

8445/GA (VBI), West Usambara Mts, E ridge, N slope of Kilimandegé, 1550-1750 m, Pócs 8507/F (VBI).

Lobaria patinifera (T. Taylor) Hue

TLC: Gyrophoric acid, ± congyrophoric acid.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/032 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/007 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/008 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/132 (O), Uzungwa Mts, Mufindi escarpment, in montane rainforest, 1750-1800 m, Krog 4T 15/022, 023 (O), Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, in montane rainforest, 1900 m, Krog 4T 12/016 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/024 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/024 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/036, 037 (O), Uzungwa Mts, Mufindi area, Kigogo forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/029 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m. Krog 3T 24/024, 031 (O).

Lobaria retigera (Bory) Trevis.

TLC: Terpenoids, ± the stictic acid complex, ± telephoric acid.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/014 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/007 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/135, 146, 148 (O), Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, 1900 m, Krog 4T 12/012, 014 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/023 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/021 (O).

Menegazzia terebrata (Hoffm.) A. Massal.

TLC: The stictic acid complex, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/021, 022 (O), West Usambara Mts, along boundary of Mazumbai University

Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/009 (O). **Southern Highlands Province**, Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/022 (O).

Myelochroa aurulenta (Tuck.) Elix & Hale

TLC: Terpenoids, secalonic acid A, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Dodwe (road towards Derema), 800 m, Santesson 23358 (O). **Eastern Province**, Morogoro District, Uluguru Mts, above Morningside, in rainforest at 1300-1800 m, Dahl s.n. (O).

[Swinscow & Krog (1988): *Hypotrachyna aurulenta* (Tuck.) Krog & Swinscow]

Nephroma tropicum (Müll. Arg.) Zahlbr.

TLC: Methylgyrophorate, ± gyrophoric acid, terpenoids.

Southern Highlands Province, Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, Krog 3T 24/021 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/021 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/023 (O).

Normandina pulchella (Borrer) Nyl.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai Village, in montane rainforest, 1850 m, Krog 2T 10/002 (O, mixed with *Pannaria elatior*). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/042 (O).

Pannaria elatior Stirt.

TLC: Pannarin.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600 m, Krog 2T 07/001 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/002 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/003-005, 007, 008 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/002 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/001a (O),

West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/001 (O), West Usambara Mts, E side ridge of Kilimandegge Summit in Balanga I West Forest Reserve, in elfin woodland and *Philippia* heath, 1730 m, Borhidi & Hedrén 8414/AG (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/175 (O); Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/035, 036 (O).

[*Pannaria fulvescens sensu* Swinscow & Krog (1988)]

Pannaria lurida (Mont.) Nyl.

TLC: Terpenoids.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/003 (O). **Eastern Province**, Morogoro District, S summit of Mindu Hill, 1250 m, Pócs 88102/AY (VBI).

Pannaria rubiginosa (Ach.) Bory

TLC: Pannarin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/002 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/002 (O).

Pannaria santessonii Swinscow & Krog

TLC: Pannarin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/001 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/001 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/002 (O), West Usambara Mts, on the isolated peak between Kwagoroto Summit and Mazumbai village, 1850 m, Pócs 8404/R (VBI). **Eastern Province**, Morogoro District, Mindu Forest Reserve, 1000-1200 m, Dahl s.n. (O - holotype), Uluguru Mts, Mindu Hill WSW of Morogoro town, in submontane rainforest patch on the summit, 1250 m, Pócs 87057/E (O).

Parmeliella mariana (Fr.) P.M. Jørg. & D.J. Galloway

TLC: None.

Eastern Province, Morogoro District, Uluguru Mts, Mindu Forest Reserve, 1000-1200 m,

Dahl s.n. (O), Uluguru Mts, Mindu Hill WSW of Morogoro town, in submontane rainforest patch on the summit, 1250 m, Pócs 87057/E (O, mixed with *Pannaria santessonii*).

[Swinscow & Krog (1988): *Pannaria mariana* (Fr.) Müll. Arg.]

Parmeliella pannosa (Sw.) Müll. Arg.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/001 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/001 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/001 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest, at the edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/017 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/046, 047 (O).

Parmelinella wallichiana (T. Taylor) Elix & Hale

TLC: Salazinic acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, road towards SW, 800-900 m, Vitikainen 9422 (H), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/065 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/042 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/012 (O).

[Swinscow & Krog (1988): *Pseudoparmelia wallichiana* (T. Taylor) Krog & Swinscow]

Parmelinopsis afrorevoluta (Krog & Swinscow) Elix & Hale

TLC: Gyrophoric acid and associated substances, 'horrescens unknown' (trace), atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/086, 096 (O).

[Swinscow & Krog (1988): *Hypotrachyna afrorevoluta* (Krog & Swinscow) Krog & Swinscow]

Parmelinopsis expallida (Kurok.) Elix & Hale

TLC: Protolichesterinic acid, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/100 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and

bamboo forest, 1750-1800 m, Krog 4T 23/030 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/019 (O).

Parmelinopsis horrescens (T. Taylor) Elix & Hale

TLC: The "horrescens unknown" complex, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/034 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/026 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/028 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/017 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/003 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/110 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/018 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/018 (O).

[Swinscow & Krog (1988): *Hypotrachyna horrescens* (T. Taylor) Krog & Swinscow]

Parmelinopsis minarum (Vain.) Elix & Hale

TLC: Gyrophoric acid and associated substances, 'horrescens unknown', atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/033, 035 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/009 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/018, 019, 111 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/111 (O); Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/015 (O).

[Swinscow & Krog (1988): *Hypotrachyna minarum* (Vain.) Krog & Swinscow]

Parmelinopsis spathulata (Kurok.) Elix & Hale

TLC: Gyrophoric acid and associated substances, 'horrescens unknown', atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/016 (O).

[Swinscow & Krog (1988): *Hypotrachyna spathulata* (Kurok.) Krog & Swinscow]

Parmelinopsis spumosa (Asahina) Elix & Hale

TLC: Gyrophoric acid and associated substance, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/036 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/011 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/015 (O). **Southern Highlands Province**, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/032 (O).

[Swinscow & Krog (1988): *Hypotrachyna spumosa* (Asahina) Krog & Swinscow]

Parmelinopsis subfatiscens (Kurok.) Elix & Hale

TLC: The "horrescens unknown" complex, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/013 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/005 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/076 (O).

[Swinscow & Krog (1988): *Hypotrachyna subfatiscens* (Kurok.) Krog & Swinscow]

Parmotrema abessinicum (Kremp.) Hale

TLC: Protolichesterinic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/053 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/081 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/007, 011 (O), Mindu Hill, E slope, Pócs 88186/F (VBI).

Parmotrema amaniense (J. Steiner & Zahlbr.) Krog & Swinscow

TLC: Protocetraric acid, alectoronic acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani Forest Reserve, T. & S. Pócs 6100/AD-B (VBI), East Usambara Mts, Karimi Estate (road towards Monga), Moberg 1485b (UPS), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/051, 052 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/050, 051 (O). **Eastern Province**, Morogoro District, Nguru Mts, E slope above Kwamanga village near Mhonda Mission, Pócs & Mabberley 6397/H (VBI), Dikurura Valley, mossy and elfin forest, 1400-1900 m, Farkas 89118-89120 (VBI), Uluguru Mts, N slope of Bondwa above Morogoro,

Pócs 6732 (VBI), Nguru Mts above Mogole village, 1575 m, Pócs 88184/Q (VBI); Kilosa District, Ukaguru Mts, Mamwira Summit, 2240 m, Pócs 88017/P (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/009 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/077 (O).

Parmotrema andinum (Müll. Arg.) Hale

TLC: Lecanoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/074 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/049 (O). **Eastern Province**, Morogoro District, Uluguru Mts, above Morningside, in rainforest at 1300-1800 m, Dahl s.n. (O).

Parmotrema austrosinense (Zahlbr.) Hale

TLC: Lecanoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/082 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/072 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/13, 014 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/052-054 (O), West Usambara Mts, Summit Range of Mt Mali, 1600-1700 m, Pócs 8410/M (VBI), near Kambi Falls W of Mazumbai village, 1600 m, Pócs 8527/E (VBI). **Eastern Province**, Morogoro District, Uluguru Mts, above Morningside, in rainforest at 1300-1800 m, Dahl s.n. (O), SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/044 (O).

Parmotrema bangii (Vain.) Hale

TLC: The stictic acid complex, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/062 (O).

Parmotrema cooperi (J. Steiner & Zahlbr.) Sérus.

TLC: Lecanoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Magamba c. 4 km N of Lushoto, Ryvarden 10911 (O), West Usambara Mts, Gonja Mountain, 5 km E of Mgwashi village, in

montane evergreen forest, 1600-1700 m, Krog 2T 06/044 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/048 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/074 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/060 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/048 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/018 (O). **Eastern Province**, Morogoro District, Uluguru Mts, Morningside Research Station, 1500-2100 m, Ryvardeen 11580 (O). **Southern Highlands Province**, Mbeya District, between Kimondo and Kikondo, in montane rainforest at 2400 m, Dahl s.n. (O); Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/013 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/095, 109, 113, 114, 117 (O).

Parmotrema crinitum (Ach.) M. Choisy

TLC: The stictic acid complex, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/078 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/068 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/063, 065 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/058 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/068 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/015 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/016, 017 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/008 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/028; Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/025 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/005 (O).

Parmotrema cryptoxanthum (Abbayes) Hale

TLC: Echinocarpic acid, protolichesterinic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/056 (O).

Parmotrema degelianum Krog & Swinscow

TLC: Two undetermined substances, pigments, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Shume natural forest, Lovett 17 (BM - holotype, O - isotype), Lovett 40 (BM), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/073 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/059 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/019 (O), near Kambi Falls W of Mazumbai village, 1600 m, Pócs 8527/E (VBI).

Parmotrema dilatatum (Vain.) Hale

TLC: Protocetraric acid, echinocarpic acid, undetermined substances, pigments, usnic acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, in the surroundings of Forestry House, Santesson 23151 (UPS), Moberg 1472b (UPS).

Parmotrema direagens (Hale) Hale

TLC: Gyrophoric acid, psoromic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/047 (O). **Eastern Province**, Morogoro District, Uluguru Mts, W slope of Lupanga above Morogoro, Pócs et al. 6067/A (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/021 (O).

Parmotrema durumae (Krog & Swinscow) Krog & Swinscow

TLC: Alecoronic acid, α -collatolic acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, behind forest houses, 950 m, Pócs 6946/G (VBI).

Parmotrema eciliatum (Nyl.) Hale

TLC: The stictic acid complex, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani Forest Reserve, T. & S. Pócs 6086/T (VBI). **Eastern Province**, Morogoro District, Mindu Forest Reserve, 1000-1200 m, Dahl s.n. (O).

Parmotrema eunetum (Stirt.) Hale

TLC: Norlobaridon, norstictic acid.

Southern Highlands Province, Mbeya District, between Kimondo and Kikondo, in montane rainforest, 2400 m, Dahl s.n. (O).

Parmotrema eurysacum (Hue) Hale

TLC: Salazinic acid, atranorin.

Eastern Province, Morogoro District, Uluguru Mts, in rainforest above Morningside, 1300-1800 m, Dahl s.n. (O).

Parmotrema fragilescens Krog

TLC: Lecanoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, in montane rainforest between Mazumbai University Forest Station and Kambi Falls, 1600-1700 m, Krog 2T 07/062 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath, 1850-1980 m, Krog 2T 09/069 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/064 (O - holotype).

Parmotrema gardneri (C.W. Dodge) Sérus.

TLC: Protocetraric acid, ± fatty acids, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani Forest Reserve, T. & S. Pócs 6086/O (VBI), East Usambara Mts, Amani, surroundings of Forestry House, Moberg 1471a (UPS), East Usambara Mts, Amani, road towards SW, Santesson 23406 (UPS). **Eastern Province**, Morogoro District, Nguru Mts, above Mogole village, 1575 m, Pócs 88184/Q (VBI). **Southern Highlands Province**, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/042 (O).

Parmotrema hababianum (Gyelnik) Hale

TLC: Protolichesterinic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/058 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/018 (O).

Parmotrema hensseniae Krog

TLC: Two undetermined substances, pigments, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1900 m, Krog 2T 09/002 (O - holotype, UPS - isotype), West Usambara Mts, Kwagoroto Summit, 1950 m, Krog 2T 11/001b (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/020 (O). **Southern Highlands Province**, Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/010 (O).

[*Parmotrema araucarium* sensu Swinscow & Krog (1988)]

Parmotrema hicksii Krog & Swinscow

TLC: Gyrophoric acid, psoromic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, in montane rainforest on the SW ridge of Gonja Mountain NE of Mazumbai village, 1500-1700 m, Pócs 8505/DB (VBI - holotype), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/058 (O). **Eastern Province**, Morogoro District, Nguru Mts, Dikurura Valley, mossy forest, 1700-1900 m, Farkas 89119 (VBI).

Parmotrema hololobum (Hale) Hale

TLC: Lecanoric acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, near Amani, T. & S. Pócs 6087/A (VBI), West Usambara Mts, Magamba c. 4 km N of Lushoto, Ryvarde 10912 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/076 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/070, 071 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/009 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/060 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/008, 013 (O), N Uluguru Mts, gorge of Mt Kinazi above Morogoro, Pócs 6289/AY (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/010 (O).

Parmotrema indicum Hale

TLC: Gyrophoric acid, norlobaridone, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Nilo Peak area, 1250-1450 m, Pócs

87123/AA (VBI), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/055 (O).

Parmotrema iringense Krog

TLC: Gyrophoric acid, protocetraric acid, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/014 (O - holotype).

Parmotrema laciniatulum Krog

TLC: Alectoronic acid, α -collatolic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain, 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/046-048 (O), Pócs 8505/s (VBI, O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath, 1850-1980 m, Krog 2T 09/075 (O - holotype), 076 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/063 (O).

Parmotrema lobulascens (J. Steiner) Hale

TLC: Alectoronic acid, \pm α -collatolic acid, atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/044 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/016 (O).

Parmotrema lophogenum (Abbayes) Hale

TLC: Gyrophoric acid, fatty acids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/054 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/071 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/059 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/016 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/056 (O).

Parmotrema maclayanum (Müll. Arg.) Hale

TLC: Alectoronic acid, \pm unknown with alectoronic acid, \pm α -collatolic acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, Greenway 1001 (BM), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 07/079 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/010, 011 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/063 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/006, 012 (O), Uluguru Mts, edge of Lukwangule Plateau, in elfin forest, 2400 m, Pócs & Ochyra 88110/BV (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kigogo forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/023 (O). Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/043 (O).

Parmotrema mellissii (C.W. Dodge) Hale

TLC: Alecoronic acid, α -collatolic acid, \pm skyrin, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/050 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/014 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/073 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/089 (O); Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/026 (O).

Parmotrema nilgherrense (Nyl.) Hale

TLC: Alecoronic acid, α -collatolic acid, atranorin.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/001, 015 (O).

Parmotrema permutatum (Stirt.) Hale

TLC: Gyrophoric acid, pigment, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/059 (O).

Parmotrema planatilobatum (Hale) Hale

TLC: Gyrophoric acid, \pm skyrin, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, surroundings of Forestry House, 900 m, Vitikainen 9308 (H), East Usambara Mts, Amani Forest Reserve, T. & S. Pócs 6102/V-C (VBI).

Parmotrema poolii (C.W. Dodge) Krog & Swinscow

TLC: Alectoronic acid, α -collatolic acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, surroundings of Forestry House, Santesson 32153 (UPS), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/058-061 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/073 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/066, 067 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/061 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/015a (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/061, 062 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/026 (O).

Parmotrema pseudeunetum Sérus.

TLC: Gyrophoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/070 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/012 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/057 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/112, 115 (O).

Parmotrema pseudocrinitum (Abbayes) Hale

TLC: Gyrophoric acid, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, Dodwe (road towards Derema), 800 m, Vitikainen 9412, 9413 (H), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/081 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/005 (O).

Parmotrema rimulosum (C.W. Dodge) Hale

TLC: Alectoronic acid, α -collatolic acid, \pm skyrin, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/078 (O).

Parmotrema sancti-angelii (Lynge) Hale

TLC: Gyrophoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/080 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/069 (O). **Eastern Province**, Morogoro District, Uluguru Mts, above Morningside, in rainforest at 1300-1800 m, Dahl s.n. (O).

Parmotrema subarnoldii (Abbayes) Hale

TLC: Protocetraric acid, \pm alectoronic acid, \pm skyrin, \pm parietin, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Shume Natural Forest, Lovett 39 (BM), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/056, 057 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/082 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/072 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/057, 066 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/013 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/068 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/010 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/082, 105, 107 (O), Uzungwa Mts, Mufindi area, Kigogo forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/016 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, in wet montane rainforest, 2000 m, 3T 24/025, 037 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2000 m, Krog 3T 25/022, 024 (O).

Parmotrema subcoloratum (Hale) Hale

TLC: Gyrophoric acid, pigment, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/083 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/065 (O).

Parmotrema tinctorum (Nyl.) Hale

TLC: Lecanoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/049 (O), West

Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/080 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/066 (O).

Parmotrema ultralucens (Krog) Hale

TLC: Salazinic acid, lichexanthone (in the medulla), atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, Dodwe (road towards Derema), 800 m, Santesson 23362 (UPS, US), East Usambara Mts, Amani, in the surroundings of Forestry House, Santesson 23155 (UPS), East Usambara Mts, Hunga Stream Valley, 840 m, Pócs 87037/U (VBI).

Parmotrema umbrosum (Krog & Swinscow) Krog & Swinscow

TLC: Gyrophoric acid, protocetraric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/077 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/064 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/093 (O), Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, on roadside trees, 1900 m, Krog 4T 12/010 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/015, 018 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/015 (O).

Parmotrema xanthinum (Müll. Arg.) Hale

TLC: Gyrophoric acid, caperatic acid, usnic acid.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/083 (O).

Peltigera praetextata (Sommerf.) Zopf

TLC: None.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/028 (O).

Phaeophyscia adiantola (Essl.) Essl.

TLC: None.

Tanga Province, Lushoto District, East Usambara Mts, Amani, 800-900 m, Moberg 1482

(UPS), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/004 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/002 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/008 (O). **Eastern Province**, Morogoro District, Nguru Mts, near Chenzema Mission, 1700 m, Pócs 6812/V (BM).

Phyllopsora africana Timdal & Krog *in ed.*

TLC: Argopsin, chlorophyllopsorin.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, 1600-1700 m, Krog 2T 06/030 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/053 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/040 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, in montane rainforest, 1900 m, Krog 4T 12/007 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/007, 033 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/018 (O), Uzungwa Mts, Mufindi escarpment, 2 km NW of Buffalo Hill, 1850 m, Krog 4T 24/001, 007 (O), Uzungwa Mts, Mufindi area, Kigogo forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/003, 008 (O).

Phyllopsora albicans Müll. Arg.

TLC: Argopsin, norargopsin (chemotype I), argopsin, pannarin (chemotype II).

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/029 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/054 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/052 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/041 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/014 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/049 (O), Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, on roadside trees, 1900 m, Krog 4T 12/001, 006 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/019 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/002, 006 (O), Uzungwa Mts, Mufindi escarpment, 2 km NW of Buffalo Hill, 1850 m, Krog 4T 24/003-006 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/001, 002 (O).

Phyllopsora buettneri (Müll. Arg.) Zahlbr.

TLC: Pannarin, zeorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, Moberg 1464, 1480d (UPS), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/028 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/053 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/040 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/016a (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/016 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/007 (O).

Phyllopsora chlorophaea (Müll. Arg.) Zahlbr.

TLC: ± atranorin (trace) (chemotype I), furfuracein ± atranorin (trace) (chemotype II).

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/037, 039 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/046 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/049, 051 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/038 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/016b (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/007 (O).

Phyllopsora confusa Swinscow & Krog

TLC: ± terpenoids (trace).

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/001, 005 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/004 (O).

Phyllopsora corallina (Eschw.) Müll. Arg.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/052 (O).

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/017b (O).

Phyllopsora dolichospora Timdal & Krog *in ed.*

TLC: Furfuracein, several undetermined substances (probably related to furfuracein).

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/038 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando forest at the edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/018b (O).

Phyllopsora furfuracea (Pers.) Zahlbr.

TLC: ± Furfuracein.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600 m, Krog 2T 06/026, 027 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/045, 047, 051 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/039 (O), East Usambara Mts, Kwamkoro Forest Reserve, 1000 m, Pócs & Mwashwa 87032 (VBI), East Usambara Mts, Amani, surroundings of Forestry House, 900 m, Santesson 23292 (UPS). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/015 (O), Uluguru Mts, E edge of Lukwangule Plateau, 2400 m, Pócs & Ochyra 88110/BS, BT (EGR), Uluguru Mts, Lukwangule Plateau, in Mgeta River Valley on the E escarpment, 2300 m, Pócs & Ochyra 88113/E (EGR). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando forest at the edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/018a (O), Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, on roadside trees, 1900 m, Krog 4T 12/003-005 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/002 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/003, 005 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/008-014 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/005 (O).

[Swinscow & Krog (1988): *Phyllopsora haemophaea* (Nyl.) Müll. Arg.]

Phyllopsora halei (Tuck.) Zahlbr.

TLC: Terpenoids, fatty acids, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/021 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/044 (O). **Eastern Province**, Morogoro District, Nguru Mts, 3 km N of Maskati Mission, in montane evergreen forest, 1700 m, Pócs 88041/A (O).

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, on roadside trees, 1900 m, Krog 4T 12/002 (O), Uzungwa Mts, Mufindi area, Lugoda tea estate, Kidopi A, on felled trees, 1900 m, Krog 4T 14/001 (O), Uzungwa Mts, Mufindi area, at edge of golf-course, 1970 m, Krog 4T 17/003 (O).

[Swinscow & Krog (1988): *Phyllopsora pannosa* Müll. Arg.]

Phyllopsora kiiensis (Vainio) Gotth. Schneider

TLC: Furfuracein.

Tanga Province, Lushoto District, East Usambara Mts, Amani, in the surroundings of Forestry House, c. 900 m, Santesson 23277, 23291 (UPS). **Southern Highlands Province**, Iringa District, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/015 (O).

Phyllopsora martinii Swinscow & Krog

TLC: Argopsin, norargopsin, chlorophyllopsorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Lulando forest at the edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/047 (O).

Phyllopsora mauritiana (T. Taylor) Gotth. Schneider

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/037 (O).

Phyllopsora mediocris Swinscow & Krog

TLC: None.

Tanga Province, Lushoto District, East Usambara Mts, Amani, near Forestry House, c. 900 m, Moberg 1481a-1 (UPS - holotype), West Usambara Mts, Gonja Mt. 5 km E of Mgwashi, 1600-1700 m, Krog 2T 06/023 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, Krog 4T 10/004 (O), 1850-1900 m, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/003, 004, 017a (O).

Phyllopsora nemoralis Timdal & Krog *in ed.*

TLC: Argopsin, atranorin (trace).

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/003 (O).

Phyllopsora subhispidula (Nyl.) Kalb & Elix

TLC: Argopsin, norargopsin, zeorin, atranorin (trace).

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/024 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/048, 049 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/050 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/038 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/007, 008 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/006 (O).

[*Phyllopsora santensis sensu* Swinscow & Krog (1988)]

Phyllopsora swinscowii Timdal & Krog *in ed.*

TLC: Methyl 2,7-dichloropsoromate, methyl 2,7-dichloronorpсорomate.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/025 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/050 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, in montane rainforest, 1900 m, Krog 4T 12/017 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/048 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/032 (O).

Physcia atrostriata Moberg

TLC: Zeorin, unidentified substances, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, in the surroundings of Forestry House, 900 m, Moberg 1495a (UPS - holotype), East Usambara Mts, Amani, Karimi Estate, 800-900 m, Moberg 1482e, 1484c (UPS).

Physcia erumpens Moberg

TLC: Zeorin, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, 850 m, Santesson 23425 (UPS), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/011 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/006 (O).

Physcia verrucosa Moberg

TLC: Zeorin, atranorin.

Tanga Province, Lushoto District, East Usambara Mts, Amani, surroundings of Forestry House, 900 m, Moberg 1494f (UPS).

Phyiscidia wrightii Tuck.

TLC: The sekikaic acid complex.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/049, 050 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/064 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/086 (O). **Eastern Province**, Morogoro District, Uluguru Mts, Morningside Research Station, c. 5 km S of Morogoro, 1500-2100 m, Ryvar den 11570b (O).

Physma byrsaeum (Ach.) Tuck.

TLC: None.

Tanga Province, Lushoto District, East Usambara Mts, Amani Botanic Garden near stream below Medical Research Center, 930 m, Pócs 87115/C (O).

Pseudocyphellaria argyracea (Delise) Vain.

TLC: Terpenoids, ± gyrophoric acid, ± methylgyrophorate.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/041, 059 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/019 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/039, 040 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/035 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/017 (O); Kilosa District, Ukaguru Mts, wet montane forest along road from Mandege Forest Station to Rubeho, 1550-1580 m, Pócs et al. 6588/C (BM). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/035 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/020 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/136 (O), Uzungwa Mts, Lulando Forest at the NE edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/020 (O).

Pseudocyphellaria aurata (Ach.) Vain.

TLC: Pigments, terpenoids.

Tanga Province, Lushoto District, East Usambara Mts, Nilo Peak area, 1250-1450 m, Pócs 87123/Z (VBI), West Usambara Mts, between Kwagoroto Summit and Mazumbai, in mosaic of grassland, *Philippia* heath and dry elfin forest, 1850 m, Pócs 8404/Q (VBI), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/060 (O); Handeni District, West Usambara Mts, SW of Mzinga village, in woodland with rock outcrops, 1500 m, Pócs 8418/N (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/019 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/130,133,138 (O).

Pseudocyphellaria clathrata (De Not.) Malme

TLC: Pigments, terpenoids.

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/020 (O).

Pseudocyphellaria crocata (L.) Vain.

TLC: The stictic acid complex, tenuiorin, methylglyphosphate, pigments, terpenoids.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/041 (O), West Usambara Mts, SW of Shagein peak, 2000-2150 m, Pócs 8445/S (VBI).

Pseudocyphellaria dozyana (Mont. & Bosch) D.J. Galloway

TLC: The stictic acid complex, terpenoids, methylglyphosphate, tenuiorin.

Eastern Province, Morogoro District, Uluguru Mts, in mist-affected woodland on the S summit of Mindu Hill near Morogoro, 1250 m, Pócs & Ochyra 88102/AO (VBI).

Pseudocyphellaria intricata (Delise) Vain.

TLC: Terpenoids.

Tanga Province, Lushoto District, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/034 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/139 (O).

Pseudoparmelia sphaerospora (Nyl.) Hale

TLC: Secalonic acid A, undetermined substances, atranorin (trace).

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/020 (O), West Usambara Mts, SW ridge of Gonja NE of Mazumbai village, 1500-1700 m, Pócs 8504/DA (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, on roadside trees, 1900 m, Krog 4T 12/009 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/015 (O).

Punctelia constantimontium Sérus.

TLC: Gyrophoric acid, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/013 (O).

Punctelia neutralis (Hale) Krog

TLC: Caperatic acid, ± additional fatty acids, atranorin.

Southern Highlands Province, Iringa District, Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/019 (O); Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/028 (O).

Punctelia rudecta (Ach.) Krog

TLC: Lecanoric acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/003 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/002 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/005 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/001 (O). **Southern Highlands Province**, Mbeya District, between Kimondo and Kikondo, in montane rainforest, c. 2400 m, Dahl s.n. (O); Iringa District, Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/011 (O).

Pyxine berteriana (Fée) Imshaug

TLC: Testacein, terpenoids, pigment, lichexanthone.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/015 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/005 (O).

Pyxine coralligera Malme

TLC: Testacein, terpenoids, pigment, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/014, 084 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/003 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/003 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/010 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/004 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/014 (O).

Pyxine katendei Swinscow & Krog

TLC: Terpenoids, lichexanthone.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/016 (O).

Pyxine soreidiata (Ach.) Mont.

TLC: Terpenoids, pigment.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/011 (O).

Ramalina africana (Stein) C.W. Dodge

TLC: The sekikaic acid complex, \pm salazinic acid.

Eastern Province, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/033 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Mufindi escarpment S of Iringa near Ulele, Pócs & Jones 6317/I (BM).

Ramalina asperula Kremp.

TLC: Divaricatic acid, \pm fatty acid.

Eastern Province, Morogoro District, Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvardeen 11596 (O), Uluguru Mts, W slope of Lukwangule Plateau above Chenzema Mission, Pócs 6818/G (BM).

***Ramalina calcarata* Krog & Swinscow**

TLC: Divaricatic acid, ± salazinic acid.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/055 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/034 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/031 (O). **Eastern Province**, Morogoro District, Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvarden 11590 (O).

***Ramalina celastri* (Spreng.) Krog & Swinscow**

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/054 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/035 (O).

***Ramalina dendriscoides* Nyl.**

TLC: Salazinic acid.

Tanga Province, Lushoto District, East Usambara Mts, at the border of Kwamkoro and Kwamsambia forest reserves, in primary submontane rainforest, 1050 m, Pócs et al. 87033/B (VBI), East Usambara Mts, Amani Forest Reserve, T. & S. Pócs 6087/P, 6100/w, 6101/c (BM), East Usambara Mts, Amani, surroundings of Forestry House, 900 m, Santesson 23298, 23384 (UPS), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/034 (O).

***Ramalina disparata* Krog & Swinscow**

TLC: The sekikaic acid complex.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/051 (O).

***Ramalina dissimilis* Krog**

TLC: Stenosporic acid, divaricatic acid.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/056 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/007 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane

rainforest, 1300-1500 m, Krog 2T 12/031 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/038, 046 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/26 (O).

***Ramalina peruviana* Ach.**

TLC: The sekikaic acid complex.

Tanga Province, Lushoto District, East Usambara Mts, Amani Forest Reserve, T. & S. Pócs 6101/c (VBI), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/052 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/033 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/033 (O).

***Ramalina pocsii* Krog & Swinscow**

TLC: The sekikaic acid complex.

Eastern Province, Morogoro District, S Uluguru Mts, in elfin forest at the edge of Lukwangule Plateau, 2400 m, Pócs 6827/T (VBI, BM, O - type collection), Dikurura Valley, montane forest, 1400-1700 m, Farkas 89118 (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/153 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/030 (O); Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/030 (O).

***Ramalina pusiola* Müll. Arg.**

TLC: The sekikaic acid complex, ± norstictic acid (trace).

Tanga Province, Lushoto District, East Usambara Mts, Amani, Ryvarde 10740 (O), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/053 (O), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/016, 017 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/032 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/033 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/008, 016 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/032 (O). **Eastern Province**, Morogoro District, S Uluguru Mts, E slopes, above Simbini Village, Pócs 6418/AA (BM), Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvarde 11571 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane

rainforest, 1450 m, Krog 3T 23/040, 041 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/152 (O), Uzungwa Mts, Mufindi area, at edge of golf-course, 1970 m, Krog 4T 17/026 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/045 (O).

Ramalina roesleri (Schaer.) Hue

TLC: The sekikaic acid complex.

Tanga Province, Lushoto District, West Usambara Mts, Shume-Magamba Forest Reserve, summit of Mlomboza, 2200-2300 m, Pócs 8448/AL (VBI), West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/018 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/036 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/038 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/045 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/032 (O), West Usambara Mts, Kwagoroto Mountain, SE slope, in montane rainforest, 1700-1900 m, Krog 2T 11/015b (O).

Ramalina sprengelii Krog & Swinscow

TLC: None.

Eastern Province, Morogoro District, Uluguru Mts, Bondwa Peak, 1950 m, on branch of evergreen shrub in subalpine heath, Pócs & Gibbon 6052/cu-b (BM).

Relicina planiuscula (Kurok.) Hale

TLC: Echinocarpic acid, undetermined substance, usnic acid.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/047 (O).

Rimelia cetrata (Ach.) Hale & Fletcher

TLC: Salazinic acid, atranorin (trace).

Eastern Province, Morogoro District, Lukwangule Plateau, 2360 m, Pócs 88109/G (VBI), Dikurura Valley, montane forest, 1400-1700 m, Farkas 89118 (VBI). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/014, 015 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog

4T 10/079, 085, 097 (O).

[Swinscow & Krog (1988): *Parmotrema cetratum* (Ach.) Hale]

Rimelia reticulata (T. Taylor) Hale & Fletcher

TLC: Salazinic acid, atranorin.

Eastern Province, Morogoro District, Uluguru Mts, Morningside Research Station, 1500-2100 m, Ryvarden 11572 (O). **Southern Highlands Province**, Mbeya District, between Kimondo and Kikondo, in montane rainforest, 2400 m, Dahl s.n. (O); Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/070, 098 (O); Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/023 (O).

[Swinscow & Krog (1988): *Parmotrema reticulatum* (T. Taylor) M. Choisy]

Rimelia subsidiosa (Müll. Arg.) Hale & Fletcher

TLC: Salazinic acid, atranorin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/079 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/061, 062 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/067 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/016 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/084 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/009 (O).

[Swinscow & Krog (1988): *Parmotrema subsidiosum* (Müll. Arg.) Hale]

Roccella endocrocea M. Choisy

TLC: Erythrin, pigment.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/058 (O), West Usambara Mts, S of Mazumbai University Forest Reserve, 1500 m, Pócs 8401/Q (VBI), West Usambara Mts, E slope of Mafi Hill, 700-1000 m, Pócs 8521/B (VBI).

Roccella montagnei Bél.

TLC: Erythrin.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/057 (O).

Siphula decumbens Nyl.

TLC: Thamnic acid.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/029 (O). **Eastern Province**, Morogoro District, Nguru Mts, Dikurura Valley, in elfin forest, 2000 m, Farkas 89120 (VBI).

Sticta ambavillaria (Bory) Ach.

TLC: None.

Eastern Province, Morogoro District, Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvar den 11592 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/035 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, wet montane rainforest, 2000 m, Krog 3T 24/042 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/045 (O), N slope of Mt Rungwe, montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/020 (O).

Sticta cyphellulata (Müll. Arg.) Hue

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/015 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/069 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/021 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/143 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/023 (O).

Sticta dichotoma Delise

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, plateau of Mafi Hill, 1000-1300 m, Pócs 8522/D (VBI).

Sticta fuliginosa (Hoffm.) Ach.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest

Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/032 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/134, 142, 147 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/34 (O).

Sticta orbicularis (Braun) Hue

TLC: None.

Southern Highlands Province, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/145 (O).

Sticta papyracea Delise

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Gonja Mountain 5 km E of Mgwashi village, in montane evergreen forest, 1600-1700 m, Krog 2T 06/014 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/014 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/030, 033 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/019 (O), West Usambara Mts, SW of Shagein Peak, in mossy cloud forest, 2000-2150 m, Pócs 8445/G (VBI), West Usambara Mts, NW of Mazumbai village, 1780 m, Pócs 8405/H (VBI). **Eastern Province**, Morogoro District, Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvar den 11595 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/126 (O), Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, on roadside trees, 1900 m, Krog 4T 12/011 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/032, 033 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/027 (O).

Sticta sublimbata (J. Steiner) Swinscow & Krog

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/033 (O, with *Dendriscoaulon*). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/140 (O), Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/021 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/022, 025 (O).

Sticta tomentosa (Sw.) Ach.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/031 (O), West Usambara Mts, Magamba, c. 4 km N of Lushoto, 1600-2000 m, Ryvar den 10923 (O). **Eastern Province**, Morogoro District, Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvar den 11575, 11595 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/128 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/021 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/038 (O), Uzungwa Mts, Mufindi area, Kigogo Forest, in mixed evergreen and bamboo forest, 1800-1850 m, Krog 4T 25/028 (O).

Sticta weigellii (Ach.) Vain.

TLC: None.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/034, 081 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/020 (O), West Usambara Mts, Magamba, c. 4 km N of Lushoto, 1600-2000 m, Ryvar den 10924 (O). **Eastern Province**, Morogoro District, Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvar den 11602, 11588 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/129, 131, 137, 141, 144 (O), Uzungwa Mts, Mufindi area, Luhota Dam and Luhota Forest, on roadside trees, 1900 m, Krog 4T 12/013, 015 (O), Mufindi escarpment, 1750-1800 m, Krog 4T 15/024 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/026 (O), Uzungwa Mts, Mufindi area, Kivere Forest Reserve, escarpment edge, in mixed evergreen and bamboo forest, 1750-1800 m, Krog 4T 23/039, 140, 141 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli village, wet montane rainforest, 2000 m, Krog 3T 24/043 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/046 (O), N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/019 (O).

Teloschistes exilis (Michaux) Vain.

TLC: Parietin, associated pigments.

Southern Highlands Province, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/044 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/025 (O).

Teloschistes flavicans (Sw.) Norman

TLC: Parietin, associated pigments.

Tanga Province, Lushoto District, West Usambara Mts, along Mazumbai-Mtai road, 1500-1560 m Pócs 8433/HA (VBI), West Usambara mts, W of Mgwashi, 1350 m, Pócs 8420/G (VBI), NE of Shume, 1850 m, Pócs 6951/F (VBI), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/090 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/012, 149, 150 (O).

Teloschistes perrugosus Müll. Arg.

TLC: Parietin, associated pigments.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/018 (O).

Usnea antiqua Swinscow & Krog

TLC: Psoromic acid, usnic acid.

Tanga Province, Lushoto District, West Usambara Mts, between Kwagoroto and Mazumbai village, 1850 m, Pócs 8404/SD (VBI), West Usambara Mts, 3km ENE of Shagayu sawmill, 1980 m, Hedrén 8443/B (VBI - holotype), West Usambara Mts, near Kambi Falls W of Mazumbai village, 1600 m, Pócs 8527/CB (VBI), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/027 (O).

Usnea articulata (L.) Hoffm.

TLC: Salazinic acid, norstictic acid, usnic acid.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/019 (O).

Usnea baileyi (Stirt.) Zahlbr.

TLC: Norstictic acid, salazinic acid (trace), pigments, usnic acid.

Tanga Province, Lushoto District, East Usambara Mts, near Amani, T. & S. Pócs 6087/M (BM), West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/045, 046 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/028 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/035 (O), West Usambara Mts, Mazumbai

University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/027 (O). **Eastern Province**, Morogoro District, Uluguru Mts, west slope of Lupanga above Morogoro, Pócs & Csontos 6067/E (BM), SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/019, 022, 024, 025 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the edge of Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/024-027, 034 (O), Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/017 (O), Uzungwa Mts, Mufindi area, on trees at edge of golf-course, 1970 m, Krog 4T 17/004 (O); Rungwe District, N slope of Mt Rungwe, in montane forest and ericaceous heath, 2320-2580 m, Krog & Congdon 4T 22/022 (O).

Usnea bicolorata Motyka

TLC: Protocetraric acid, barbatic acid, usnic acid.

Southern Highlands Province, Rungwe District, N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/029 (O).

Usnea elata Motyka

TLC: Diffractaic acid, usnic acid.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/046 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/029, 030 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/028 (O). **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/029 (O).

Usnea exasperata (Müll. Arg.) Motyka

TLC: Fumarprotocetraric acid and related substances, ± diffractaic acid (chemotype I), norstictic and galbinic acids (chemotype II), salazinic acid (chemotype III), none (chemotype IV).

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/039-044, West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/028, 029 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane forest and at forest edge, 1850-1900 m, Krog 4T 10/010, 020, 022 (O), Uzungwa Mts, Mufindi area, Luisenga, in mixed forest with bamboo, 1800 m, Krog 4T 16/008 (O).

Usnea firmula (Stirt.) Motyka

TLC: Norstictic acid, salazinic acid (trace), usnic acid.

Eastern Province, Morogoro District, Uluguru Mts, Morningside Research Station c. 5 km S of Morogoro, 1500-2100 m, Ryvarden 11885 (O).

Usnea himantodes Stirt.

TLC: Protocetraric acid, ± fatty acids (chemotype I), constictic acid ± diffractaic acid (chemotype II).

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/043 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/021-026 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/036 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/026, 027 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/029, 030. **Eastern Province**, Morogoro District, SE slope of Kanga Mountain, along Mkange stream, in submontane rainforest, 1000-1200 m, Krog 3T 14/020, 021 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Lulando Forest at the NE edge of the Mufindi escarpment, in low montane rainforest, 1450 m, Krog 3T 23/023 (O).

[Swinscow & Krog (1988): *Usnea gigas* Motyka]

Usnea perhispidella J. Steiner

TLC: The stictic acid complex, ± norstictic acid.

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/044 (O).

Usnea roseola Vain.

TLC: Diffractaic acid.

Tanga Province, Lushoto District, West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/022 (O).

Usnea rubicunda Stirt.

TLC: Fatty acids (chemotype I), salazinic acid ± norstictic acid, ± galbinic acid (chemotype II), the stictic acid complex, norstictic acid (chemotype III).

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/047 (O), West

Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/018, West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T 08/037, West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/037 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/024, 025 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/026 (O). **Southern Highlands Province**, Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli Village, in wet montane rainforest, 2000 m, Krog 3T 24/026 (O), N slope of Mt Rungwe, in ericaceous heath at the natural forest line, 2400 m, Krog 3T 25/030 (O).

Usnea solediosula Motyka

TLC: Protocetraric acid, ± related substances, ± additional undetermined substance, pigment.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/015 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/038 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/062 (O).

Usnea submollis J. Steiner

TLC: Salazinic acid, ± galbinic acid, usnic acid.

Tanga Province, Lushoto District, West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/017 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/025 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/014 (O); Rungwe District, Rungwe volcano, Pócs 6507/1 (BM).

Usnea undulata Stirt. s. lat.

TLC: Norstictic acid, galbinic acid (chemotype I), salazinic acid, ± norstictic acid, ± constictic acid, ± undetermined substance (chemotype II), the stictic acid complex, ± norstictic acid (trace) (chemotype III), protocetraric acid, ± related substances (chemotype IV), psoromic acid, consporomic acid (chemotype V).

Tanga Province, Lushoto District, West Usambara Mts, vicinity of Mazumbai University Forest Station, in tea plantation with scattered trees, 1560 m, Krog 2T 05/049, 050 (O), West Usambara Mts, between Mazumbai University Forest Station and Kambi Falls, in montane rainforest, 1600-1700 m, Krog 2T 07/020 (O), West Usambara Mts, along motor road from Mazumbai University Forest Station to the edge of the forest reserve, 1500-1560 m, Krog 2T

08/034 (O), West Usambara Mts, Mazumbai University Forest Reserve, Sagara Ridge, in mossy elfin forest and *Philippia* heath with rock outcrops, 1850-1980 m, Krog 2T 09/035 (O), West Usambara Mts, Kwagoroto Summit WNW of Mazumbai village, in montane rainforest, 1850-1950 m, Krog 2T 10/022 (O), West Usambara Mts, Mazumbai University Forest Reserve, lower part, in submontane rainforest, 1300-1500 m, Krog 2T 12/023, 024 (O), West Usambara Mts, along boundary of Mazumbai University Forest Reserve, in montane rainforest between Sagara Ridge and motor road, 1500-1900 m, Krog 2T 13/011 (O). **Southern Highlands Province**, Iringa District, Uzungwa Mts, Buffalo Hill at edge of Mufindi escarpment, in montane rainforest and at forest edge, 1850-1900 m, Krog 4T 10/007-009, 011, 013, 015, 016, 018, 019, 021 (O), Mufindi area, Uzungwa Mts, Mufindi escarpment, 1750-1800 m, Krog 4T 15/009, 010 (O); Rungwe District, Poroto Mts, on the way to Ngozi crater, at the SE edge of Poroto Forest Reserve, W of Idweli Village, in wet montane rainforest, 2000 m, Krog 3T 24/027, 028 (O).

[Including *Usnea leprosa sensu Swinscow & Krog* (1988)]

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