

FOLIICOLOUS LICHEN COLLECTIONS ON MOUNT KANGA, TANZANIA (EAST AFRICA)

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The Tanzanian Mt Kanga was at first visited by Tamás Pócs in 1987 when he collected foliicolous lichens in lowland rainforest between 800 and 900 m elevation and in submontane rainforest between 900 and 1,250 m. Later, in 1989 he returned there with participants of the Nguru Mts expedition, when the author collected further lichens including foliicolous ones in three different forest types (dry evergreen and semi-evergreen forest at 600–800 m, submontane rainforest at 850–1,200 m and rocky forest at 1,200–1,300 m). Altogether 36 species became known from the area. The comparison of collections revealed that submontane rainforests (including rocky forests) are the richest of the studied forest types in foliicolous lichens. Mt Kanga is characterised by rare species like *Calopadia editae* discovered by Antonín Vězda in material from Mt Kanga, described and validated in 2011 by Chaves and Lücking based on materials from Mt Kanga and Costa Rica. The palaeotropical *Opegrapha viridistellata* Sérus., Lücking et Sparrius described in 2008 is reported here as new for Tanzania.

Key words: catchment forest, lichenised fungi, Nguru Mts, on leaves

INTRODUCTION

The Nguru Mts in Morogoro Region are part of the Eastern Arc of the Precambrian crystalline block mountains of Tanzania, East Africa. These mountains enjoyed favourable climatic conditions since their uplift in the Cretaceous and on the rainy slopes the forest vegetation could persist continuously. The massif is divided in four major groups of mountains. Messumbwa, Mafulumula, Manyagu and Kanga, separated from each other by deep, rocky, valleys, which carry their water to the Wami river on the Mkata Plains. Mt



Fig. 1. Mount Kanga, Tanzania, East Africa

Kanga (Fig. 1) consists of three high, very spectacular peaks of 2,019, 1,725 and 1,740 m altitude. The annual rainfall varies between 1,000 and 2,500 mm on Mt Kanga (Pócs *et al.* 1991). The N–S oriented mountain range is situated between $05^{\circ} 56'$ and $06^{\circ} 01' S$, and $37^{\circ} 41'$ and $37^{\circ} 44' E$.

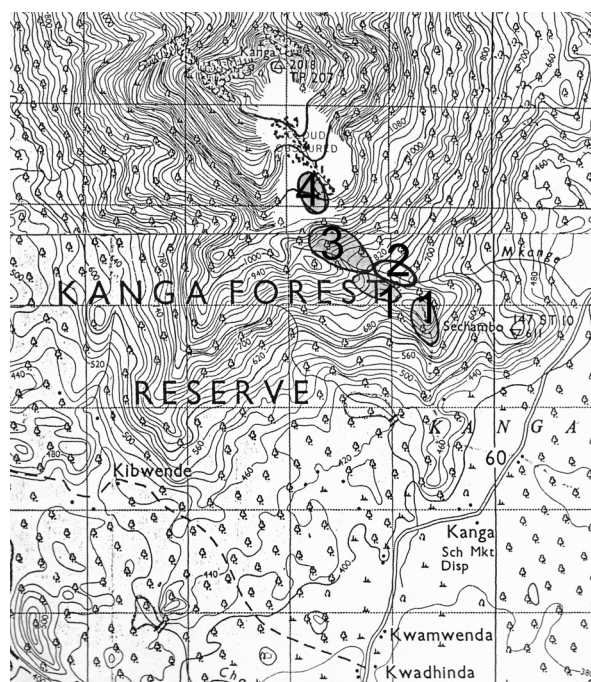


Fig. 2. Localities on Mt Kanga: 1 = (green) dry evergreen and semi-evergreen rainforest, 2 = (white) lowland rainforest, 3 = (blue) submontane rainforest, 4 = (red) rocky forest

The area of the entire Southern Nguru Mts block is 1,700 km², 340 km² of which is forested area (Burgess *et al.* 2007). Kanga Forest Reserve covers 66.64 km² and its elevation range is between *ca* 380 and 2,020 m (Doggart and Loserian 2007). The main forest types are: lowland forests from 500 to 800 m elevation with canopy of 25 m (emergents to 35 m), submontane forest from 750 to 1,300 m with canopy of 30–35 m (on rocky ridges between 1,000 to 1,300 m on east and south an evergreen rocky forest occurs), montane forests from 1,300 to 2,000 m, where on the summit the forest trees are covered in moss and canopy is 5–10 m tall (Lovett and Pócs 1993).

Foliicolous lichens of various Tanzanian regions have been studied (Farkas 1987, 1991*a, b*, Farkas and Vězda 1987, 1993, Vězda and Farkas 1988). Mt Kanga remained lichenologically unexplored for a long time, due mainly to its difficult accessibility. The first lichen floristical results are based on the collections of Tamás Pócs and the author (Farkas 1990). The Tanzanian Mt Kanga was at first visited by Tamás Pócs in 1987 when he collected foliicolous lichens in lowland rainforest between 800 and 900 m elevation and in submontane rainforest between 900 and 1,250 m. Later, in 1989 he returned there with participants of the Nguru Mts expedition, when the author collected further lichens including foliicolous ones in three different forest types (dry evergreen and semi-evergreen forest at 600–800 m, submontane rainforest at 850–1,200 m and rocky forest at 1,200–1,300 m) (Fig. 2).

Of the 322 vascular plant species of Southern Nguru Mts 5 are endemic. The Kanga Forest Reserve has also its species described from its characteristic habitats. The giant *Lobelia morogoroensis* Knox and Pócs (Fig. 3A) grows on steep rocky sites of Uluguru, Nguru (including sites of Kanga) and Nguru ya Ndege Mountains (Knox and Pócs 1992). A lichen covering mossy bark surfaces, *Herpothallon hypoprotetraricum* G. Thor (Fig. 3B) (Aptroot *et al.* 2009), earlier identified as *Cryptothecia rubrocincta* (Ehrenb.) Thor (Thor 1991: 282)



Fig. 3. The giant vascular plant *Lobelia morogoroensis* carried by Tamás Pócs (A); and the lichen species *Herpothallon hypoprotetraricum* (B), which were described from Mt Kanga (scale: B = 1 mm)

was collected by the present author in rocky forest of Mt Kanga and distributed in *Lichenes Delicati Exsiccati Editae* (Farkas 2014). The foliicolous lichen species, *Calopadia editae* Vězda ex Chaves et Lücking (Fig. 4) was discovered by Antonín Vězda in the 1990s in materials from Mt Kanga, its description became possible only after his death, when Chaves and Lücking validated it (Lumbsch *et al.* 2011: 27) based on material from Mt Kanga and Costa Rica, indicating that it possibly grows also in the Galapagos Islands.

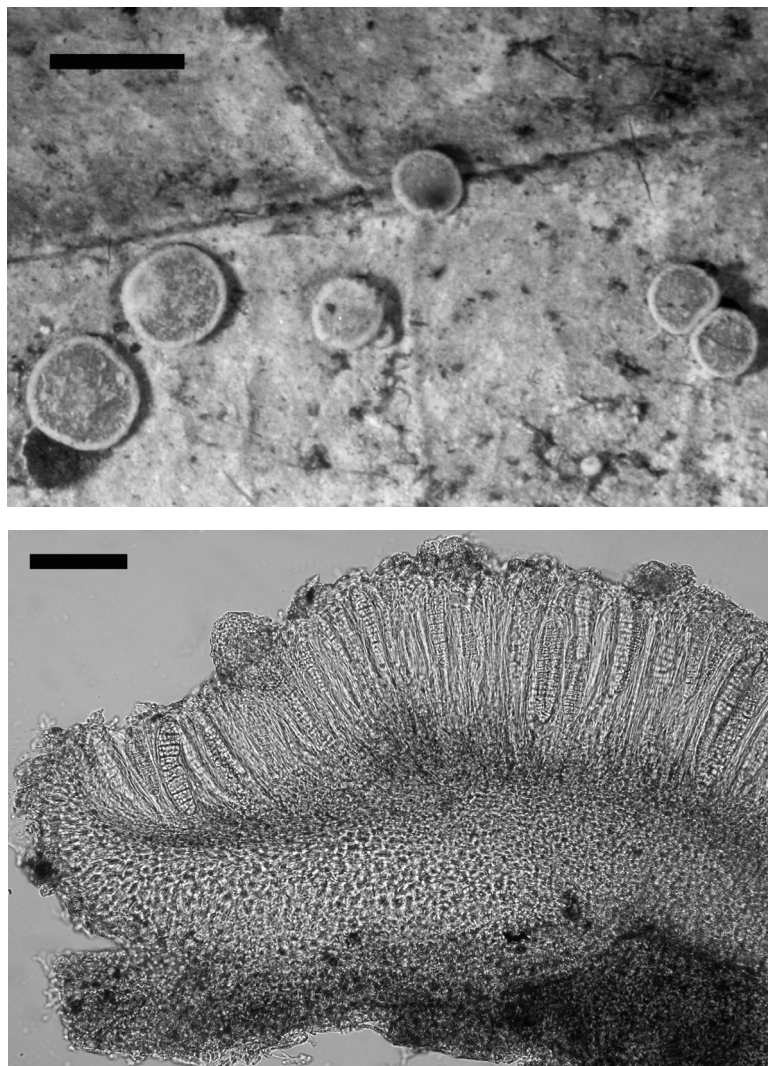


Fig. 4. *Calopadia editae* Vězda ex Chaves et Lücking has its type locality on Mt Kanga. A= thallus with apothecia; B = section of apothecium (scale: A = 1 mm, B = 50 μ m)

MATERIALS AND METHODS

The following microscopes were used for identifications: Olympus SZX9 and Olympus BX50 (DIC) microscopes. Recent control investigations, measurements were carried out by a NIKON Eclipse/NiU (DIC, epifluorescence) compound microscope. Micrographs were prepared mostly by Olympus E450 camera (with Quick Photo Camera 2.3 software) and occasionally by Nikon DS-Fi1c camera (with NIS-Elements BR software).

The following sites were visited, indicated by locality numbers, listed in sequence of increasing elevations.

89114 – Dry evergreen and semi-evergreen forest on the lower rocky southeastern slopes of Mt Kanga at 600–800 m, coll. E. Farkas, 31 March 1989.

87226 – Lowland rainforest on the southeastern slope of Mt Kanga, along Mkange stream at 800–900 m, coll. T. Pócs, 2 and 3 December 1987.

87227 – Submontane forest on the southeastern slopes of Mt Kanga along Mkange stream at 900–1,250 m, coll. T. Pócs, 2 December 1987.

89110 – Submontane forest on the southeastern slopes of Mt Kanga along Mkange stream at 850–1,200 m, coll. E. Farkas, 30 March 1989.

89112 – Rocky forest on the southeastern slopes of Mt Kanga at 1,200–1,300 m, coll. E. Farkas, 30 March 1989.

Jaccard-index (K) was calculated for comparison of forest types. Lichen specimens are deposited in VBI.

RESULTS AND DISCUSSION

The species and their localities of Mt Kanga are presented in Table 1. For the nomenclature the following works were considered: Lücking *et al.* 2000, Lücking and Martínez Colín 2004 and Lücking 2008. Altogether 36 species are listed. From these 7 were collected in dry evergreen and semi-evergreen forest, 11 in lowland forest. Submontane forests (including rocky forests) are the richest concerning to the number of foliicolous lichens with 34 species: 23 species were found in submontane forests and 24 in rocky forest. 13 species are found both in submontane and rocky forests, 10 only in submontane and 10 only in rocky forest (K = 55%). Except for *Gyalectidium caucasicum* (Elenk. et Woron.) Vězda there is no overlap of species of the lower elevation forests: lowland rainforest and dry evergreen and semi-evergreen forests (K = 17%). *Badimia cateilea* (Vain.) Lücking, Lumbsch et Elix occurred exclusively in lowland rainforest. The composition of foliicolous lichens characterises their habitats also in Mt Kanga (cf. Lücking 1997).

Table 1
The locality numbers according to habitat types (1–4) are indicated in the list of species found in Mt Kanga. The occurrence of habitat types is indicated by the same numbers (1–4) on the map (Fig. 2). A species new to Tanzania is indicated by boldface

	1. Dry ever-green and semi-ever-green forest	2. Lowland forest	3. Submontane forest	4. Rocky forest
	600–800 m	800–900 m	850–1,250 m	1,200–1,300 m
<i>Arthonia accoleus</i> Stirt.		87226		89112
<i>Arthonia cyanea</i> Müll. Arg.			87227	89112
<i>Astrothyrium</i> sp.				
<i>Bacidina apudhica</i> (Müll. Arg.) Vězda				89112
<i>Bacidina scutellifera</i> (Vězda) Vězda				89112
<i>Badimia cateilea</i> (Vain.) Lücking, Lumbsch et Elix		87226		
<i>Bapalmua palmularis</i> (Müll. Arg.) Sérus.			89110	89112
<i>Brasilicia dimerelloides</i> (Vězda) Lücking, Kalb et Sérus.			89110	89112
<i>Byssolecania fumosomigrans</i> (Müll. Arg.) R. Sant.		87226	87227, 89110	89112
<i>Byssoloma leucoblepharum</i> (Nyl.) Vain.		87226	87227, 89110	89112
<i>Calopadia editae</i> Vězda ex Chaves et Lücking,			89110	
<i>Calopadia puiggarii</i> (Müll. Arg.) Vězda	89114		87227, 89110	89112
<i>Coenogonium pocsii</i> (Vězda et Farkas) Lücking, Aptroot et Sipman			89110	
<i>Coenogonium subluteum</i> (Rehm) Kalb et Lücking in Lücking et Kalb			89110	
<i>Coenogonium</i> sp.	89114			
<i>Fellhanera boutillei</i> (Desm.) Vězda		87226	87227, 89110	
<i>Fellhanera sublecanorina</i> (Nyl.) Vězda		87226	87227, 89110	

Table 1 (continued)

	1. Dry ever-green and semi-ever-green forest	2. Lowland forest	3. Submontane forest	4. Rocky forest
<i>Gyalectidium caucasicum</i> (Elenk. et Woron.) Vězda	89114	87226	89110	
<i>Gyalectidium filicinum</i> Müll. Arg.	89114	87227		
<i>Mazosia melanophthalma</i> (Müll. Arg.) R. Sant.	89114	87227, 89110		89112
<i>Mazosia phyllosema</i> (Nyl.) Zahlbr.		87227		89112
<i>Fouragea filicina</i> (Mont.) Trevis.		87226	87227, 89110	89112
<i>Fouragea viridistellata</i> (Sérusiaux, Lücking et Sparrhus) Ertz et Frisch				89112
<i>Phylloblastia borhidii</i> (Farkas et Vězda) Lücking			89110	
<i>Porina epiphylla</i> (Fée) Fée				89112
<i>Porina epiphyloides</i> Vězda				89112
<i>Porina leptosperma</i> Müll. Arg.		87226	89110	89112
<i>Porina nitidula</i> Müll. Arg.				89112
<i>Porina sphaerocephaloides</i> Farkas			87227	89112
<i>Sporopodium leprieurii</i> Mont.	89114	87226	89110	89112
<i>Strigula phyllogena</i> (Müll. Arg.) R. C. Harris				89112
<i>Strigula smaragdula</i> Fr.	89114			89112
<i>Strigula nemathora</i> Mont.			87227, 89110	89112
<i>Strigula subtilissima</i> (Fée) Müll. Arg.		87226	87227, 89110	89112
<i>Tapellaria phyllophila</i> (Stirt.) R. Sant. in Thorold				89112
<i>Tricharia dilatata</i> Vězda			87227	

Brasilicia dimerelloides (Vězda) Farkas, *comb. nova*

Basionym: *Bacidia dimerelloides* Vězda, Acta Mus. Silesiae, Opava, ser. A, 23: 179, 1974.

The new combination was originally suggested in a manuscript of Lücking and Martínez Colín (2004). As I agree with the taxonomic decision, the combination is validated here in agreement with the first author.

Fouragea viridistellata (Sérusiaux, Lücking et Sparrius) Ertz et Frisch, *Taxon* 63(4): 738, 2014.

Basionym: *Opegrapha viridistellata* Sérus., Lücking et Sparrius, *Mycotaxon* 104: 223, 2008.

The species, *Opegrapha viridistellata* Sérus., Lücking et Sparrius (Sérusiaux *et al.* 2008) was identified as new from Mt Kanga. Recently it was recombined in a new genus as *Fouragea viridistellata* (Sérus., Lücking et Sparrius) Ertz et Frisch (Frisch *et al.* 2014). It was known from Australia, Ivory Coast, Japan, New Caledonia, Papua New Guinea, Seychelles and Thailand. Here it is new for Tanzania from submontane rainforests of mountains Kanga and Uluguru from two different host plants: *Pandanus* sp. and *Marattia* sp. Tanzanian specimens are illustrated (Fig. 5).

Specimens investigated: Tanzania. Morogoro Region, in rocky forest on the southeastern slopes of Mt Kanga at 1,200–1,300 m, on leaf of *Pandanus* sp., coll. E. Farkas 89112/V, 30 March 1989 (VBI 06064). – Tanzania. Morogoro Region, in submontane rainforest in the NNE valley of Lupnaga peak of Northern Uluguru Mts at 1,200–1,400 m, on fronds of *Marattia* sp., coll. T. Pócs and E. Knox 88192/VI, 28 March 1988 (VBI 06065).

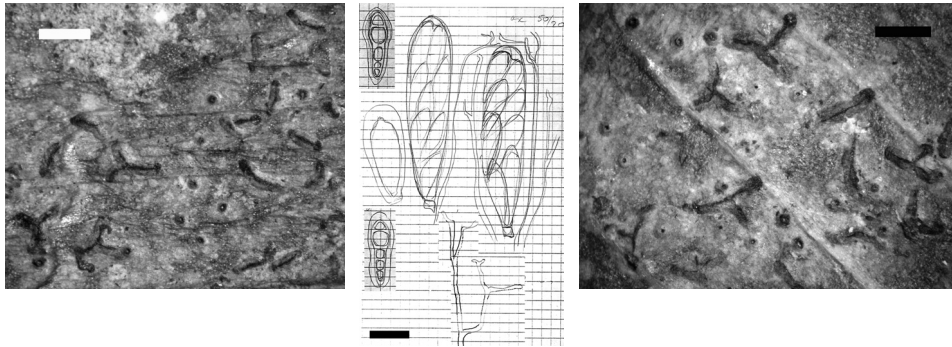


Fig. 5. *Fouragea viridistellata* (Sérus., Lücking et Sparrius) Ertz et Frisch. Thallus with ascomata and pycnidia (A = Mt Kanga, on *Pandanus* leaf, C = Southern Uluguru Mts, on *Marattia* frond); and a sketchy drawing of details of asci, paraphyses and ascospores from 1990 (B) (scale: A, C = 500 μ m, B = 10 μ m)

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