



# Article The Lichen Genus Sticta (Lobariaceae, Peltigerales) in East African Montane Ecosystems

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**Abstract:** The lichen flora of Africa is still poorly known. In many parts of the tropics, recent studies utilizing DNA methods have revealed extraordinary diversity among various groups of lichenized fungi, including the genus *Sticta*. In this study, East African *Sticta* species and their ecology are reviewed using the genetic barcoding marker nuITS and morphological characters. The studied regions represent montane areas in Kenya and Tanzania, including the Taita Hills and Mt. Kilimanjaro, which belong to the Eastern Afromontane biodiversity hotspot. Altogether 14 *Sticta* species are confirmed from the study region, including the previously reported *S. fuliginosa, S. sublimbata, S. tomentosa,* and *S. umbilicariiformis. Sticta andina, S. ciliata, S. duplolimbata, S. fuliginoides,* and *S. marginalis* are reported as new to Kenya and/or Tanzania. *Sticta afromontana, S. aspratilis, S. cellulosa, S. cyanocaperata,* and *S. munda,* are described as new to science. The abundance of new diversity detected and the number of taxa represented by only few specimens show that more comprehensive sampling of the region may be needed to reveal the true diversity of *Sticta* in East Africa. More generally, our results highlight the need for further taxonomic studies of lichenized fungi in the region.

**Keywords:** Mt. Kilimanjaro; Taita Hills; Mt. Kasigau; Eastern Arc; Mt. Elgon; Eastern Afromontane biodiversity hotspot; nuITS; lichenized fungi; Ascomycota; molecular phylogeny

# 1. Introduction

Tropical mountains, and especially their forests, are hot spots of biodiversity and endemism [1–4]. In East Africa, montane regions, such as the ancient Eastern Arc Mountains which range from southern Tanzania to Kenya, and the much younger volcanic mountains, such as Mt. Kilimanjaro in Tanzania and Mt. Elgon at the border of Kenya and Uganda, are surrounded by vast stretches of arid woodlands and savannas [5,6]. Still, especially the humid upper windward slopes of these mountains have provided refuge for the montane rainforests already for millions of years [6,7]. During this time, climatic induced fluctuations in the areal extent and isolation of moist montane forests have generated remarkably high levels of diversity and local endemism [1,3,6,8,9] in what is now known as the Eastern Afromontane biodiversity hotspot [10,11].

The lichen flora of Africa is poorly known and is still largely based on information collected during the 20th century [12]. So far, only few groups of parmelioid and cyanolichens have been studied in any detail, and especially the more recent application of DNA methods has revealed high levels of previously unknown diversity [13–18]. *Sticta* (Schreb.) Ach. (Lobariaceae, Peltigerales) is a genus of foliose macrolichens characterized by well-differentiated pores called cyphellae on the lower surface. Recent molecular studies



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**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). from different parts of the globe have demonstrated that the genus is very rich in species, with altogether 500 or more species [19–23]. Many traditionally delimited *Sticta* species, such as S. fuliginosa and S. weigelii, have been shown to represent complexes of taxa with a somewhat similar gross morphology, often called morphodemes [19–23]. High species diversity has been found from tropical montane areas of the Neotropics, and Madagascar and nearby islands [19,24,25]. In their classical guide to East African macrolichens, Swinscow and Krog [12] listed ten Sticta species from an East African region encompassing Ethiopia, Kenya, Tanzania, and Uganda. Since then, only one additional species has been reported from this region [26]. These reported taxa include S. ambavillaria (Bory) Ach., S. cyphellulata (Müll. Arg.) Hue, S. dichotoma Delise, S. fuliginosa (Hoffm.) Ach., S. kunthii Hook. f., S. limbata (Sm.) Ach., S. orbicularis (Braun) Hue, S. papyracea Delise, S. sublimbata (Steiner) Swinscow and Krog, S. tomentosa (Swartz) Ach., and S. weigelii var. weigelii (Ach.) Vainio and S. weigelii var. xanthotropa (Krempelh.) Hue [12,26–31], of which the latter is now known as S. xanthotropa (Kremp.) D. J. Galloway [32]. Sticta papyracea has been treated as a synonym of S. variabilis Ach. [33], and the reports of Sticta limbata from many parts of the world, including East Africa, probably represent S. umbilicariiformis Hochsc. Ex Flotow [20], a species originally described from Ethiopia. Additionally, S. duplolimbata (Hue) Vain. And *S. ciliata* Taylor have been reported from Rwanda [20].

In this study, we review *Sticta* species and their ecology in the montane regions of Kenya and Tanzania using the barcoding nuITS genetic marker and provide a wealth of new information on their diversity and ecology.

#### 2. Materials and Methods

#### 2.1. Study Locations and Sampling

Specimens were collected from four mountain regions in East Africa, including the dormant volcano Mt. Kilimanjaro in Tanzania, the Taita Hills, and Mt. Kasigau, which represent the northeastern end of the Eastern Arc Mountain Range in Kenya, and Mt. Elgon at the border of Kenya and Uganda. All the mountains are less than 400 km from the equator and separated from each other by wide semiarid plains with a tropical climate with two distinct rainy seasons.

The high Mt. Kilimanjaro (5895 m) supports a wide range of natural vegetation types from natural savanna to alpine *Helichrysum* heath, in addition to which human activity has produced a variety of additional habitat types. The sampling in the Kilimanjaro region was done in 2016–2017 along five replicate transects on the southern and southeastern slopes of the mountain. The 65 sampling plots represent the following 13 natural and disturbed ecosystems, with 5 replicate plots in each ecosystem type: natural savanna and maize fields (800–1100 masl), lower montane forests, traditional Chagga home gardens, commercial coffee farms, and grasslands (1100–2000 masl), montane *Ocotea* forest and selectively logged *Ocotea* forest (2100–2800 masl), upper montane *Podocarpus* forest and secondary forest dominated by *Erica excelsa* as a result of repeated forest fires (2800–3100 masl), subalpine *Erica trimera* forest and fire disturbed *E. trimera* forest/shrubbery (3500–4000 masl), and alpine *Helichrysum* heath (4000–4650 masl). For a more detailed description of the sampled environments on Mt. Kilimanjaro, see [13,34]. On each plot, lichen specimens were collected from a 5 × 20 m central plot and along two 50 m transects. Additionally, also a larger 20 × 50 m plot was sampled for branches that had dropped from the canopy.

The Taita Hills consists of three mountain massifs: Dabida, Mbololo, and Sagalla. While the potential natural vegetation on the moist upper slopes consists of evergreen *Ocotea* forest, long-lasting and intensive human influence has fragmented the indigenous forest into small and often heavily disturbed, isolated patches [35–37]. The sampling of lichens in the Taita Hills took place during several field trips mainly in 2009–2011, encompassing all the main remaining forest fragments: On the Dabida massif, fragments of indigenous montane forest mainly occur on the highest peaks and ridges, including Ngangao (120 ha), Chawia (86 ha), Yale (16 ha), Fururu (8 ha), Macha (3 ha), Mwachora (2 ha), Vuria (<1 ha), and Shomoto Hill (<0.2 ha) [36,38]. Mt. Sagalla in the southeast harbors a small indigenous forest patch of 2 ha surrounded by plantation forest, while

Mbololo in the northeast has a relatively well-preserved 185 ha moist montane forest on top of a single ridge [39]. Additionally, few specimens were collected from Maktau Hill, an isolated peak with a small patch of dry woodland vegetation, lying west of the Dabida massif. All the collection localities in the Taita Hills were situated between 1300 masl (Maktau Hill) and 2208 masl (Vuria). For a more detailed description of the sampled forest fragments especially on the Dabida massif, see [13].

Mt. Kasigau is situated approximately 50 km southeast of the Taita Hills and, unlike the highly fragmented forests of the Taita Hills, the forest and woodland on Mt. Kasigau has remained relatively intact. The vegetation includes a transition from the *Acacia-Commiphora* bushland on the surrounding plains in 520 masl through a lower montane woodland to an evergreen forest, reaching the summit at 1641 masl [40,41]. On Mt. Kasigau, specimens were mainly collected in 2010, along four transects corresponding to the northern, eastern, southern, and western slopes of the mountain, as described in [42]. On Mt. Elgon, specimens were collected in 2016 from the ericaceous zone of the mountain.

Local species abundances in the Mt. Kilimanjaro sampling plots were defined based on species presence on the central plot and along the two transects, the value thus ranging from 0–3 for each sampling plot. Abundances in habitat types were defined as the sum of abundances in the five sample plots representing each habitat type. In the Taita Hills, abundance was defined as the number of different forest fragments from which a species was collected (0–11); abundance was not estimated for the individual forest fragments. On Mt. Kasigau, the abundance was defined as the number of elevational transects from which the species was collected (0–4).

#### 2.2. Morphological Inspection

In sum, 373 *Sticta* specimens from Mt. Kilimanjaro, the Taita Hills, Mt. Kasigau, and Mt. Elgon (Table A1) were studied and identified based on morphological characters and the previous literature from the study region [12,26]. The morphological and anatomical characters were assessed using a Leica S8AP0 stereo and an Olympus BX51 compound light microscopes, the latter equipped with a Deltapix Invenio 12EIII camera. The description and naming of characters (branching, vegetative propagules, tomentum) follows Moncada et al. [43]. Spot reactions were checked from medulla with 10% KOH (K), sodium hypochlorite solution (liquid bleach; C), and 1,4-phenylenediamine in ethanol (Pd).

#### 2.3. DNA Sequencing

The DNA extractions were made using the GeneJET Genomic DNA Purification Kit (Thermo Fisher Scientific, Waltham, MA, USA). For the extraction, a clean piece of lichen thallus (~0.1 cm<sup>2</sup>) was selected under a preparation microscope using a sterile needle or scalpel. Amplification and sequencing of the nuclear fungal internal transcribed spacer (ITS: ITS1-5.8S-ITS2) was performed as in [44], using primers ITS1 or ITS5, and ITS4 [45]. Sequencing was performed by Macrogen Europe (Amsterdam, the Netherlands) and LGC Genomics (Berlin, Germany). Sequences were edited with CodonCode Aligner [46]. The newly obtained ITS sequences were deposited in the NCBI GenBank database [47]. The specimen information, collection locations and the GenBank accession numbers are listed in Table A1.

# 2.4. Phylogenetic Analyses

The generated ITS sequence dataset was complemented with sequences downloaded from the GenBank [47]. The initial alignment of the ITS was done using MAFFT on the online server [48] and adjusted by hand using PhyDE v. 0.9771 [49]. Ambiguous regions were removed from the ITS alignment before the analysis of the complete dataset resulting an alignment of 346 sequences and 602 characters.

Bayesian analyses were performed using MrBayes v.3.2.7 [50,51] on CIPRES Science Gateway [52]. To allow possible deviating substitution models for the different regions the data sets were divided in a partition of three subsets (1: ITS1; 2: 5.8S; 3: ITS2). The best fitting nucleotide substitution models were selected by jModelTest [53] using AIC and BIC, and

GTR +  $\Gamma$  was used for ITS1, SYM +  $\Gamma$  for 5.8S, and GTR + I +  $\Gamma$  for ITS2. Posterior probability distributions of trees were calculated using the Metropolis-coupled Markov chain Monte Carlo (MCMCMC) method and the search strategies suggested by Huelsenbeck et al. [54,55]. Three runs with four chains with  $10 \times 10^6$  generations each were run simultaneously. First, 25% of the trees were discarded (burnin), and the convergence of the runs confirmed with Tracer v. 1.7.1 [56] before the calculations for the 50% majority consensus tree and clade posterior probabilities (PP) were made. The trees were visualized using TreeGraph2 v2.15.0 [57].

To further analyze the phylogenetic relationships in the *Sticta umbilicariiformis—fuliginosa* clade, further analyses were run for selected specimens using more of the ITS region, following the same practices as in the first analysis. The alignment included 37 sequences and 495 characters with *S. duplolimbata* (KT281696), *S. andensis* (KC732547), and *S. pseudolimbata* (KC732564) as outgroup sequences. SYM +  $\Gamma$  was selected for ITS1, JC for 5.8S, and HKY + I for ITS2 as substitution models, and the analysis was run for  $5 \times 10^6$  generations. The sequence alignment files and the resulting tree files from the phylogenetic analyses are available in the Zenodo repository (https://zenodo.org/) with doi 10.5281/zenodo.7575780.

# 3. Results

Of the studied 373 *Sticta* specimens, a good quality ITS sequence was obtained from 233 specimens. ITS variant information for each sequenced lichen specimen is listed in Table A1.

#### 3.1. Phylogenetic Analyses of the Specimens

The Bayesian analysis of the nuITS region of the genus *Sticta* revealed that several of the morphologically identified species included representatives of more than one phylogenetic lineage (Figure S1).

### 3.1.1. Specimens with Soredia or Pustules

Based on the previous literature from the region [12], the sorediate specimens were identified as either *S. sublimbata* or *S. limbata*. All specimens with soredia that were collected from the lower to middle montane forest zones formed a well-supported (PP = 1) clade together with *S. sublimbata* specimens from Réunion and Japan (Figure 1). However, the sorediate-pustular specimens from higher elevation habitats did not group together with *S. limbata*, but were closely related to a previously sequenced *S. umbilicariiformis* specimen from Rwanda (Figure 2).



**Figure 1.** Clades with *Sticta tomentosa* and *S. sublimbata* of the Bayesian tree of the genus *Sticta* based on the nuITS marker region (Figure S1A,B). The colored polygons (rectangle, triangle) in the tree show

the distribution of the ITS variants in the studied regions and ecosystem types: On Mt. Kilimanjaro, the different habitats are indicated by color and grid; the width of the rectangle indicate the number of sample plots in which the taxon was present in each ecosystem type (square = 1). In the Taita Hills, each triangle indicates presence in one forest fragment and on Mt. Kasigau in one sampling transect. The grey boxes show the total abundance and distribution of the species, also including the data from unsequenced specimens. Stronger support (PP > 0.9) for a clade is indicated with a thicker branch. The scale refers to nucleotide substitutions per site.



**Figure 2.** Phylogeny of the *Sticta umbilicariiformis—fuliginosa* group based on the nuITS region. The colored polygons (rectangle or triangle) in the tree show the distribution of the ITS variants in the studied regions and ecosystem types: On Mt. Kilimanjaro, the different habitats are indicated by color and grid; the width of the rectangle indicate the number of sample plots in which the taxon was present in each ecosystem type (square = 1). In the Taita Hills, each triangle indicates presence in one forest fragment and on Mt. Kasigau in one sampling transect. The grey boxes show the total abundance and distribution of the species, also including the data from unsequenced specimens. The proportions of different structures (pustules, isidia, or just apothecia) among the specimens with specific ITS variants are indicated with pie charts for the new species and *S. umbilicariiformis*. Stronger support (PP > 0.9) for a clade is indicated with a thicker branch. The scale refers to nucleotide substitutions per site.

#### 3.1.2. Fertile Specimens without Symbiotic Propagules

Three frequently fertile *Sticta* species that lack symbiotic propagules had previously been reported from the region, i.e., *S. ambavillaria*, *S. kunthii*, and *S. tomentosa* [12,26], and specimens resembling the descriptions of all these taxa were also present in our material. All specimens

matching the description of *S. tomentosa* fell into a well-supported (PP = 1) clade, which mainly consists of *S. tomentosa* specimens from Colombia and Hawaii (Figure 1). All other specimens belonged to the *S. umbilicariiformis—fuliginosa* group (Figure 2). In the additional analysis, six specimens formed a well-supported (PP = 0.992) clade (*S. munda*); however, many morphologically similar specimens, i.e., fertile with pubescent or nodulous apothecial margins and with smooth, scrobiculate, foveolate to pitted upper surface, were mainly placed in the poorly resolved *S. umbilicariiformis* group, with some specimens in the well-supported (PP = 1) *S. aspratilis* clade.

#### 3.1.3. Specimens with Laminal Isidia (Sticta fuliginosa Morphodeme)

Our specimens identified as *S. fuliginosa*, based on the previous literature from the region [12], fell into six different clades (Figure S1). These include three previously described species of the *Sticta fuliginosa* morphodeme, i.e., *S. ciliata*, *S. fuliginoides* (Figure 3), and *S. fuliginosa* (Figure 2). Additionally, four specimens (*Sticta* sp. B) representing two different ITS variants formed a well-supported (PP = 0.995) clade with one sequence obtained from a specimen from Rwanda identified as *S. ciliata*, forming a sister clade to *S. parvilobata*, a recently described species [23] from Puerto Rico (Figure 3). Additionally, three specimens (*Sticta* sp. A) were closely related to *S. catharinae*, another recently described species [22] from Bolivia (Figure 3). Nineteen specimens (*S. aspratilis*), mostly representing the *S. fuliginosa* morphodeme, but also including some fertile specimens without isidia, formed a well-supported (PP = 1) clade within the *S. umbilicariiformis—fuliginosa* group (Figure 2).



**Figure 3.** Clades with *Sticta fuliginoides*, *S. ciliata*, *Sticta* sp. A, and *Sticta* sp. B of the Bayesian tree of the genus *Sticta* based on the nuITS marker region (Figure S1C). The colored polygons (rectangle, triangle) in the tree show the distribution of the ITS variants in the studied regions and ecosystem types: On Mt. Kilimanjaro, the different habitats are indicated by color and grid; the width of the rectangle indicate the number of sample plots in which the taxon was present in each ecosystem type (square = 1). In the Taita Hills, each triangle indicates presence in one forest fragment. The grey boxes

show the total abundance and distribution of the species, also including the data from unsequenced specimens. Stronger support (PP > 0.9) for a clade is indicated with a thicker branch. The scale refers to nucleotide substitutions per site.

# 3.1.4. Specimens of the Sticta weigelii Morphodeme

The specimens belonging to the *Sticta weigelii* morphodeme, i.e., with cylindrical or flattened marginal isidia and often also with elongate lobes, were split into several different clades (Figure S1). The specimens with cylindrical isidia fell into a clade with specimens identified as *S. weigelii* from different parts of the world; however, the smaller clade consisting of specimens identified as *S. weigelii* s. str. [58] only includes GenBank sequences from the Neotropics (Figure 4).



**Figure 4.** Clades with *Sticta cellulosa, S. andina, Sticta sp. C (weigelii agg.), S. duplolimbata,* and *Sticta* sp. D of the Bayesian tree of the genus *Sticta* based on the nuITS marker region (Figure S1D,E). The colored polygons (rectangle, triangle) in the tree show the distribution of the ITS variants in the studied regions and ecosystem types: On Mt. Kilimanjaro, the different habitats are indicated by and grid; the width of the rectangle indicate the number of sample plots in which the taxon was present in each ecosystem type (square = 1). In the Taita Hills, each triangle indicates presence in one forest fragment. The grey boxes show the total abundance and distribution of the species, including also the data from unsequenced specimens. Stronger support (PP > 0.9) for a clade is indicated with a thicker branch. The scale refers to nucleotide substitutions per site.

Specimens with at least some flattened isidia were divided into three different clades. The majority fell within the *S. umbilicariiformis—fuliginosa* group and formed a clade (PP = 0.665) closely related to *S. munda, S. umbilicariiformis,* and *S. aspratilis* (Figure 2). One specimen was placed into a well-supported (PP = 0.992) clade comprised mainly of *S. andina* specimens (Figure 4), and four specimens (*S. cyanocaperata*) grouped together with *S. caperata* from Réunion and Madagascar (Figure 5).



**Figure 5.** Clades with *Sticta marginalis, Sticta* sp. 2, and *Sticta cyanocaperata* in the Bayesian tree of the genus *Sticta* based on the nuITS marker region (Figure S1F). The colored polygons (rectangle,triangle) in the tree show the distribution of the ITS variants in the studied regions and ecosystem types: On Mt. Kilimanjaro, the different habitats are indicated by color and grid; the width of the rectangle indicate the number of sample plots in which the taxon was present in each ecosystem type (square = 1). In the Taita Hills, each triangle indicates presence in one forest fragment and on Mt. Kasigau in one sampling transect. The grey boxes show the total abundance and distribution of the species, also including the data from unsequenced specimens. Stronger support (PP > 0.9) for a clade is indicated with a thicker branch. The scale refers to nucleotide substitutions per site.

#### 3.1.5. Specimens with Marginal Isidia

Previously, two additional species with marginal isidia have been reported from the region, including *S. cyphellulata* and *S. orbicularis* [12]. Of the remaining marginally isidiate specimens, 18 clearly stipitate specimens formed a well-supported group with *S. marginalis* specimens

from Réunion and Madagascar (Figure 5), and 22 formed a well-supported (PP = 1) group with *S. duplolimbata* specimens from other parts of the world (Figure 4). Additionally, specimens with cylindrical, mainly marginal isidia, but with an otherwise unique appearance (*S. cellulosa*), formed their own clade (PP = 0.868) among several recently described species mainly from the Neotropics (Figure 4). Additionally, two small and poorly developed specimens (*Sticta* sp. D) grouped (PP = 0.765) together with *S. isidioimpressula* but with a relatively long branch (Figure 4).

#### 3.1.6. Sticta with Green Algae

Previously, two *Sticta* species with a green algal photobiont have been reported from East Africa: *Sticta dichotoma* and *S. papyracea/variabilis* [12]. Only four such specimens were collected by us, all resembling the description of *S. papyracea*. However, in the phylogenetic analysis, the sequenced specimens did not group together with *S. variabilis* or *S. dichotoma*, but formed a clade (PP = 0.854) with some specimens from Madagascar (Figure 5), identified as "*Sticta* sp. 2" by Simon et al. [25].

# 3.2. Species of Sticta Identified

According to the results of the phylogenetic analysis, our *Sticta* specimens represent 19 distinct species (Table A1). These include nine previously established species, *S. andina*, *S. ciliata*, *S. duplolimbata*, *S. fuliginoides*, *S. fuliginosa*, *S. marginalis*, *S. sublimbata*, *S. tomentosa*, and *S. umbilicariiformis*; five newly described species, *S. afromontana*, *S. aspratilis*, *S. cellulosa*, *S. cyanocaperata*, *S. munda*, and five putative species, *Sticta* sp. A (*fuliginoides* agg.), *Sticta* sp. B (*ciliata* agg.), *Sticta* sp. C (*weigelii* agg.), *Sticta* sp. D, and *Sticta* sp. 2. Brief descriptions of the established species and full descriptions of the novel species are provided, including a summary of observations on their ecology and distribution. All the observed species are included in the key. *Sticta dichotoma* is included in the key based on previous published reports from the region [12].

#### 3.2.1. Key to Sticta Species in East Africa

- 1a. Main photobiont green alga-2.
- 1b. Main photobiont cyanobacterium—3.
- 2a. Thallus thin and fragile, with marginal lobules—*Sticta* sp. 2 (Figure 6a)
- 2b. Thallus robust, without marginal lobules—*Sticta dichotoma*
- 3a. Thallus with marginal to submarginal soralia (may occasionally form coralloid, isidia-resembling structures) and/or pustules—4.
- 3b. Thallus without soredia or pustules—5.
- 4a. With true, mainly marginal soredia (found in sub/lower montane habitats, mainly <2000 masl)—*Sticta sublimbata*
- 4b. With pustules that may appear sorediate (found in upper montane and subalpine habitats, >3500 masl)—*Sticta umbilicariiformis*
- 5a. Thallus without symbiotic propagules, often fertile—6.
- 5b. Thallus with marginal or laminal isidia and/or phyllidia—9.
- 6a. Apothecial margin with abundant white hairs, not nodulous; lobe margins often with projecting tufts of hair/tomentum; cyphellae urceolate with a small pore; ascospores large (> $40 \times 8 \mu m$  in diam.)—*Sticta tomentosa*
- 6b. Apothecial margin slightly pubescent at most, most often nodulous; cyphellae not strongly urceolate with a small pore; ascospores shorter—7.
- 7a. Ascospores 3-septate; lobes usually <3 cm long and wide—*Sticta munda* sp. nov.
- 7b. Ascospores 1-septate; lobes often larger—8.
- 8a. Ascospores 33–40 µm long—Sticta umbilicariiformis
- 8b. Ascospores usually shorter—Sticta aspratilis sp. nov.
- Dark isidia marginal, submarginal, and on scrobiculate ridges present at least near the thallus margins of the brown thallus—*Sticta cellulosa* sp. nov.
- 9b. Thallus without scrobiculate isidiate ridges—10.

- 10a. Isidia scattered over thallus lamina; without apothecia—11.
- 10b. Isidia predominantly on thallus margins (in fertile specimens often also on lamina)—14.
- 11a. Lobes elongate-obovate, fan-shaped, ascending from one attachment point with a funnel-like base; older thalli commonly with stalked lobules; lower side with pronounced, often clearly dome-like cyphellae (in middle montane to subalpine habitats, >2500 masl)—*Sticta fuliginoides* agg. (*Sticta fuliginoides* and *Sticta* sp. A)
- 11b. Lobes rounded and/or palmate, without a funnel-shaped base, stalked lobules not present—12.
- 12a. Thallus small (up to 2 cm in diam.), lobes widely rounded (wider than long) and revolute (often complete lobes becoming convex); lower side marginally etomentose with widely different sized and often flat cyphellae (in lower and middle montane habitats, <2600 masl)—*Sticta ciliata agg.* (*Sticta ciliata* and *Sticta* sp. B, Figure 6b)
- 12b. Thallus usually larger, lower side fully tomentose, cyphellae cupuliform to slightly urceolate—13.
- 13a. Lower side usually with abundant, arachnoid, moniliform secondary tomentum— *Sticta aspratilis* sp. nov.
- 13b. Lower side usually without arachnoid, moniliform secondary tomentum— *Sticta fuliginosa*
- 14a. Lobes palmate, clearly stipitate and ascending from one attachment point; lower side largely etomentose, often with a yellow hue; marginal isidia developing into lobules especially in older thalli—*Sticta marginalis*
- 14b. Lobes not clearly stipitate, palmate, and ascending; lower side tomentose—15.
- 15a. Lobes elongate, with rounded apices, often with dark marginal cilia; cyphellae distinctly raised and urceolate with a small opening (dome-like)—*Sticta duplolimbata*
- 15b. Lobe margins without dark marginal cilia; cyphellae not distinctly dome-like—16.
- 16a. Isidia cylindrical to coralloid, in congested dark heaps, occasionally developing into stalked lobules—*Sticta* sp. C (*weigelii* agg.) (Figure 6c)
- 16b. Isidia flattened and extending horizontally from the margins, usually not in congested heaps—17.
- 17a. Lower surface color is usually cream to light brown with light to brown tomentum (or lower surface brown with white tomentum); upper surface grey to chocolate brown—18.
- 17b. Lower surface dark brown (at least centrally) with dark tomentum; upper surface color is usually fawn to yellow–brown (occasionally light grey or dark brown)—19.
- 18a. Thallus thick and large; with marginal flattened isidia; primary tomentum of agglutinated hyphae—*Sticta afromontana* sp. nov.
- 18b. Rounded lobes with marginal and submarginal isidia and stalked lobules; lower surface at least centrally dark brown and glossy, tomentum white-light, only weakly agglutinated and hair-like, often entangled—*Sticta* sp. D
- 19a. K+ yellow; with moniliform secondary tomentum—Sticta andina
- 19b. K-; without moniliform secondary tomentum—*Sticta cyanocaperata* sp. nov.



**Figure 6.** *Sticta* sp. 2, *Sticta* sp. B (*ciliata* agg.), *Sticta* sp. C (*weigelii* agg.), and *Sticta andina*. (a) *Sticta* sp. 2, the only green algal species collected by us, photographed in situ on Mt. Kasigau and showing the characteristic abundant and delicate marginal phyllidia (JR10K302). (b) *Sticta* sp. B, closely resembling *S. ciliata*, photographed in situ on Shomoto Hill and displaying the small, dark brown, rounded lobes and laminal isidia (JR10060). (c) *Sticta* sp. C photographed in situ in Sagalla forest with the characteristic congested heaps of cylindrical-coralloid isidia in the margins of the elongate lobes (JR16295). (d,e) *Sticta andina* (JR10117). (d) Photographed in situ on Vuria Mountain. (e) When dry, the species has a yellowish–brown upper surface and dark brown lower surface. Scale 0.5 cm in (e).

3.2.2. Sticta afromontana Kaasalainen and Rikkinen sp. nov. (Figure 7)

### Mycobank # MB847043

Species of *Sticta* lichenized with a cyanobacterium and characterized by robust thallus, flattened marginal isidia, and cream to mid–brown lower surface with moniliform secondary tomentum.

Type: **Tanzania**, Mt. Kilimanjaro, near the Maua Route, upper montane secondary forest with *Erica excelsa*, -3.1864° N 37.4403° E, 2820 masl, 11 March 2017, on a fallen branch, U. Kaasalainen UK170826e (H 9237169—holotype).

ITS barcoding marker accession (GenBank): OP999496 (holotype).

Description: *Thallus* rosetteform to irregular, 200–350 µm thick and up to 5 cm in diam., attached to substrate from the center of the lower side. *Lobes* robust, loosely adnate, elongate, palmate, up to 3 cm long and 2.5 cm wide, branching polytomous; margins crenate and crisped with abundant, mostly flattened isidia. *Upper surface* light grey to brown, smooth to slightly wavy to foveolate centrally, often with tufts of submarginal white hairs. *Upper cortex* paraplectenchymatous, 25–40 µm and 3(4) cell layers thick, the first layer(s) composed of smaller slightly flattened cells (~5 × 7 um), the others of larger (6–12 um) isodiametric cells. *Photobiont Nostoc. Photobiont layer* 45–85 µm thick, with *Nostoc* cells 5–6 µm in diam. *Medulla* 70–240 µm thick, with hyphae 2–4 µm wide. *Cilia* not present. *Isidia* abundantly present, mainly marginal but on fertile specimens also on lamina, grey to dark brown, glossy, coralloid, and mostly flattened and horizontal. *Lower surface* cream colored to (more rarely) brown, smooth or ridged, with abundant tomentum. *Lower cortex* paraplectenchymatous, 20–40 µm and 2–3 cell layers thick, with isodiametric cells 7–10 µm

in diam. *Primary tomentum* usually with a brown and agglutinated stem, becoming white and squarrose towards the end. *Secondary tomentum* white, arachnoid, composed of moniliform assemblages. *Rhizines* infrequent, dark, slender. *Cyphellae* 45–90/cm<sup>2</sup>, cupuliform to slightly urceolate, with raised margins, pore up to 1.3 mm in diam., often with a darker ring surrounding the opening; cyphellar membrane white, 15–20 µm thick, composed of rounded, epapillose cells ~7 µm in diam. *Apothecia* infrequent and mainly found on specimens collected from optimal habitats; submarginal and laminal, sessile, up to 1.3 mm in diam. and 0.6 mm high (from the lower cortex of the lobe invagination); disc orange–brown; margin light brown with dark brown nodules. *Exciple margin* 95–115 µm wide. *Epithecium* 10–15 µm thick, orange–brown. *Hymenium* 100–120 µm thick. *Hypothecium* 55–70 µm thick, orange–brown. *Ascospores* fusiform, colorless, (1)3(5)-septate, 27–40 × 6–8 µm. *Pycnidia* not seen. *Chemistry*: K–, C–, Pd–.



**Figure 7.** *Sticta afromontana*. (**a**) Type specimen UK170826e collected from the upper montane forest on Mt. Kilimanjaro. The specimen has laminal isidia that are not present in specimens without apothecia. (**b**) Specimen JR16366 illustrating typical habit with marginal isidia. (**c**) Specimen JR10112 photographed in situ on Vuria Mountain. (**d**) Cross section of an apothecium from the type specimen. (**e**,**f**) Thallus part of the same collection as the type imaged from the upper and lower side. Scales 0.5 cm in (**a**), (**b**), (**e**), and (**f**), 300 μm in (**d**).

Etymology: Sticta *afromontana* is one of the most common *Sticta* species in the studied afromontane region.

Ecology and distribution: *Sticta afromontana* is common, abundant and often fertile in the upper montane forest zone and present from lower montane forests to the ericaceous zone (1800–3510 masl) but has not been collected outside forest habitats. *Sticta afromontana* is particularly common on Mt. Kilimanjaro, where often the most abundant *Sticta* species, but also found in some Taita Hills forests. Epiphytic on tree trunks, branches, shrubs, and climbers. So far, only known from Tanzania and Kenya.

Selected specimens examined: **Tanzania**, Mt. Kilimanjaro, near Machame Route, lower montane forest,  $-3.1675^{\circ}$  N 37.2363° E, 1920 masl, 15 March 2017, on a fallen branch, U. Kaasalainen UK170930c (H). Middle montane *Ocotea* forest,  $-3.0812^{\circ}$  N 37.1444° E, 2260 masl, 9 March 2017, on fallen branch, U. Kaasalainen UK170792d (H). Upper montane *Podocarpus* forest,  $-3.1035^{\circ}$  N 37.2604° E, 2850 masl, 9 March 2017, on mossy liana U.

Kaasalainen UK170775b, U. Kaasalainen UK170779c. On fallen branch, U. Kaasalainen UK170781b (H). Near Marangu Route, upper montane Podocarpus forest, -3.1044° N 37.3046° E, 2800 masl, 13 March 2017, on tree trunk, U. Kaasalainen UK170886a (H). Near Maua Route, disturbed middle montane Ocotea forest, 2270 masl, on fallen branch, U. Kaasalainen UK171180a (H). Upper montane Podocarpus forest, -3.1936° N 37.4421° E, 2270 masl, 11 March 2017, on tree trunk, U. Kaasalainen UK170857a (H). On trunk of fallen tree, U. Kaasalainen UK170858g (H). Upper montane secondary forest with Erica excelsa, -3.1898° N 37.4390° E, 2880 masl, 11 March 2017, on a shrub branch, U. Kaasalainen UK170846e (H). -3.1864° N 37.4403° E, 2720 masl, 11 March 2017, on a fallen branch, U. Kaasalainen UK170806j (H). On a tree trunk, U. Kaasalainen UK170832c (H). Near the Mweka route, upper montane Podocarpus forest, -3.1659° N 37.3626° E, 2940 masl, 24 June 2017, on a fallen branch, U. Kaasalainen UK171526a (H). On a tree trunk, U. Kaasalainen UK171528b (H). Upper montane secondary forest with *Erica excelsa*, -3.1640° N 37.3675° E, 2990 masl, 25 June 2017, on a tree trunk, U. Kaasalainen UK171577f (H). Near the Umbwe route, middle montane Ocotea forest, -3.0824° N 37.1811° E, 2540 masl, 20 June 2017, on a tree trunk, U. Kaasalainen UK171490e (H). Kenya, Taita Hills, Vuria Mountain, -3.24° N 38.17° E, 2200 masl, J. Rikkinen JR10112 (EA), J. Rikkinen JR10121B (EA), J. Rikkinen and P. M. Kirika JR16366 (EA).

Notes: *Sticta afromontana* can be distinguished from other *Sticta* species in the region by its flattened marginal isidia and lack of K reaction (strong and immediate yellow in *S. andina*), presence of moniliform secondary hyphae (not present in *S. cyanocaperata*), and usually cream to light brown lower surface and primary tomentum (usually dark brown in *S. andina* and *S. cyanocaperata*). *Sticta xanthotropa*, previously reported from East Africa, has a thin and fragile thallus (robust in *S. afromontana*), shorter ascospores (24–36 µm), and different substrate ecology (grows on rocks and soil) [32] than *S. afromontana*.

#### 3.2.3. Sticta andina B. Moncada, Lücking and Sérus. (Figure 6d,e)

A detailed description of *S. andina* is provided in [21]. Only one specimen of *S. andina* was identified from our material. It has a cyanobacterial main photobiont (*Nostoc*) and is characterized by flattened marginal isidia, yellowish–brown upper surface and dark brown lower surface with dark, short primary tomentum, and moniliform secondary tomentum. Chemistry: K+ yellow, C-, Pd-.

Morphologically, *S. andina* most resembles *S. cyanocaperata*; however, it can be easily identified based on the immediate, bright yellow K+ reaction in the medulla (*S. andina* is the only K+ species in our region). *Sticta cyanocaperata* also lacks the moniliform secondary tomentum present in *S. andina*.

Ecology and distribution: In other parts of the world (Columbia, Hawaii, Azores), *S. andina* has been reported to grow epiphytically in humid montane forests and in montane heathlands [21]. Our single specimen was collected from a moist montane forest on Vuria Mountain in the Taita Hills, and it shared an identical ITS sequence with a specimen previously collected from Hawaii (MT132671).

#### 3.2.4. *Sticta aspratilis* Kaasalainen and Rikkinen sp. nov. (Figure 8)

#### Mycobank # MB847044

Species of *Sticta* lichenized with a cyanobacterium and characterized by its large thallus, rough upper surface with laminal isidia, abundant moniliform secondary tomentum on the lower side, and short one-septate ascospores.

Type: **Kenya**, Mount Elgon National Park, ericaceous zone, 2016, on a tree trunk, J. Rikkinen and P. M. Kirika JR16107 (EA—holotype).

ITS barcoding marker accession (GenBank): OP999437 (holotype).

Description: *Thallus* rosetteform to irregular, attached to substrate from the center of the lower side. *Lobes* 130–250  $\mu$ m thick, loosely adnate, rarely ascending, usually rounded palmate, usually 2–4 cm wide and 2–3 cm long, but sometimes more elongate and up to 7 cm long; branching polytomous, margins entire to sinuose, sometimes slightly crisped with

isidia, occasionally revolute. Upper surface grey-brown or more rarely brown, usually at least slightly glossy, uneven, ridged (isidiate specimens) and/or foveolate, with occasional eroded patches surrounded by isidia. Upper cortex paraplectenchymatous, 25-60 µm and 3–6 cell layers thick, composed of tightly packed cells of ~7 µm in diam. *Photobiont Nostoc*. Photobiont layer 30-75 µm thick, with Nostoc cells 5-6 µm in diam. Medulla 35-145 µm thick, with hyphae 3–4 µm wide. *Cilia* not present. *Isidia* abundantly present, laminal, and sometimes also present on the lobe margins, brown or grey, darker than the upper surface, glossy, nodular to branched or coralloid. Lower surface cream to light brown, smooth to occasionally slightly uneven, abundantly tomentose. Lower cortex paraplectenchymatous, 20-40 µm and 3–4 cell layers thick, with cells 7–10 µm in diam. *Primary tomentum* white to brown, composed of agglutinated hyphae. Secondary tomentum abundant, pale, arachnoid, composed of moniliform assemblages. Rhizines sparse, in scattered groups, long, slender, concolorous with primary tomentum. Cyphellae 90–270/cm<sup>2</sup>, cupuliform to slightly urceolate, with a raised margin, very variable is size, pore up to 1(2.4) mm in diam.; cyphellar membrane white, ~20 µm thick, with rounded, epapillose cells ~8 µm in diam. Apothecia occasional, only seen on specimens without isidia; submarginal and laminal, up to 2.7 mm wide; margin beige to brown with darker brown stripes or nodules, sometimes slightly pubescent or tomentose; disc red-brown. Exciple margin 120-150 µm wide. Epithecium 10-20 µm thick, orange–brown. *Hymenium* 90–140 μm thick. *Hypothecium* 50–75 μm thick, orange–brown. Ascospores fusiform, 1-septate, colorless,  $(21)26-33(35) \times 5.5-8 \mu m$  in diam. Pycnidia not seen. Chemistry: K-, C-, Pd-.



**Figure 8.** *Sticta aspratilis.* (**a**–**d**) Type specimen JR16107. (**a**) Photographed in situ in the ericaceous zone on Mt. Elgon. (**b**) The uneven and isidiate upper surface. (**c**) Abundantly tomentose lower surface. (**d**) Thallus cross section with a cyphella, showing the cyphellar membrane with rounded cells without papillae. (**e**) Specimen JR10155 photographed in situ on Yale, with gray and distinctly reticulate upper surface. (**f**,**g**) Fertile specimen UK171478a. (**f**) Foveolate upper surface with apothecia. (**g**) Cross section of an apothecium. Scales 0.5 cm in (**b**) and (**c**), 100 μm in (**d**) and (**g**), 1 cm in (**f**).

Etymology: The specific epithet refers to the characteristic uneven roughness of the upper thallus surface.

Ecology and distribution: *Sticta aspratilis* is relatively common, but not very abundant in any habitat type. It has a wide elevational range on Mt. Kilimanjaro, the Taita Hills, and Mt. Elgon, extending from lower montane forests to the subalpine zone (1450–3720 masl). In addition to primary forests, it has also been collected from disturbed habitats. Epiphytic, mainly on canopy branches, but also on tree trunks at more open sites, occasionally also on soil in the subalpine zone. So far, *S. aspratilis* is only known from Kenya and Tanzania.

Selected specimens examined: Tanzania, Mt. Kilimanjaro, coffee farm in Maua, -3.1630° N 37.2813° E, 1660 masl, 23 May 2017, on coffee bush, U. Kaasalainen UK170975f (H). Near Machame Route, upper montane *Podocarpus* forest,  $-3.1035^{\circ}$  N 37.2604° E, 2970 masl, 9 March 2017, on fallen branch, U. Kaasalainen UK170781c (H). Near Marangu Route, upper montane *Podocarpus* forest, -3.1044° N 37.3046° E, 2800 masl, 13 March 2017, on tree trunk, U. Kaasalainen UK170892c (H). On fallen branch, U. Kaasalainen UK170896b (H). Near Mweka Route, middle montane Ocotea forest near Mweka Route, -3.1722° N 37.3583° E, 2850 masl, 24 June 2017, on a fallen branch, U. Kaasalainen UK171515b (H). Upper montane *Podocarpus* forest, -3.1616° N 37.3632° E, 2970 masl, 26 June 2017, on a fallen tree, U. Kaasalainen UK171587j (H). Disturbed subalpine Erica vegetation, -3.1339° N 37.3702° E, 3720 masl, 25 June 2017, on shrub base, U. Kaasalainen UK171562c (H). Near Umbwe Route, middle montane Ocotea forest, -3.0819° N 37.1819° E, 2650 masl, 20 June 2017, on fallen branch, U. Kaasalainen UK171478a (H). Kenya, Taita Hills, field edge near the Fururu Forest, -3.25° N 38.20° E, 1650 masl, 20 January 2011, on tree trunk, U. Kaasalainen UK110551f (EA), UK110551g (EA). Shomoto Hill, -3.395° N 38.360° E, 1500 masl, 2010, epiphytic, J. Rikkinen JR10044A (EA), JR10057 (EA). Yale, -03.24° N 38.20° E, 1850 masl, 2010, epiphytic, J. Rikkinen JR10155A (EA), JR10155B (EA), JR10155C (EA), JR10171 (EA).

Notes: *Sticta aspratilis* most closely resembles *S. fuliginosa* which, however, usually lacks the moniliform secondary tomentum that characteristically covers the lower surface of *S. aspratilis*. Fertile specimens may resemble *S. kunthii*, previously reported from East Africa, and fertile specimens of *S. umbilicariiformis*. However, the upper surface of *S. kunthii* is marbled with maculae and papillate [32], while *S. umbilicariiformis* usually has longer ascospores (33–40 µm) than *S. aspratilis*.

# 3.2.5. Sticta cellulosa Kaasalainen sp. nov. (Figure 9)

Mycobank # MB847045

Species of *Sticta* lichenized with a cyanobacterium and characterized by its thick, brown lobes and tomentum, and the scrobiculate, isidiate ridges on the upper surface present at least near the margins.

Type: **Tanzania**, Mt. Kilimanjaro, near Umbwe Route, subalpine *Erica trimera* forest, -3.1114° N 37.3183° E, 3500 masl, 18 June 2017, on fallen branch, U. Kaasalainen UK171406e (H9237170—holotype).

ITS barcoding marker accession (GenBank): OP999548 (holotype).

Description: *Thallus* irregular, 150–300  $\mu$ m thick, attached to substrate from the lower side of thallus. *Lobes* loosely adnate to ascending, elongate or rarely palmate, up to 3 cm wide and 4 cm long, branching polytomous, margins entire to sinuose, usually abundantly isidiate. *Upper surface* middle to dark brown or occasionally lighter yellow–brown, moderately glossy, smooth to foveolate centrally, with a scrobiculate pattern of isidiate ridges and hollows, at least submarginally, but occasionally spreading over a large part of the upper surface. *Upper cortex* paraplectenchymatous, 30–50  $\mu$ m and 3–5 cell layers thick, cells up to 15  $\mu$ m in diam., the first layer of cells often smaller and brownish in color. *Photobiont Nostoc. Photobiont layer* 20–70  $\mu$ m thick, with *Nostoc* cells approximately 9  $\mu$ m in diam. *Medulla* 50–180  $\mu$ m thick, with hyphae 2–4  $\mu$ m wide. *Cilia* not present. *Isidia* abundantly present and congested, marginal, submarginal, and on the laminal scrobiculate ridges, dark brown to almost black, glossy, cylindrical to coralloid, occasionally present also on the lower surface

where grey. *Lower surface* dark brown, occasionally lighter towards margins, smooth, thickly and densely tomentose throughout. *Lower cortex* paraplectenchymatous, brown, 25–70  $\mu$ m and 3–5 cell layers thick, with cells 6–14(20)  $\mu$ m in diam. *Primary tomentum* dark brown to almost black, composed of agglutinated hyphae. *Secondary tomentum* arachnoid, pale, composed of moniliform assemblages. *Rhizines* often present in small, scattered groups, clearly longer than tomentum, fasciculate, squarrose, dark brown and often with white tips. *Cyphellae* 13–50/cm<sup>2</sup>, cupuliform with a round pore and raised margins, larger may be more irregular and slightly urceolate, pore size very variable, up to 2.3 mm in diam.; cyphellar membrane cream-colored to slightly brown or yellow, 15–25  $\mu$ m thick, composed of rounded, epapillose cells 5–12  $\mu$ m in diam. *Apothecia* or *pycnidia* not seen. *Chemistry*: K–, C–, Pd–.



**Figure 9.** *Sticta cellulosa.* (**a**,**b**) Type specimen UK171406e imaged from the upper and lower side. (**c**) Thallus part of the same collection as type specimen with abundant characteristic isidiate ridges. (**d**) Thallus cross section with a cyphella on the right showing the epapillate cells of the cyphellar membrane, and the moniliform assemblages which form secondary tomentum on the lower surface (UK171340t). Scales 0.5 cm in (**a**–**c**), 100  $\mu$ m in (**d**).

Etymology: The specific epithet refers to the characteristic reticulate pattern of the upper thallus surface.

Ecology and distribution: *Sticta cellulosa* seems to be rare and is found mainly in the subalpine zone on Mt. Kilimanjaro (2990–3520 masl). It occurs in primary and secondary

(fire disturbed) *Erica trimera* forests and in the secondary upper montane forest with *Erica excelsa*. Epiphytic especially on *Erica*. So far, only known from Mt. Kilimanjaro, Tanzania.

Selected specimens examined: **Tanzania**, Mt. Kilimanjaro, near Machame Route, fire disturbed subalpine *Erica* vegetation,  $-3.0854^{\circ}$  N 37.2794° E, 3520 masl, 15 June 2017, on *Erica* branches, U. Kaasalainen UK171340t (H). Near Mweka Route, fire disturbed upper montane *Podocarpus* forest now dominated by *Erica excelsa*,  $-3.1640^{\circ}$  N 37.3675° E, 2990 masl, 25 June 2017, on tree trunk, U. Kaasalainen UK171584k (H). Near Umbwe Route, subalpine *Erica trimera* forest,  $-3.1114^{\circ}$  N 37.3183° E, 3500 masl, 18 June 2017, on fallen branch, U. Kaasalainen UK171407j (H). On *Erica*, U. Kaasalainen UK171458k (H).

Notes: Well-developed specimens are easy to distinguish from other *Sticta* species based on their robust, often dark brown appearance, the isidiate scrobiculation at least along lobe margins, and thick dark brown tomentum of the lower surface. Poorly developed specimens may resemble other isidiate species with yellowish–brown upper surface, but can be distinguished on the basis of submarginal, cylindrical isidia.

#### 3.2.6. *Sticta ciliata* Tayl. (Figure 10a)

*Sticta ciliata* has a cyanobacterial main photobiont (*Nostoc*) and rounded lobes with laminal isidia. A detailed description of *S. ciliata* is provided in [20]. In our region, the two sequenced specimens of *S. ciliata* have small, approximately 1–2 cm wide and 0.5–1.5 cm long, loosely adnate, rounded, obovate lobes with abundant, laminal isidia on the grey upper surface. The lobes are revolute making them convex. The lower surface is pale with a tomentose base, but with the tomentum becoming scarce or absent towards the margins, and with flat, variably sized cyphellae. Lobe margins are often ciliate. Chemistry: K-, C-, Pd-.

In our region, four other species with laminal isidia are present: *Sticta aspratilis*, *S. fuliginoides*, *S. fuliginosa*, and *Sticta* sp. B. Our *S. ciliata* specimens are rather few and poorly developed, but Magain and Sérusiaux [20] describe their diagnostic characters: Fresh specimens of *S. ciliata* have delicate and usually ciliate thallus margins, especially in young thalli, and abundant tiny papillae over the cells of the cyphellar membrane, however, the regeneration lobules of all other isidiate species can also have marginal cilia, and the fine anatomy of cyphellae can only be studied from fresh and well-preserved material. In our material, *S. fuliginosa* and *S. aspratilis* usually have larger thalli with a tomentose lower surface and usually occurs on higher elevations than *S. ciliata*. *Sticta* sp. B closely resembles *S. ciliata* in morphology and occurs in similar habitats. However, the material presently available is too scarce to allow a detailed morphological analysis to compare the two species.

Ecology and distribution: In other parts of the world, *S. ciliata* is known from Europe, Macaronesia, and possibly Colombia, where it grows as an epiphyte on tree trunks and on bryophytes, especially in well-preserved, humid forests [20]. The two confirmed specimens in our material were collected from moist montane forest, one from the Sagalla Mountain in the Taita Hills and one from the lower montane forest of Mt. Kilimanjaro. Both specimens were growing epiphytically on tree trunks. *Sticta* sp. B seems to be widely distributed in East Africa and has been collected from Kenya, Tanzania, and Rwanda, from similar moist lower to middle montane forests as *S. ciliata*.



**Figure 10.** *Sticta ciliata, Sticta duplolimbata, Sticta fuliginoides, Sticta fuliginosa,* and *Sticta marginalis.* (**a**) *Sticta ciliata* from Chawia Forest with small revolute lobes and ciliate margins (UK110570a). (**b**) *Sticta duplolimbata* photographed in situ on Vuria Mountain, showing the elongate lobes with rounded apices and marginal cilia and isidia, and abundantly tomentose lower surface. (**c**) *Sticta fuliginoides* from an upper montane forest on Mt. Kilimanjaro with palmate lobes and a funnel-like base (UK171468d). (**d**,**e**) *Sticta fuliginosa* photographed in situ in the Taita Hills. (**d**) Specimen JR16358 with rounded lobes and abundant laminal isidia. (**e**) Specimen JR09A46 showing the white and abundantly tomentose lower surface. (**f**–**h**) *Sticta marginalis* photographed in situ in the Taita Hills. (**f**) Specimen JR29502 with stipitate, ascending lobes and marginal isidia. (**g**) Note the characteristic etomentose lower surface with inconspicuous cyphellae. (**h**) Delicate marginal isidia and stalked lobules occur commonly especially in ageing thalli.

# 3.2.7. Sticta cyanocaperata Kaasalainen sp. nov. (Figure 11)

### Mycobank # MB847046

Species of *Sticta* lichenized with a cyanobacterium and characterized by its light grey to fawn, wrinkled upper surface, flattened marginal isidia, and brown, ridged (visible in thallus cross-section) lower surface without moniliform secondary tomentum.

Type: **Tanzania**, Mt. Kilimanjaro, near the Umbwe Route, middle montane *Ocotea* forest  $-3.0819^{\circ}$  N 37.1819° E, 2650 masl, 20 June 2017, on a fallen branch, U. Kaasalainen UK171480d (H 9237171—holotype).

ITS barcoding marker accession (GenBank): OP999563 (holotype).

Description: Thallus rosetteform, (140)200–470 µm thick with thickenings on the lower side clearly visible in the cross-section, closely adnate centrally, loosely adnate marginally. Lobes elongate, polytomously branching, up to 5.5 cm long and 2 cm wide; margins often crisped, with darker, mostly flattened isidia, occasionally also with phyllidia. Upper surface is usually fawn to yellowish brown, occasionally light grey wavy to slightly wrinkled at least centrally. Upper cortex paraplectenchymatous, 30–70 µm and 4–6 cell layers thick, cells 6–13 µm in diam., the first layer(s) more compact. Photobiont Nostoc. Photobiont layer 30–90 μm thick, with Nostoc cells 5–7 μm in diam. Medulla 75–300 μm thick, with hyphae 3-4 µm wide. Cilia not present. Isidia marginal, usually dark brown, glossy, coralloid, flattened. Lower surface dark brown at least centrally, may become lighter towards margins, with ridges (may not always be visible under a preparation microscope, but present at least as thickenings in a thallus cross-section), with brown tomentum, lighter margins may be etomentose. Lower cortex paraplectenchymatous, (10)30-45 µm and (2)3 cell layers thick, cells 7–12 µm in diam. Primary tomentum usually dark brown, composed of agglutinated hyphae, may become entangled and matted centrally, and/or resemble arachnoid secondary tomentum. Moniliform secondary tomentum not present. Rhizines scattered in groups, dark brown to black, glossy, often with long, tapering, white tip, often hirsute from the lower parts. Cyphellae urceolate with a wide opening (up to 1 mm in diam.), pore margin raised or flat, occasionally thickened; cyphellar membrane light yellow, ~20 µm thick, cells rounded, epapillose, 6–7 µm in diam. Apothecia or pycnidia not seen. Chemistry: K-, C-, Pd-.



**Figure 11.** *Sticta cyanocaperata.* (a) A fragment of the type specimen UK171480d. (b,c) Additional thalli part of the same collection as the type: (b) Showing the brown tomentum and pale thallus margins. (c) Characteristic light yellowish–brown, wrinkled upper surface and dark, flattened, marginal isidia. (d) Thallus cross section showing the uneven lower surface (UK170912a) and the lack of moniliform secondary tomentum. Scales 0.5 cm in (a–c), 100  $\mu$ m in (d).

Etymology: The specific epithet refers to the cyanobacterial primary photobiont and characteristic wrinkles on the upper and lower surfaces, and to the close phylogenetic affiliation to *Sticta caperata*.

Ecology and distribution: *Sticta cyanocaperata* is common in the middle montane forests on Mt. Kilimanjaro (2270–2650 masl). Epiphytic on canopy branches, tree trunks, and lianas. So far, *S. cyanocaperata* is only known from Mt. Kilimanjaro, Tanzania.

Selected specimens examined: **Tanzania**, Mt. Kilimanjaro, near Marangu Route, disturbed middle montane *Ocotea* forest,  $-3.1207^{\circ}$  N 37.3057° E, 2370 masl, 14 March 2017, on fallen branch, U. Kaasalainen UK170912a (H). U. Kaasalainen UK170912e (H). Near Maua Route, disturbed middle montane *Ocotea* forest,  $-3.1319^{\circ}$  N 37.2717° E, 2270 masl, 29 May 2017, on liana, U. Kaasalainen UK171182c (H). Near Umbwe Route, middle montane *Ocotea* forest,  $-3.0824^{\circ}$  N 37.1811° E, 2540 masl, 20 June 2017, on tree trunk, U. Kaasalainen UK171495f (H).

Notes: In shady habitats, *S. cyanocaperata* may have a rather different appearance in having a light grey upper surface, thin thallus, few isidia, and poorly developed lower side tomentum. However, such specimens can still be identified on the basis of the characteristic lower side ridges and lack of moniliform secondary tomentum. The closely related *S. caperata* most commonly has a green algal primary photobiont. The cyanomorph of *S. caperata* reported from Réunion [25] differs from *S. cyanocaperata* in having a marbled upper surface. *Sticta xanthotropa*, previously reported from East Africa [12], is distinguished for example based on the pale cream-colored to yellowish lower surface [32]. The most closely resembling species in the region with similar flattened marginal isidia and yellow-brown upper surface is *S. andina* which can be recognized due to the instant and strong K+ yellow reaction of the medulla.

#### 3.2.8. *Sticta duplolimbata* (Hue) Vain. (Figure 10b)

Sticta duplolimbata has a cyanobacterial main photobiont (*Nostoc*) and marginal isidia. A detailed description of the species is provided in [59]. In our region, the species is characterized by loosely adnate, elongate, and most often light grey lobes with rounded apices, dark, mainly marginal cylindrical to coralloid isidia, and dark marginal cilia which, however, are not always present. The lower side is abundantly tomentose, with tomentum reaching the lobe margins, and usually pale but sometimes even dark brown. Cyphellae are conspicuous, raised, and distinctly urceolate with a small opening. Chemistry: K-, C-, Pd-.

*Sticta duplolimbata* is easy to distinguish from the other *Sticta* species in our region, especially by the dark cilia usually present at the rounded lobe apices and distinct, urceolate cyphellae. Galloway [59] mentions that *S. duplolimbata* has "lobes arising from short stalk"; however, this is not visible in most of our specimens, which are usually attached to their substrate by the tomentum of the central parts of the lower surface.

Ecology and distribution: In other parts of the world, *S. duplolimbata* is mainly known from the Western Pacific region [59]. Abundant on tree trunks, climbers, and canopy branches in lower and middle montane forests on Mt. Kilimanjaro, with fewer specimens from upper montane forests, Chagga home gardens, and moist montane forests of the Taita Hills (1800–3060 masl).

#### 3.2.9. Sticta fuliginoides Magain and Sérus. (Figure 10c)

*Sticta fuliginoides* has a cyanobacterial main photobiont (*Nostoc*) and obovate lobes with laminal isidia. A detailed description of the species is provided in [20]. In our region, *S. fuliginoides* is characterized by the obovate lobes, ascending from a single attachment point. The lobes are usually up to 2.5 cm in diam and have a funnel-like base. The upper surface is grey, brown or yellowish–brown, smooth to strongly reticulate especially in ageing thalli, and with dark, mainly laminal, cylindrical to coralloid isidia, often developing into stalked lobules. The lower surface is white or beige, with abundant tomentum near the attachment point, but often etomentose towards the margins. Cyphellae are variable

in size, usually urceolate and dome-like and raised especially towards the thallus margin, and if cupuliform, with a distinctly raised margin. Chemistry: K-, C-, Pd-.

Poorly developed thalli and/or specimens collected from suboptimal habitats may often have only one obovate-palmate ascending lobe with laminal isidia, and a mostly etomentose lower surface with pronounced cyphellae. In well-developed thalli, the ascending lobes usually have a funnel-shaped base quite distinct from those of other *Sticta* species with laminal isidia. Based on our phylogenetic analysis, three specimens, closely resembling *S. fuliginoides* in overall morphology, represent an additional undescribed taxon *Sticta* sp. A (Figure 3). However, the material presently at hand is insufficient for properly assessing the morphological characteristics of that species.

Ecology and distribution: In other parts of the world (Europe, Macaronesia, North America, Colombia) *S. fuliginoides* grows on mossy trees and rocks in humid forests and parks [20]. In our region it is an abundant epiphyte on tree trunks, canopy branches, and climbers, especially in upper montane forests on Mt. Kilimanjaro, but occurring in middle montane to subalpine habitats as well (2470–3520 masl).

# 3.2.10. Sticta fuliginosa (Hoffm.) Ach. (Figure 10d,e)

*Sticta fuliginosa* has a cyanobacterial main photobiont (*Nostoc*) and laminal isidia. A detailed description of the species and a discussion of differences between *S. fuliginosa*, *S. ciliata*, and *S. fuliginoides* are provided in [20]. In our region, *S. fuliginosa* is characterized by rounded palmate-obovate lobes, usually up to 5 cm in diam., with an uneven, most often greyish–brown upper surface and darker laminal isidia. The lower surface is pale with cupuliform to slightly urceolate cyphellae, and with a pale primary tomentum, but usually without a moniliform secondary tomentum. Chemistry: K-, C-, Pd-.

Of the other species with laminal isidia in our region, *S. fuliginosa* mostly resembles *S. aspratilis* which, however, has a well-developed arachnoid secondary tomentum on the lower surface, often making also the primary tomentum appear "furry". Small thalli of *S. fuliginosa* often have dark brown, rounded lobes with ciliate and occasionally revolute margins very similar to those of *S. ciliata* agg. *Sticta ciliata* is usually much smaller and according to Magain and Sérusiaux [20], fresh specimens of *S. ciliata* and *S. fuliginosa*.

Ecology and distribution: *Sticta fuliginosa* is believed to be widely distributed in both hemispheres [20,60]. In our region, it is common in the Taita Hills forests and occurs on Mt. Kasigau. On Mt. Kilimanjaro it is common especially on canopy branches in middle montane forests but is also found in the lower montane to upper montane zones, including the Chagga home gardens (1840–2880 masl).

# 3.2.11. Sticta marginalis Bory (Figure 10f-h)

Sticta marginalis has a cyanobacterial main photobiont (*Nostoc*) and marginal isidia that often develop into stalked lobules. Thallus lobes are clearly stipitate, palmate, and ascending from a single attachment point. The upper surface is smooth, usually light grey with a yellow tinge. Isidia are dark, mainly marginal, cylindrical to coralloid, and often develop into characteristic stalked lobules especially in ageing thalli. Lower surface is light to dark brown, often with some yellow coloring, usually without tomentum or with a limited amount of short velvety hair; cyphellae are small and flat. Apothecia are not present in our material, but in the description of *S. marginalis* from Réunion, the apothecia are described submarginal and the ascospores brown, 1–3-septate, 40–48 × 8  $\mu$ m [61]. Chemistry: K–, C–, Pd–.

Sticta marginalis is very characteristic looking and easily distinguished from the other *Sticta* species in the region based on the stipitate, palmate, ascending lobes with isidiate-lobulate margins, mostly naked lower surface, and flat cyphellae.

Ecology and distribution: In other parts of the world, *Sticta marginalis* is known from its type location Réunion and from Madagascar [61–63]. In our region, *S. marginalis* often grows as an epiphyte on tree trunks, but occasionally also on decaying wood and rock. It is

common in moist lower and middle montane forests of Mt. Kilimanjaro, the Taita Hills, and Mt. Kasigau (1450–2470 masl).

Note: *Sticta marginalis* was described from Réunion [61] and has not previously been reported from the African continent. Another stipitate species *S. orbicularis*, originally described from Java in Indonesia [64], has previously been reported to occur in East Africa [12,28,30]. *Sticta marginalis* has even been suggested to be synonymous to *S. orbicularis* [65], and also Swinscow and Krog [12] noted that the taxon needs critical study and that *S. pusilla* Meissner may be its correct name. No DNA data is available from *S. orbicularis* and a description of the type material mentions that the material consists of only two immature specimens [64].

3.2.12. Sticta munda Kaasalainen sp. nov. (Figure 12)

Mycobank# MB847047

Species of *Sticta* lichenized with a cyanobacterium and characterized by palmate lobes with light grey upper surface, lack of symbiotic propagules, and submarginal apothecia with nodular margins and 3-septate, 30–40 µm long ascospores.

Type: **Tanzania**, Mt. Kilimanjaro, near the Mweka Route, upper montane secondary forest with *Erica excelsa*, -3.1640° N 37.3675° E, 2990 masl, 25 June 2017, on a tree trunk, U. Kaasalainen UK171584u (H 9237172—holotype).

ITS barcoding marker accession (GenBank): OP999600 (holotype).

Description: Thallus loosely adnate, often rosetteform, (120)150–180(210) µm thick and up to 5(7) cm in diam., attached from the center of the lower side or, more often, consisting of a single ascending, palmate lobe attached to substrate from its base. *Lobes* relatively thin, palmate, 1.5–3(4) cm in diam., usually isodiametric or wider than long, with rounded margins. Upper surface light grey or occasionally brownish towards margins, smooth to slightly wavy or foveolate. Upper cortex paraplectenchymatous, (20)25–35(50) µm and 3-4(6) cell layers thick, composed of isodiametric cells  $7-11 \mu m$  in diam., the cells in the first layer(s) occasionally slightly flattened and/or smaller. Photobiont Nostoc. Photobiont layer (30)35-50(70) µm thick, with Nostoc cells 5–8 µm in diam. Medulla (35)40–75 µm thick, with hyphae 2–4 µm wide. Cilia, isidia, soredia, and phyllidia absent. Lower surface cream colored to light brown, smooth, with abundant tomentum. *Lower cortex* paraplectenchymatous, 15–35(40)  $\mu$ m and 2–3(4) cell layers thick, with isodiametric to slightly oblong cells 6–13  $\mu$ m in diam. Primary tomentum with brown and agglutinated stems, becoming lighter and squarrose towards the tips. Secondary tomentum white, arachnoid, composed of moniliform assemblages. Rhizines not present. Cyphellae (40)50-200/cm<sup>2</sup>, cupuliform and rounded with a clearly raised margin when small to medium sized, irregular and slightly urceolate when large; pore rarely >0.8 mm in diam., often surrounded by a darker ring; cyphellar membrane white, cells rounded, epapillose, 6–9 µm in diam. Apothecia common, submarginal to laminal, up to 2 mm in diam.; disc light reddish to dark brown; margin light brown with darker brown nodules. Exciple margin 120–140 µm wide. Epithecium 10–15(30) µm thick, orange–brown. Hymenium (80)90–110 μm thick. Hypothecium (45)80–95 μm thick, orange– brown. Ascospores fusiform, colorless, 3-septate,  $30-38(43) \times (5)6-9 \mu m$ . Pycnidia not seen. *Chemistry*: K–, C–, Pd–.



**Figure 12.** *Sticta munda*. (**a**-**c**) Type specimen UK171584u. (**a**,**b**) Typical single lobed, palmate, and abundantly fertile specimen seen from the upper and lower side. (**c**) A cross section of apothecium. (**d**) Specimen UK171582i with a rosetteform thallus. Scales 0.5 cm in (**a**), (**b**), and (**d**), 100 μm in (**c**).

Etymology: The specific epithet refers to the simple and elegant form of the species.

Ecology and distribution: *Sticta munda* is quite rare in the middle and upper montane forests on Mt. Kilimanjaro (2220–2990 masl). Epiphytic on canopy branches and tree trunks. So far, only known from Mt. Kilimanjaro, Tanzania.

Selected specimens examined: **Tanzania**, Mt. Kilimanjaro, near the Marangu route, upper montane *Podocarpus* forest,  $-3.1044^{\circ}$  N 37.3046° E, 2800 masl, 13 March 2017, on a fallen branch, U. Kaasalainen UK170888c (H). Near the Mweka route,  $-3.1101^{\circ}$  N 37.2130° E, 2470 masl, 24 June 2017, on a fallen branch, U. Kaasalainen UK171508j (H), U. Kaasalainen UK171510k (H). Upper montane secondary forest with *Erica excelsa*,  $-3.1640^{\circ}$  N 37.3675° E, 2990 masl, 25 June 2017, on a tree trunk, U. Kaasalainen UK171582i (H). Near the Umbwe route, disturbed middle montane *Ocotea* forest,  $-3.0903^{\circ}$  N 37.1724° E, 2220 masl, 20 June 2017, on a fallen branch, U. Kaasalainen UK171497d (H).

Notes: The six specimens of *S. munda* sequenced represented three different ITS variants. Although all the specimens formed a well-supported monophyletic clade, there are some morphological differences between specimens representing the different ITS variants. *Sticta munda* resembles *S. ambavillaria* from Réunion, which, however, is distinguished by the phylogenetic analysis (Figure 2). *Sticta ambavillaria* also has longer ascospores ((42)44.5–50 µm [33]) than *S. munda*, which was apparently also noticed by Swinscow and Krog [12] who reported short ascospores (30–40 × 6–10 µm) for their *S. ambavillaria* specimens collected from East Africa. Additionally, fertile specimens of *S. umbilicariiformis* and *S. aspratilis* can resemble *S. munda*, but they have one-septate ascospores and thicker lobes, which are often brown instead of grey and more distinctly foveolate.

3.2.13. Sticta sublimbata (J. Steiner) Swinscow and Krog (Figure 13a,b)

*Sticta sublimbata* has a cyanobacterial main photobiont (*Nostoc*) and marginal soralia. A detailed description of East African material is provided in [12]. The rosetteform thallus has adnate or loosely adnate, elongate more or less linear and narrow (usually < 1 cm wide) lobes with rounded apices that are often also revolute when dry. The upper surface

is usually light leather brown to grey but may also be dark brown. The lower surface is light to dark brown, and usually has scarce, short tomentum, but also densely tomentose forms are quite common. Cyphellae are white with open, raised margins. Marginal linear soralia are almost always present and produce farinose to granular soredia, and sometimes also form aggregates resembling isidia. Apothecia not seen. Chemistry: K-, C-, Pd-.

In our region, *S. sublimbata* is the only sorediate species in lower montane forests and woodland below 2500 masl. *Sticta umbilicariiformis*, which is common in the upper montane and subalpine zones, can occasionally appear sorediate, but usually has much thicker and wider (several centimeters wide) lobes and an abundantly tomentose lower surface.

Ecology and distribution: In addition to Africa, *S. sublimbata* is known from Australia, New Zealand, and southern South America [59]. In our region, *S. sublimbata* is an abundant and common epiphyte especially on tree trunks, but it also grows among bryophytes on cliffs and other rock surfaces. *Sticta sublimbata* is especially common in the lower montane forests of the Taita Hills, but also occurs on Mt. Kasigau and Mt. Kilimanjaro, mainly below 2000 masl. It may even benefit from human activity as it seems most abundant in moderately disturbed habitats.



**Figure 13.** *Sticta sublimbata, Sticta tomentosa,* and *Sticta umbilicariiformis.* (**a**,**b**) *Sticta sublimbata.* (**a**) Large and adnate thallus of specimen JR16275 photographed in situ on Sagalla Mountain. (**b**) Specimen JRCA2 photographed in situ in Ngangao Forest displaying characteristic rounded lobes and marginal soralia. (**c**,**d**) *Sticta tomentosa* photographed in situ on Vuria Mountain. (**c**) Specimen JR16368 with palmate lobes and abundant apothecia. (**d**) Specimen JRA14357 showing the lobe margins with tufts of hair, apothecia with white hairs on the margin, and white lower surface with prominent cyphellae. (**e**-**g**) *Sticta umbilicariiformis.* (**e**) Specimen JR16102 photographed in situ in the ericaceous zone on Mt. Elgon with characteristic pustules on thallus margins and submarginal lamina. (**f**,**g**) Fertile specimen UK171411c with strongly foveolate upper surface and tomentose apothecial margins. Scales 0.5 mm in (**f**), 1 cm in (**g**).

#### 3.2.14. Sticta tomentosa (Sw.) Ach. (Figure 13c,d)

Sticta tomentosa has a cyanobacterial main photobiont (*Nostoc*) and palmate lobes without symbiotic propagules, but usually with apothecia. A detailed description of *S. tomentosa* is provided in [66] and, based on East African material, in [12]. Our material of *S. tomentosa* have light grey, palmate lobes ascending clearly from one attachment point, and with tufts of hairs projecting from the lobe margins. The lower surface is white with abundant white tomentum and has prominent, dome-like cyphellae. *Sticta tomentosa* does not produce isidia, soredia nor phyllidia, but is almost always fertile. The apothecia are mainly submarginal with long white hairs on the margins. Ascospores are fusiform, colorless, 3-septate,  $39-50 \times 7-11 \ \mu m (30-50 \times 6-10 \ \mu m in [12])$ . Chemistry: K-, C-, Pd-.

Sticta tomentosa is the only species in the studied lower montane forests that is commonly fertile and does not produce any type of symbiotic propagules. Easily distinguished from other fertile species in the region based on the thick white hairs on apothecial margin. The apothecial margins of other species are pubescent at most, and this feature is usually only seen in specimens collected from high-elevation habitats. Furthermore, the three-septate ascospores of *S. tomentosa* are larger than those of any other species in the region. The ascospores in the type specimen of *S. tomentosa* were measured to be  $27.5-33.5(-36) \times 5.5-8.5 \ \mum$  [66], which is considerably less than in our material. Previously, also Swinscow and Krog [12] reported a relatively large ascospore size (30–40(50) × 6–10 um) from East Africa.

Ecology and distribution: *Sticta tomentosa* is a pantropical species found especially in undisturbed, middle to high elevation rainforest habitats [60]. In our region, *S. tomentosa* is not very common and grows as an epiphyte on tree trunks. It can occasionally be locally abundant in lower montane forests, and also occurs in middle and upper montane forests (1650–3060 masl) in the Taita Hills and on Mt. Kilimanjaro.

#### 3.2.15. *Sticta umbilicariiformis* Hochst. ex Flot. (Figure 13e–g)

Sticta umbilicariiformis has a cyanobacterial main photobiont (*Nostoc*) and typically many marginal pustules which can sometimes make it appear sorediate. Thalli of *S. umbilicariiformis* are often quite large with thick (usually 200–350  $\mu$ m), wavy to foveolate, loosely adnate to ascending lobes 3–5 cm long and 2–4 cm wide. The upper surface is greyish brown with congested marginal, and often also laminal pustules that may occasionally appear sorediate. The lower surface is cream colored or, more rarely, brown, and thickly tomentose. Primary tomentum has brown and agglutinated stems and squarrose, white tips. Secondary tomentum is white and arachnoid, composed of moniliform assemblages. Cyphellae are slightly urceolate with a relatively wide opening (up to 1 mm in diam.) and raised margins, the pore is often surrounded by a darker ring.

Also fertile specimens of *S. umbilicariiformis* are common and usually lack symbiotic propagules. The thallus lobes of palmate fertile specimens are often thinner than the lobes of pustulate specimens and vary from wavy to strongly foveolate. Apothecia are submarginal and laminal, up to 2(3) mm wide, with brown disks and, occasionally, pubescent margins patterned with brown nodules. Ascospores are colorless, fusiform, 1-septate,  $31-40 \times 6.5$ –8 µm. Chemistry: K-, C-, Pd-.

Pustular thalli of *S. umbilicariiformis* are easily distinguished from other species in the region merely based on their habit. The only vaguely similar species is *S. sublimbata* which, however, produces true marginal soralia, has adnate and narrow lobes, and mainly occurs below 2000 masl. The characters that help to distinguish fertile specimens of *S. umbilicariiformis* from fertile specimens of *S. aspratilis* and *S. munda* are described under those species.

Ecology and distribution: *Sticta umbilicariiformis* is presently confirmed only from East Africa, but might have a much wider distribution reaching North America and Australia [20]. In our region, *S. umbilicariiformis* is common and abundant in the upper montane and subalpine zones on Mt. Kilimanjaro, and also occurs in middle montane zone (between 2540–3800 masl). It is by far the most abundant *Sticta* species in the subalpine zone, and

was also collected from the *Erica* zone on Mt. Elgon. In the upper montane forest, *S. umbilicariiformis* mainly grows epiphytically on tree trunks and branches, in the subalpine zone also on rock and soil among bryophytes.

Notes: The phylogeny within the *S. umbilicariiformis* clade remains poorly resolved even in the more detailed analysis (Figure 2). Almost all pustular specimens represent the same ITS variant (umbilicariiformis1), closely related to a sequence from Rwanda (KT281697). The other ITS variants (umbilicariiformis2–5) are mainly from specimens without pustules, but which often have apothecia. The type specimen of *S. umbilicariiformiss* (H-Nyl 33835; originally described in [67], lectotype designated in [20]) has both pustules and apothecia on the same thallus and the only fertile specimen of *S. umbilicariiformis* in our material that also has pustules belongs to ITS variant group umbilicariiformis4.

### 3.3. Sticta Diversity in the Montane Ecosystems of East Africa

Altogether 16 species of *Sticta* were collected from Mt. Kilimanjaro, of which *S. cyanocaperata, S. fuliginoides, S. munda, Sticta* sp. A, and *Sticta* sp. D were not found from other locations. The Taita Hills had 12 species, of which *S. andina* and *Sticta* sp. C (*weigelii* agg.) were not collected from the other locations. Mt. Kasigau had four species, and two species were collected from Mt. Elgon (Figure 14). A clear majority of all *Sticta* specimens were collected from montane forests, with not a single observation from lowland savannas or alpine *Helichrysum* heaths, or from agricultural or grassland habitats. The species diversity was highest in middle montane forests (Figure 14a). *Sticta sublimbata* was by far the most common *Sticta* species in the relatively open low elevation habitats. *Sticta afromontana, S. duplolimbata, S. marginalis,* and *S. fuliginosa* were common in lower to middle elevation forests, while upper montane and subalpine habitats were dominated by *S. umbilicariiformis, S. afromontana,* and *S. fuliginoides* (Figure 14b).



**Figure 14.** Diversity and abundance of the genus *Sticta* in the study region. (**a**) Number of species (dark red) and abundance (light orange) in the different habitats and locations. D = disturbed. (**b**) The abundance of the *Sticta* species in different elevation zones and habitat types. Low elevation habitats: dry woodland on Mt. Kasigau, the Maktau Hill, Shomoto Hill in the Taita Hills, and coffee farm and home garden habitats on Mt. Kilimanjaro; Lower montane forests: most evergreen forests in the Taita Hills and on Mt. Kasigau, and lower montane forest on Mt. Kilimanjaro. Middle montane forests: middle montane forests on Mt. Kilimanjaro and on Vuria Mountain in the Taita Hills. Upper

montane forest: such forests on Mt. Kilimanjaro. Subalpine: subalpine habitats on Mt. Kilimanjaro and Mt. Elgon. *Sticta ciliata* agg. includes specimens of *S. ciliata* and *Sticta* sp. B; *Sticta fuliginoides* agg. includes specimens of *S. fuliginoides* and *Sticta* sp. A.

#### 4. Discussion

A total of 19 *Sticta* species, including five species new to science, were found from the studied mountains in Kenya and Tanzania, and at least five other new species remain to be described pending more material. Of these species, only *S. fuliginosa, S. sublimbata, S. tomentosa*, and *S. umbilicariiformis* were known to be present in Kenya and/or Tanzania based on previous reports [12,20,28–31]. *Sticta ciliata* and *S. duplolimbata* had been previously reported from Rwanda [20] and are now confirmed to also occur in Kenya and Tanzania. Additionally, *S. marginalis* and *S. fuliginoides* are here reported as new for Kenya and Tanzania, and *S. andina* as new for Kenya.

Five species were described as new to science: *Sticta afromontana, S. aspratilis, S. cellulosa, S. cyanocaperata,* and *S. munda,* the three last mentioned of which have so far only been collected from Mt. Kilimanjaro. Additionally, five putative species, *Sticta* sp. A in the *Sticta fuliginoides* aggregate, *Sticta* sp. B in the *Sticta ciliata* aggregate, *Sticta* sp. C in the *Sticta weigelii* aggregate, *Sticta* sp. D, and *Sticta* sp. 2 were well resolved in the phylogenetic tree, but are not yet described due to insufficient material. In contrast to previous reports, it seems unlikely that *S. ambavillaria, S. cyphellulata, S. limbata, S. kunthii, S. orbicularis, S. papyracea/variabilis, S. weigelii,* or *S. xanthotropa* would occur in East Africa, as specimens with similar thallus morphologies are here shown to represent other species. Our study confirms the presence of 14 *Sticta* species in Kenya and 17 in Tanzania. Additionally, *S. dichotoma* and *Sticta* sp. 2 are expected to occur in Tanzania based on previous observations [12,28,30], raising the current total number of *Sticta* species in Tanzania to 19. A short synopsis of all *Sticta* species reported from East Africa is provided in Table 1.

Several previous studies have demonstrated that many of the "traditional" *Sticta* species, such as *S. fuliginosa* and *S. weigelii*, include taxa that belong to several different evolutionary lineages [19–21,68]. The previously reported *S. fuliginosa* is accompanied by several other taxa with laminal isidia also in East Africa: *Sticta ciliata, S. fuliginoides, S. aspratilis, Sticta* sp. B, and *Sticta* sp. A. Of these, *S. fuliginoides* and *Sticta* sp. A belong to the same large clade (Figure 3), are morphologically quite similar, and occur in similar habitats. The same applies to *S. ciliata* and *Sticta* sp. B. This suggests that there may still be significant undetected diversity hiding under the name *S. fuliginosa*, both in East Africa and globally.

Several Sticta species belonging to the S. weigelii morphodeme, i.e., those with elongate lobes and marginal isidia [21], were found from our region: Sticta andina, S. afromontana, S. cyanocaperata, and Sticta sp. C. Most of these have flattened isidia, but the isidia of Sticta sp. C are cylindrical, resembling those of *S. weigelii* s. str. [58,69]. However, *Sticta* sp. C does not have a color reaction with K, in contrast to the K+ yellow of S. weigelii s. str. [69], giving further support to our phylogenetic analysis, which indicated that *S. weigelii* s. str. has not been collected from East Africa. This supports the notion that S. weigelii s. str. may be restricted to the Neotropics [21,58]. In East Africa, Sticta specimens with flattened marginal isidia have previously been assigned to S. xanthotropa [12], a species that also mainly occurs in the Americas [32]. However, our results indicate that none of the East African species with flattened isidia actually represent S. xanthotropa: Sticta and ina has a strong K+ yellow color reaction, while S. xanthotropa is K = [32]; Sticta afromontana has a robust thallus, while S. xanthotropa is described as "papery thin", and the spores of S. afromontana are larger than those of *S. xanthotropa* [32]; *Sticta cyanocaperata* has a very dark lower surface, while it is pale in S. xanthotropa [32]. Furthermore, all the aforementioned species are mainly epiphytic, while *S. xanthotropa* has been reported to mainly grow on rocks and soil [32,70].

The group of species that have previously been reported from East Africa, but the presence of which we were not able to confirm include *S. cyphellulata*, *S. orbicularis*, *S. limbata*, *S. ambavillaria* and *S. kunthii* [12,26–28,30]. Our specimens morphologically matching the

previous reports of S. orbicularis and S. cyphellulata were assigned to S. marginalis and S. duplolimbata, while the previously reported S. limbata represents S. umbilicariiformis, as already suggested by Magain and Sérusiaux [20]. Sticta ambavillaria and S. kunthii are both fertile species devoid of symbiotic propagules, and the previous reports from East Africa likely refer to S. munda and/or fertile specimens of S. aspratilis or S. umbilicariiformis. Based on our phylogenetic analyses, a specimen of *S. ambavillaria* (JQ735978) from Réunion from where the species was described [63], does not group with any of the East African specimens. Furthermore, already Swinscow and Krog [12] reported that the ascospores of East African specimens were shorter than what has been described from the type of *S. ambavillaria* [33]. *Sticta kunthii* was described from Peru and appears to have a mainly neotropical distribution [32,33]. It has been reported only once from East Africa, from an upper montane forest on Mt. Kenya. The specimen(s) were described to have "a thallus surface with numerous depressions, sometimes appearing almost pitted, a pale lower tomentum with medium-sized cyphellae, and apothecia with short marginal hairs" [26], which corresponds well with some fertile specimens of S. aspratilis and S. umbilicariiformis. However, the apothecia of these species are submarginal or laminal while those of S. kunthii are mainly marginal [32,33]. Furthermore, the apothecial margins of *S. kunthii* are distinctly hairy with long bundles of silky, white hairs [33], while those of East African specimens have only velvety stubble. No sequences have as yet been published from S. kunthii, but Moncada et al. [19] placed the species within the S. kunthii clade based on morphological evidence; in our material the only taxon belonging to that clade is the isidiate *Sticta* sp. D.

*Sticta dichotoma* and *S. papyracea/variabilis* are the only two species with green algae as the main photobiont previously reported to occur in East Africa, both from Tanzania where they are said to be rare [12,28,30]. While we did not find any specimens matching the description of *S. dichotoma*, the species may well be present in montane forests of Tanzania [12,28,30]. Our four *Sticta* specimens with a green algal photobiont all have marginal phyllidia, and thus correspond morphologically with *S. papyracea* [12]. *Sticta papyracea* and the synonymous *S. variabilis* were both originally described from Réunion [33,71]. However, in the phylogenetic analysis our specimens did not group together with *S. variabilis* from Réunion (Figure 5), but instead formed a clade with specimens of "*Sticta* sp. 2" by Simon et al. [25] collected from Madagascar. This putative species was described to have a green algal photobiont, elongated and dichotomously branching lobes, and apothecia, but lack lobules and phyllidia [25]. Hence, it seems quite possible, that our specimens represent yet another undescribed species. However, more collections are needed before definite conclusions can be made.

In the regions examined, the diversity of *Sticta* species was highest in indigenous moist forests of the middle montane zone. Two other Peltigeralean lichen genera, Leptogium and Peltigera, exhibited slightly different diversity patterns, with the highest diversity of Leptogium species recorded from moist lower montane forests and that of *Peltigera* species from the upper montane zone [13,17]. In comparison to the approximately 20 species of Sticta present in the study region, the genus Leptogium is much more diverse with possibly over 70 species in the region [13], while only 8 species of *Peltigera* have so far been collected from Mt. Kilimanjaro [17]. When comparing the natural and disturbed habitat types on Mt. Kilimanjaro, the number of Sticta species was usually at least slightly lower in disturbed habitats. Similar patterns has previously been reported also for *Leptogium* and *Peltigera* [13,17]. Even while the effects and degree of disturbance varied considerably between different habitat types, all the disturbed habitats tended to be at least slightly more open, and often considerably so, than the unaltered habitat types [34], with probable effects to illumination conditions, temperature, and humidity. A similar trend of decreasing lichen species diversity with increasing habitat disturbance has been observed also in previous studies [72–74]. Especially shade-adapted cyanolichens are easily negatively affected by disturbance, and these effects on total species diversity are not necessarily compensated by a concurrent increase in the number of heliophytic species [72].

**Table 1.** Summary of the genus *Sticta* in East Africa, including Ethiopia (E), Kenya (K), Rwanda (R), Tanzania (T), and Uganda (U). Distributions are reported according to our observations and previous studies listed in References. The ecological notes are based on our observations.

Species	Distribution	Ecology	Comments	References
Sticta afromontana sp. nov.	K*, T*	Common especially in middle and upper montane forests.		
Sticta ambavillaria	-	Not found in this study.	Previous reports may represent <i>S. munda</i> .	[12,27–30]
Sticta andina	K*	Middle montane forest (single observation).		
<i>Sticta aspratilis</i> sp. nov.	K*, T*	Lower montane to subalpine zones.		
<i>Sticta cellulosa</i> sp. nov.	T*	Rare in upper montane and subalpine zones.		
Sticta ciliata	K*, T*	Rare in lower montane forest zone.	Previous report from Rwanda [20] represents <i>Sticta</i> sp. B.	
<i>Sticta cyanocaperata</i> sp. nov.	T*	Uncommon in middle montane forest.		
Sticta cyphellulata	-	Not found in this study.	Previous reports may represent <i>S. duplolimbata</i> and/or <i>S. marginalis</i> .	[12,28,30]
Sticta dichotoma	Т	Not found in this study.		[12,28,30]
Sticta duplolimbata	K*, T*, R	Common in lower and middle montane forests.		[20]
Sticta fuliginoides	T*	Common especially in upper montane forests.		
Sticta fuliginosa	K, T, R	Common in lower and middle montane forests.	Some previous reports may represent other species of <i>S. fuliginosa</i> morphodeme.	[12,20,28–31]
Sticta kunthii	-	Not found in this study.	Previous report may represent <i>S. umbilicariiformis</i> and/or <i>S. aspratilis</i> .	[26]
Sticta limbata	-	Not found in this study.	Previous reports represent <i>S</i> . <i>umbilicariiformis</i> [20].	[12,27]
Sticta marginalis	K*, T*, U*	Common in lower and middle montane forests.	Presence in Uganda based on previous reports of <i>S. orbicularis</i> [12,28,30].	
<i>Sticta munda</i> sp. nov.	T*	Rare in middle and upper montane forests.		
Sticta orbicularis	-	Not found in this study.	Previous reports may represent <i>S. marginalis</i> .	[12,28,30]
Sticta papyracea/variabilis	-	Not found in this study.	Sticta papyracea and S. variabilis are synonymous [33]. The previous reports may represent Sticta sp. 2.	[12,30]
Sticta sublimbata	E, K, T, U	Common in low elevation and lower montane habitats.		[12,30,31]
Sticta tomentosa	K, T, U	Lower and middle montane forests.		[12,28,30,31]

Species	Distribution	Ecology	Comments	References
Sticta umbilicariiformis	E, K, T, R, U	Abundant in the upper montane and subalpine zones.	Presence in Uganda based on previous reports of <i>S. limbata</i> [12].	[20]
Sticta weigelii	-	Not found in this study.	Previous reports may represent <i>Sticta</i> sp. C.	[12,27–31]
Sticta xanthotropa	-	Not found in this study.	Previously reported as <i>S.</i> <i>weigelii</i> var. <i>xanthotropa</i> . The reports may represent other species with marginal flattened isidia.	[12]
Sticta sp. A	T*	Rare in middle and upper montane forests.	Sticta fuliginoides agg.	
<i>Sticta</i> sp. B	K*, T*, R	Rare in lower and middle montane forests.	<i>Sticta ciliata</i> agg. Previously reported from Rwanda as <i>S. ciliata</i> [20].	
Sticta sp. C	K*	Low elevation and lower montane habitats.	<i>Sticta weigelii</i> agg. May include two distinct taxa.	
Sticta sp. D	T*	Rare in middle and upper montane forests.		
Sticta sp. 2	K*, T	Rare in lower montane forests.	Presence in Tanzania based on previous reports of <i>S. papyracea</i> [12,30].	

\* New record for the region.

#### 5. Conclusions

At least 20 species of *Sticta* have now been confirmed to occur in East Africa, which is almost double to that known before. Only four of the presently accepted species are identified under the same species names that have been used in previous studies from the region, highlighting the general need of taxonomic revisions of lichenized fungi in Africa. The overall diversity of *Sticta* in East Africa is substantially higher than previously known, but seems to be lower than what has recently been recorded from some mountain regions in the Neotropics. Interestingly, even though our collections originated in relatively few mountain regions of Kenya and Tanzania, we still managed to collect specimens corresponding to almost all morphological species previously reported from East Africa. Both the relatively high number of novel taxa detected, and the percentage of species represented by only a few specimens and/or found from single localities, indicates that more comprehensive sampling will undoubtedly reveal further diversity in the genus *Sticta* in East Africa.

**Supplementary Materials:** The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/jof9020246/s1, Figure S1: Bayesian tree of the genus *Sticta* based on the nuITS genetic marker region.

**Author Contributions:** Conceptualization, U.K. and J.R.; methodology, U.K. and A.H.; formal analysis, U.K.; investigation, U.K.; resources, U.K., J.R. and P.M.K.; data curation, U.K.; writing—original draft preparation, U.K.; writing—review and editing, U.K., J.R., P.M.K., N.P.M. and A.H.; visualization, U.K. and J.R.; project administration, U.K. and J.R.; funding acquisition, U.K. and J.R. All authors have read and agreed to the published version of the manuscript.

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**Data Availability Statement:** The sequence data presented in this study are openly available in the NCBI GenBank (www.ncbi.nlm.nih.gov/genbank/ accessed on 29 December 2022) with accession numbers OP999379–OP999611. The sequence alignment files and the resulting tree files from the phylogenetic analyses are openly available in the Zenodo repository (https://zenodo.org/) with doi 10.5281/zenodo.7575780 accessed on 29 December 2022.

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Conflicts of Interest: The authors declare no conflict of interest.

#### Appendix A

**Table A1.** Specimen information. Specimens are collected from Kenya (Taita Hills, Mt. Kasigau, Mt. Elgon) and Tanzania (Kilimanjaro). Habitats on Mt. Kilimanjaro: Home = Chagga home garden, Cof = coffee farm, Flm = lower montane forest, FOc = middle montane *Ocotea* forest, FOD = disturbed *Ocotea* forest, FPo = upper montane *Podocarpus* forest, FPD = disturbed upper montane forest with *Erica excelsa*, FEr = subalpine *Erica trimera* forest, FED = disturbed subalpine *Erica* forest/shrubbery.

Species	Collection ID	ITS Variant	Collection Location		Accession
Sticta afromontana	JR10112	afromontana1	Taita Hills	Vuria	OP999402
Sticta afromontana	JR10121B	afromontana1	Taita Hills	Vuria	OP999404
Sticta afromontana	JR10189	afromontana1	Taita Hills	Yale	OP999412
Sticta afromontana	JR16366	afromontana1	Taita Hills	Vuria	OP999453
Sticta afromontana	JR25	-	Taita Hills	Yale	-
Sticta afromontana	JR31	-	Taita Hills	Vuria	-
Sticta afromontana	UK110523c	-	Taita Hills	Vuria	-
Sticta afromontana	UK170771f	afromontana1	Kilimanjaro	FPo1	OP999477
Sticta afromontana	UK170775b	afromontana3	Kilimanjaro	FPo1	OP999480
Sticta afromontana	UK170779c	afromontana1	Kilimanjaro	FPo1	OP999481
Sticta afromontana	UK170781b	afromontana1	Kilimanjaro	FPo1	OP999482
Sticta afromontana	UK170792d	afromontana1	Kilimanjaro	FOc2	OP999484
Sticta afromontana	UK170794d	-	Kilimanjaro	FOc2	-
Sticta afromontana	UK170800b	-	Kilimanjaro	FOc1	-
Sticta afromontana	UK170806j	afromontana1	Kilimanjaro	FPD4	OP999491
Sticta afromontana	UK170807a	-	Kilimanjaro	FPD4	-
Sticta afromontana	UK170817h	-	Kilimanjaro	FPD4	-
Sticta afromontana	UK170822k	-	Kilimanjaro	FPD4	-
Sticta afromontana	UK170826e	afromontana1	Kilimanjaro	FPD4	OP999496
Sticta afromontana	UK170830d	-	Kilimanjaro	FPD4	-
Sticta afromontana	UK170832c	-	Kilimanjaro	FPD4	-
Sticta afromontana	UK170834a	-	Kilimanjaro	FPD3	-
Sticta afromontana	UK170836b	-	Kilimanjaro	FPD3	-
Sticta afromontana	UK170841b	-	Kilimanjaro	FPD3	-
Sticta afromontana	UK170842e	afromontana1	Kilimanjaro	FPD3	OP999498
Sticta afromontana	UK170846e	afromontana1	Kilimanjaro	FPD3	OP999501
Sticta afromontana	UK170856c	-	Kilimanjaro	FPo4	-
Sticta afromontana	UK170857a	afromontana1	Kilimanjaro	FPo4	OP999503
Sticta afromontana	UK170858g	afromontana1	Kilimanjaro	FPo4	OP999507
Sticta afromontana	UK170880e	-	Kilimanjaro	FPo5	-
Sticta afromontana	UK170886a	afromontana1	Kilimanjaro	FPo5	OP999509
Sticta afromontana	UK170892b	-	Kilimanjaro	FPo5	-
Sticta afromontana	UK170897ar	-	Kilimanjaro	FOD4	-
Sticta afromontana	UK170911b	-	Kilimanjaro	FOD5	-
Sticta afromontana	UK170915a	-	Kilimanjaro	FOD5	-
Sticta afromontana	UK170930c	afromontana1	Kilimanjaro	Flm1	OP999523
Sticta afromontana	UK170951g	-	Kilimanjaro	Flm1	-
Sticta afromontana	UK171180a	afromontana4	Kilimanjaro	FOD3	OP999537
Sticta afromontana	UK171185h	-	Kilimanjaro	FOD3	-
Sticta afromontana	UK171405e	-	Kilimanjaro	FEr4	-

Species	Collection ID	ITS Variant	Collection Location		Accession
Sticta afromontana	UK171413a	-	Kilimaniaro	FEr4	_
Sticta afromontana	UK171438g	-	Kilimaniaro	FEr2	-
Sticta afromontana	UK171439t	afromontana2	Kilimanjaro	FEr2	OP999554
Sticta afromontana	UK171442c	-	Kilimanjaro	FEr2	-
Sticta afromontana	UK171445j	-	Kilimanjaro	FEr2	-
Sticta afromontana	UK171470v	-	Kilimanjaro	FPD1	-
Sticta afromontana	UK171471c	-	Kilimanjaro	FPD1	-
Sticta afromontana	UK171476e	afromontana1	Kilimanjaro	FPD1	OP999561
Sticta afromontana	UK171490e	afromontana1	Kilimanjaro	FOc3	OP999566
Sticta afromontana	UK171525a	-	Kilimanjaro	FPo2	-
Sticta afromontana	UK171526a	afromontana1	Kilimanjaro	FPo2	OP999590
Sticta afromontana	UK171528b	afromontana1_4	Kilimanjaro	FPo2	OP999591
Sticta afromontana	UK171577f	afromontana2	Kilimanjaro	FPD2	OP999595
Sticta afromontana	UK171578m	-	Kilimanjaro	FPD2	-
Sticta afromontana	UK171581j	-	Kilimanjaro	FPD2	-
Sticta afromontana	UK171582p	-	Kilimanjaro	FPD2	-
Sticta afromontana	UK171584v	afromontana1	Kilimanjaro	FPD2	OP999601
Sticta afromontana	UK171589b	-	Kilimanjaro	FPo3	-
Sticta andina	JR10117	andina1	Taita Hills	Vuria	OP999403
Sticta aspratilis	JR10044A	aspratilis4	Taita Hills	Shomoto Hill	OP999394
Sticta aspratilis	JR10057	aspratilis1	Taita Hills	Shomoto Hill	OP999395
Sticta aspratilis	JR10155A	aspratilis1	Taita Hills	Yale	OP999406
Sticta aspratilis	JR10155B	aspratilis1	Taita Hills	Yale	OP999407
Sticta aspratilis	JR10155C	aspratilis1	Taita Hills	Yale	OP999408
Sticta aspratilis	JR10171	aspratilis1	Taita Hills	Yale	OP999409
Sticta aspratilis	JR16103	aspratilis1	Mt. Elgon	Erica zone	OP999436
Sticta aspratilis	JR16107	aspratilis1	Mt. Elgon	Erica zone	OP999437
Sticta aspratilis	UK110551f	aspratilis2	Taita Hills	Fururu	OP999475
Sticta aspratilis	UK110551g	aspratilis2	Taita Hills	Fururu	OP999476
Sticta aspratilis	UK110566c	-	Taita Hills	Chawia	-
Sticta aspratilis	UK170781c	-	Kilimanjaro	FPo1	-
Sticta aspratilis	UK170892c	aspratilis1	Kilimanjaro	FPo5	OP999510
Sticta aspratilis	UK170896b	aspratilis1and2	Kilimanjaro	FPo5	OP999512
Sticta aspratilis	UK170910b	-	Kilimanjaro	FOD5	-
Sticta aspratilis	UK170912b	-	Kilimanjaro	FOD5	-
Sticta aspratilis	UK170916c	aspratilis1	Kilimanjaro	Flm6	OP999520
Sticta aspratilis	UK170975f	aspratilis1	Kilimanjaro	Cof5	OP999530
Sticta aspratilis	UK171478a	aspratilis1	Kilimanjaro	FOc4	OP999562
Sticta aspratilis	UK171487c	aspratilis1	Kilimanjaro	FOc4	OP999565
Sticta aspratilis	UK171508k	-	Kilimanjaro	FOD2	-
Sticta aspratilis	UK171515b	aspratilis3	Kilimanjaro	FOc5	OP999584
Sticta aspratilis	UK171562c	aspratilis1	Kilimanjaro	FED2	OP999592
Sticta aspratilis	UK171587j	aspratilis1	Kilimanjaro	FPo3	OP999607
Sticta cellulosa	UK171340t	cellulosa2	Kilimanjaro	FED1	OP999545
Sticta cellulosa	UK171406e	cellulosal	Kilimanjaro	FEr4	OP999548
Sticta cellulosa	UK171407j	cellulosal	Kilimanjaro	FEr4	OP999549
Sticta cellulosa	UK171458K	-	Kilimanjaro	FEr4	- OD000500
Sticta cellulosa	UK171584K	cellulosal	Kilimanjaro	FPD2	OP999599
Sticta ciliata	JR16294D	ciliata i	Taita Hills	Sagalla	OP9999443
Sucu cumu Stieta ciliata (2000)	UN170944J UV110570a	cillataz	Kiiinanjaro Taita Hilla	Chauria	01999928
Sticiu ciliulu (agg.)	UK110570a	-			-
Sticta ciliata (agg.)	UK160352F	-	Kilimaniaro	Coff	-
Sticta cumacomenta	UK170904	-	Kilimaniaro	C015 EOD4	-
Sticta cyanocaperata	UK1700122	-	Kilimaniaro	FOD4 FOD5	- OP000516
Sticta cyanocaperata	UK170912a	cyanocaperata1	Kilimaniana	FODS	OD000518
Sticta cyanocaperata	UK170912e	cyanocaperata1	Kilimaniaro	FOD3	OP000520
Sticta cyanocaperata	UK171480d	cyanocaperata1	Kilimanjaro	FOr4	OP999563
Sticta cyanocaperata	UK171483w	-	Kilimanjaro	FOc4	-
Stieta cyanocaparata	UK171400V UK171486h	_	Kilimanjaro	FOc4	-
Sticta cyanocaparata	UK1714000 UK1714054	- avanocanorata1	Kilimanjaro	FOC3	- OP990570
Sticta cyanocaparata	UK1714701 UK171506a	cyanocaperatar	Kilimanjaro	FOD2	01 9990/0
Sticta cyanocanerata	UK171510m	_	Kilimanjaro	FOD2	-
Sticta dunlolimbata	IR10104 A	- duplolimbata1	Taita Hille	Valo	- OP000/14
Sucu uupiounouu Stieta dunlolimbata	JR10174A IR10104R	aupioinnoatai	Taita Hills	Valo	01 777410
Sticta duplolimbata	JR10124D JR16374b	- duplolimbata4	Taita Hills	Vuria	- OP999460
Sticta duplolimbata	IR16374d	duplolimbata1	Taita Hills	Vuria	OP999462
энси ипронтовии	JIC1007 Hu	aupioinnoatai	14114 1 11115	v ul la	01 777402

Strict algebindum         JB68         dupplimbula         L2.4         Tata Hills         Varia         OP99471           Strict algebindum         UK1707091         dupplimbula         Tata Hills         Varia         OP99471           Strict algebindum         UK1707094         dupplimbula         Killsangebindum         OP999483           Strict algebindum         UK170856         -         Gupplimbula         Killsangebindum         OP999489           Strict algebindum         UK170856         -         Gupplimbula         Killsangebindum         OP999519           Strict algebindum         UK170856         -         Killsangebindum         OP999524           Strict algebindum         UK1708502         -         Killsangebindum         OP999524           Strict algebindum         UK1708502         -         Killsangebindum         OP999524           Strict algebindum         UK1708502         -         Killsangebindum         OP999525           Strict algebindum         UK1708502         -         Killsangebindum         OP999525           Strict algebindum         UK171850         -         Killsangebindum         OP999525           Strict algebindum         UK171850         -         Killsangebindum         -	Species	Collection ID	ITS Variant	Collection Location	n	Accession
Site dapkinkan         [B69         dapkinkan         Varia         OPP99471           Site dapkinkan         UK170790         dapkinkan         Kilimanjaro         FO2         OP99483           Site dapkinkan         UK170790         dapkinkan         Kilimanjaro         FO3         -           Site dapkinkan         UK1707914         dapkinkan         Kilimanjaro         FP03         -           Site dapkinkan         UK1707934         dapkinkan         Kilimanjaro         FP03         -           Site dapkinkan         UK1707934         dapkinkan         Kilimanjaro         FInil         -           Site dapkinkan         UK1707936         -         Kilimanjaro         FInil         -           Site dapkinkan         UK1707506         -         Kilimanjaro         FInil         -           Site dapkinkan         UK1707506         -         Kilimanjaro         FInil         -           Site dapkinkan         UK1707506         -         Kilimanjaro         FInil         -           Site dapkinkan         UK171571         dapkinkan         Kilimanjaro         FINil         -           Site dapkinkan         UK171574         -         Kilimanjaro         FINil         -	Sticta duplolimbata	IR68a	duplolimbata1 2 4	Taita Hills	Vuria	OP999470
Site in Applehendra         UK170790         duplehendra         Killmanjaro         FO2         OP999483           Site in Applehendra         UK170784         duplehendra         Killmanjaro         FD3         OP999483           Site in Applehendra         UK170845	Sticta duplolimbata	IR69	duplolimbata1	Taita Hills	Vuria	OP999471
Steir alphilinka         UK1707894         duplik         Kilmanjaro         FD3         CP399489           Sitis dupliknsku         UK170845.         -         Kilmanjaro         FD3         CP399513           Sitis dupliknsku         UK170845.         dupliknsku         CP399513         CP399513           Sitis dupliknsku         UK170284.         dupliknsku         FIn1         CP399523           Sitis dupliknsku         UK170284.         dupliknsku         FIn1         CP399523           Sitis dupliknsku         UK170284.         dupliknsku         FIn1         CP399524           Sitis dupliknsku         UK170284.         -         Kilmanjaro         FIn1         CP399536           Sitis dupliknsku         UK170582.         dupliknsku         Kilmanjaro         FO3         CP399536           Sitis dupliknsku         UK171184         dupliknsku         Kilmanjaro         FO3         CP399536           Sitis dupliknsku         UK171185         -         Kilmanjaro         FO3         CP399563           Sitis dupliknsku         UK171484         -         Kilmanjaro         FO3         CP399563           Sitis dupliknsku         UK171484         -         Kilmanjaro         FO3         CP399563	Sticta duplolimbata	LIK170790	duplolimbata1	Kilimaniaro	FOc?	OP999483
Silta duplicinstata         UK1705876         - / / manutatata         Killmanajaro         PP05         OP909511           Silta duplicinstata         UK170916         duploimbatal         Killmanajaro         PF05         OP909513           Silta duplicinstata         UK170926         duploimbatal         Killmanajaro         Pina6         OP999524           Silta duplicinstata         UK170338,         -         Killmanajaro         Pina1         -           Silta duplicinstata         UK170378,         -         Killmanajaro         Pina1         -           Silta duplicinstata         UK170378,         -         Killmanajaro         Pina1         -           Silta duplicinstata         UK171381         duploimbata         Killmanajaro         Pina1         -           Silta duploimbata         UK171182         -         Killmanajaro         PO03         OP999536           Silta duploimbata         UK171482         -         Killmanajaro         PO03         -           Silta duploimbata         UK171483         -         Killmanajaro         PO03         -           Silta duploimbata         UK1714724         -         Killmanajaro         PO03         -           Silta duploimbata         UK17147424	Stieta duplolimbata	UK170799d	duplolimbata1	Kilimanjaro	FOc1	OP000480
Sitta daglabalitata         UK17987a         dupolimbata1         Kilimanjarov         FPD5         OP999511           Sitta daglabilitata         UK17972b;         dupolimbata1         Kilimanjarov         FIna1         OP999521           Sitta daglabilitata         UK17972b;         dupolimbata1         Kilimanjarov         FIna1         OP999521           Sitta daglabilitata         UK17973b;         dupolimbata1         Kilimanjarov         FIna1         -           Sitta daglabilitata         UK17973b;         dupolimbata1         Kilimanjarov         FIna1         -           Sitta daglabilitata         UK17975b;         dupolimbata1         Kilimanjarov         FIna1         OP999536           Sitta daglabilitata         UK171975b;         dupolimbata1         Kilimanjarov         FOD3         OP999536           Sitta daglabilitata         UK1714752         dupolimbata1         Kilimanjarov         FOD3         -           Sitta daglabilitata         UK1714752         dupolimbata1         Kilimanjarov         FOD3         -           Sitta daglabilitata         UK1714724         -         Kilimanjarov         FOO3         OP99957           Sitta daglabilitata         UK1714767         dupolimbata1         Kilimanjarov         FOO3         -<	Sticta duplotimbata	UK1707990	dupiolinibata1	Killinanjaro	FDC1	01 999409
Strik algobinistical         Chr.Norsza         Chr.Norsza <thchr.norsza< th="">         Chr.Norsza         <t< td=""><td>Sticia duplotimbata</td><td>UK1708430</td><td>-</td><td>Killinanjaro</td><td>FFD5</td><td>- OP000E11</td></t<></thchr.norsza<>	Sticia duplotimbata	UK1708430	-	Killinanjaro	FFD5	- OP000E11
Short angletimbetia         UK 17914b         dupolimbetial         Kilmanjano         FUD6         UP99519           Shirta dupolimbetia         UK 17023b;         dupolimbatal         Kilmanjano         Fine 6         UP99521           Shirta dupolimbetia         UK 17093b;         dupolimbatal         Kilmanjano         Fine 1         -           Shirta dupolimbetia         UK 17093b;         -         Kilmanjano         Fine 1         -           Shirta dupolimbetia         UK 17093b;         -         Kilmanjano         Fine 1         -           Shirta dupolimbetia         UK 17093b;         -         Kilmanjano         Fine 1         -           Shirta dupolimbetia         UK 17193b;         dupolimbetal         Kilmanjano         FOD3         -           Shirta dupolimbeta         UK 17118b;         -         Kilmanjano         FOD3         -           Shirta dupolimbeta         UK 17118b;         -         Kilmanjano         FOD3         -           Shirta dupolimbeta         UK 1714971         dupolimbeta         Kilmanjano         FOD3         -           Shirta dupolimbeta         UK 1714972         dupolimbeta         Kilmanjano         FOD3         -           Shirta dupolimbeta         UK 1714974 <td>Sticta aupiolimbata</td> <td>UK170893a</td> <td>duplolimbatal</td> <td>Kilimanjaro</td> <td>FP05</td> <td>0P999511</td>	Sticta aupiolimbata	UK170893a	duplolimbatal	Kilimanjaro	FP05	0P999511
Shita daploinbata         Kilmanjarov         Find         OP99921           Skita daploinbata         Kilmanjarov         Find         -<	Sticta duplolimbata	UK1709146	duplolimbata2	Kilimanjaro	FOD5	OP999519
Sitch algolandnata UKT/1983h duplolimbata Kilimanjaro Pinl OP99524 Sitch algolandnata UKT/1983e, - Kilimanjaro Pinl - Sitch algolandnata UKT/1983e, - Kilimanjaro Pinl - Sitch algolandnata UKT/1985e, - Kilimanjaro Pinl - Sitch algolandnata UKT/1985e, - Kilimanjaro Pinl - Sitch algolandnata UKT/1985e, - Kilimanjaro Pinl - Sitch algolandnata UKT/1985e - Kilimanjaro Pinl - Sitch algolandnata UKT/1872d - Kilimanjaro Pinl - Sitch algolandnata UKT/1872d - Kilimanjaro Pinl - Sitch algolandnata UKT/1895 - Sitch algolandnata UKT/1897 - Sitch algolandnata UKT/1896 - Sitch algolandnata UKT/1896 - Sitch algolandnata UKT/1897 - Sitch algolandnata UKT/1896 - Sitch algolandnata UKT/1897 - Sitch algolandnata UKT/1896 - Sitch algolandnata UKT/1896 - Sitch algolandnata UKT/1897 - Sitch algolandnata UKT/1897 - Sitch algolandnata UKT/1897 - Sitch algolandnata UKT/1896 - Sitch algoland	Sticta duplolimbata	UK170929c	duplolimbata1	Kilimanjaro	Flm6	OP999521
Skita duplolimbata         UK10933g.         -         Kilimanjavo         Fin1         -           Skita duplolimbata         UK10950g.         -         Kilimanjavo         Fin1         -           Skita duplolimbata         UK10950g.         -         Kilimanjavo         Fin1         OP99929           Skita duplolimbata         UK10952g.         duplolimbata1         Kilimanjavo         FOD3         OP999236           Skita duplolimbata         UK17182g.         -         Kilimanjavo         FOD3         -           Skita duplolimbata         UK17142g.         -         Kilimanjavo         FOD3         -           Skita duplolimbata         UK17142g.         -         Kilimanjavo         FOC4         -           Skita duplolimbata         UK171497         duplolimbata1         Kilimanjavo         FOC3         OP999572           Skita duplolimbata         UK171497         duplolimbata1         Kilimanjavo         FOD1         OP999573           Skita duplolimbata         UK171497         duplolimbata1         Kilimanjavo         FOD1         OP999573           Skita duplolimbata         UK171497         duplolimbata1         Kilimanjavo         FOD1         OP999573           Skita duplolimbata         UK1714974	Sticta duplolimbata	UK170931h	duplolimbata3	Kilimanjaro	Flm1	OP999524
Sitica duplolimbata         UK129396g         -         Kilimanjaro         Fin1         -           Sitica duplolimbata         UK12952c         duplolimbata         Kilimanjaro         Fin1         OP999536           Sitica duplolimbata         UK171784         duplolimbata         Kilimanjaro         FOD3         OP999536           Sitica duplolimbata         UK17184         duplolimbata         Kilimanjaro         FOD3         -           Sitica duplolimbata         UK171840         -         Kilimanjaro         FOD3         -           Sitica duplolimbata         UK171840         -         Kilimanjaro         FOD3         -           Sitica duplolimbata         UK171840         -         Kilimanjaro         FOD3         -           Sitica duplolimbata         UK171497         -         Kilimanjaro         FOD1         OP99972           Sitica duplolimbata         UK171497         duplolimbata         Kilimanjaro         FOD1         OP999757           Sitica duplolimbata         UK1714974         duplolimbata         Kilimanjaro         FOD1         OP999757           Sitica duplolimbata         UK1714974         duplolimbata         Kilimanjaro         FOD1         -           Sitica duplolimbata         UK1	Sticta duplolimbata	UK170933g	-	Kilimanjaro	Flm1	-
Site daple industryUK179850c-KilimanjaroFinal-Site daple industryduple industalKilimanjaroFOD3OF999529Site daple industryKILIManjaroFOD3OF999538Site daple industryKILIManjaroFOD3-Site daple industryKILIManjaroFOD3-Site daple industryKILIManjaroFOD3-Site daple industryKILIManjaroFOD3-Site daple industryKILIManjaroFOD3-Site daple industryKILIManjaroFOD3-Site daple industryKILIMANKILIMAN-Site daple industryKILIMANKILIMAN-Site daple industryKILIMANKILIMAN-Site daple industryKILIMANKILIMAN-Site daple industryKILIMANKILIMAN-Site daple industryKILIMANSite daple industryKILIMANSite daple industryKILIMANNSite daple industryKILIMANSite daple industry<	Sticta duplolimbata	UK170936g	-	Kilimanjaro	Flm1	-
Sittet diploimbataUK17082; duploimbataduploimbataKilimanjaroFOD3OP999536Sittet diploimbataUK171184duploimbataKilimanjaroFOD3OP999536Sittet diploimbataUK171184duploimbataKilimanjaroFOD3-Sittet diploimbataUK171184-KilimanjaroFOD3-Sittet diploimbataUK171483-KilimanjaroFOD3-Sittet diploimbataUK171483-KilimanjaroFOC3-Sittet diploimbataUK171490-KilimanjaroFOC3OP999567Sittet diploimbataUK171497duploimbataKilimanjaroFOD1OP999573Sittet diploimbataUK171497duploimbataKilimanjaroFOD1OP999573Sittet diploimbataUK171497duploimbataKilimanjaroFOD1OP999573Sittet diploimbataUK171804duploimbataKilimanjaroFOD1OP999575Sittet diploimbataUK171804duploimbataKilimanjaroFOD1OP999575Sittet diploimbataUK171804duploimbataKilimanjaroFOD2OP999582Sittet diploimbataUK171804duploimbataKilimanjaroFOD2OP999582Sittet diploimbataUK171894duploimbataKilimanjaroFD2OP999982Sittet diploimbataUK171894duploimbataKilimanjaroFD3OP999969Sittet diploimbataUK171896duploimbataKilimanjaroFD4OP9999615<	Sticta duplolimbata	UK170950c	-	Kilimanjaro	Flm1	-
Sitea duplolimbataUK171181duplolimbata1KilimanjaroFOD3OP999538Sitea duplolimbataUK171182-KilimanjaroFOD3-Sitea duplolimbataUK171182-KilimanjaroFOD3-Sitea duplolimbataUK171182-KilimanjaroFOD3-Sitea duplolimbataUK1714724-KilimanjaroFOC4-Sitea duplolimbataUK171490duplolimbataKilimanjaroFOC3OP99558Sitea duplolimbataUK171495duplolimbataKilimanjaroFOC3OP99572Sitea duplolimbataUK171495duplolimbataKilimanjaroFOD1OP99573Sitea duplolimbataUK171497duplolimbataKilimanjaroFOD1OP99573Sitea duplolimbataUK171502duplolimbataKilimanjaroFOD1OP99575Sitea duplolimbataUK171502duplolimbataKilimanjaroFOD1OP99575Sitea duplolimbataUK171504duplolimbataKilimanjaroFOD2OP99575Sitea duplolimbataUK171514duplolimbataKilimanjaroFOD2OP99575Sitea duplolimbataUK171514duplolimbataKilimanjaroFOC5OP99582Sitea duplolimbataUK171514duplolimbataKilimanjaroFOC5OP99605Sitea duplolimbataUK171514duplolimbataKilimanjaroFTO4OP99605Sitea duplolimbataUK171514duplolimbataKilimanjaroFTO4OP99605Site	Sticta duplolimbata	UK170952e	duplolimbata1	Kilimanjaro	Flm1	OP999529
Shica duplolimbataUK171181eduplolimbata2KilimanjaroFOD3OP99538Shica duplolimbataUK171182b-KilimanjaroFOD3-Shica duplolimbataUK171474-KilimanjaroFOC4-Shica duplolimbataUK1714743g-KilimanjaroFOC3OP99567Shica duplolimbataUK171470duplolimbata1KilimanjaroFOC3-Shica duplolimbataUK171470duplolimbata1KilimanjaroFOC3-Shica duplolimbataUK171497cduplolimbata1KilimanjaroFOD1OP99573Shica duplolimbataUK171497cduplolimbata1KilimanjaroFOD1OP99575Shica duplolimbataUK171502cduplolimbata1KilimanjaroFOD1OP99575Shica duplolimbataUK171503c-KilimanjaroFOD1-Shica duplolimbataUK171503c-KilimanjaroFOD2OP99575Shica duplolimbataUK171503c-KilimanjaroFOD2OP99575Shica duplolimbataUK171513fduplolimbata1KilimanjaroFOC5OP99555Shica duplolimbataUK171521h-KilimanjaroFOC5-Shica duplolimbataUK17152bduplolimbata2KilimanjaroFD3OP99605Shica duplolimbataUK171596duplolimbata2KilimanjaroFD3OP999605Shica duplolimbataUK171596duplolimbata2KilimanjaroFD4OP999555Shica duplolimbataUK17	Sticta duplolimbata	UK171178f	duplolimbata1	Kilimanjaro	FOD3	OP999536
Shite duplolimbita         UK171182b         -         Kliimanjaro         PO03         -           Shite duplolimbita         UK171182b         -         Kliimanjaro         PO1         -           Shite duplolimbita         UK171492a         -         Kliimanjaro         PO3         -           Shite duplolimbita         UK171492a         -         Kliimanjaro         PO3         OP99567           Shite duplolimbita         UK171495e         duplolimbata1         Kliimanjaro         PO3         OP99572           Shite duplolimbita         UK171495e         duplolimbata1         Kliimanjaro         PO3         OP99572           Shite duplolimbita         UK171497e         duplolimbata1         Kliimanjaro         PO01         OP99572           Shite duplolimbita         UK171502e         duplolimbata1         Kliimanjaro         PO01         OP99573           Shite duplolimbita         UK171502e         duplolimbata1         Kliimanjaro         PO02         OP99575           Shite duplolimbita         UK171504e         duplolimbata1         Kliimanjaro         PO5         OP999575           Shite duplolimbita         UK171519e         duplolimbata1         Kliimanjaro         PO5         OP999955           Shite duplolimb	Sticta duplolimbata	UK171181e	duplolimbata2	Kilimaniaro	FOD3	OP999538
Site dapploindeta         UK171188b         -         Kilianajaro         FOD3         -           Site daploindeta         UK171433g         -         Kilianajaro         FPO4         -           Site daploindeta         UK171493g         -         Kilianajaro         FOA3         O'P999567           Site daploindeta         UK171493b         -         Kilianajaro         FOA3         -           Site daploindeta         UK171497e         duploinbata1         Kilianajaro         FOD1         O'P999569           Site daploindeta         UK171497e         duploinbata1         Kilianajaro         FOD1         O'P999573           Site daploindeta         UK171502b         duploinbata1         Kilianajaro         FOD1         O'P999575           Site daploindeta         UK171502b         duploinbata1         Kilianajaro         FOD1         -           Site daploindeta         UK171502b         duploinbata1         Kilianajaro         FOD1         -           Site daploindeta         UK171503c         -         Kilianajaro         FOC5         O'P999575           Site daploindeta         UK171590g         duploinbata2         Kilianajaro         FOC5         O'P999575           Site daploindeta         UK171590g	Sticta dunlolimhata	UK171182b	-	Kilimaniaro	FOD3	-
Site:a duple/imbairUK171472d-KilimangaroFPD1-Site:a duple/imbairUK171487duple/imbailKilimangaroFOc3OF99567Site:a duple/imbairUK171497duple/imbailKilimangaroFOc3OF99567Site:a duple/imbairUK171497duple/imbailKilimangaroFOc3OF99569Site:a duple/imbairUK171497duple/imbailKilimangaroFOD1OF99573Site:a duple/imbairUK171502duple/imbailKilimangaroFOD1OF99575Site:a duple/imbairUK171502duple/imbailKilimangaroFOD1OF99575Site:a duple/imbairUK171502duple/imbailKilimangaroFOD1OF99575Site:a duple/imbairUK171502duple/imbailKilimangaroFOD2OF99575Site:a duple/imbairUK1715137duple/imbailKilimangaroFOC5OF995855Site:a duple/imbairUK171502duple/imbailKilimangaroFOC5OF995855Site:a duple/imbairUK171505duple/imbailKilimangaroFPO3OF996060Site:a duple/imbairUK171505duple/imbailKilimangaroFPO3OF996060Site:a duple/imbairUK171505duple/imbailKilimangaroFPO3OF996060Site:a duple/imbairUK171505duple/imbailKilimangaroFPO3OF996060Site:a duple/imbairUK171505duple/imbailKilimangaroFPO3OF996060Site:a duple/imbairUK171405fulginoid	Sticta duplolimbata	UK171188b	-	Kilimaniaro	FOD3	-
Data informationOK 17 MeaKillmanigatoFD.1-Shitti duplikimbataUK 17 Mea.duploimbata1KillmanigatoFD.3-Shitti duplikimbataUK 17 Ha95-KillmanigatoFD.3-Shitti duplikimbataUK 17 Ha95-duploimbata1KillmanigatoFD.3-Shitti duplikimbataUK 17 Ha95duploimbata1KillmanigatoFD.01O1999572Shitti duplikimbataUK 17 Ha97duploimbata1KillmanigatoFD.01O1999573Shitti duplikimbataUK 17 S02duploimbata1KillmanigatoFD.01-Shitti duplikimbataUK 17 S02duploimbata1KillmanigatoFD.01-Shitti duplikimbataUK 17 S03KillmanigatoFD.02-Shitti duplikimbataUK 17 S04duploimbata1KillmanigatoFD.05O1999575Shitti duploimbataUK 17 S151duploimbata1KillmanigatoFD.05-Shitti duploimbataUK 17 S151duploimbata2KillmanigatoFD.05-Shitti duploimbataUK 17 S150duploimbata1KillmanigatoFD.05-Shitti duploimbataUK 17 S04duploimbata1KillmanigatoFD.05-Shitti duploimbataUK 17 S04fulginoides1KillmanigatoFD.04O1999605Shitti duploimbataUK 17 S04fulginoides1KillmanigatoFD.04O1999605Shitti duploimbataUK 17 L485fulginoides1Killmanig	Stieta duplolimbata	UK171472d	_	Kilimanjaro	FPD1	_
skreta dapiklimada UKI71490; duplolimbata Kilimanjaro POC3 OP999567 Sireta dapiklimbata UKI71495; duplolimbata Kilimanjaro POD1 OP999572 Sireta dapiklimbata UKI71497; duplolimbata Kilimanjaro POD1 OP999572 Sireta dapiklimbata UKI71497; duplolimbata Kilimanjaro POD1 OP99573 Sireta dapiklimbata UKI71497; duplolimbata Kilimanjaro POD1 OP99573 Sireta dapiklimbata UKI71502; duplolimbata Kilimanjaro POD2 OP99575 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro POD2 OP99575 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro POD2 OP99575 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro POC5 OP995852 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro POC5 OP99585 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro POS OP99609 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro PP03 OP99609 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro PP03 OP99609 Sireta dapiklimbata UKI71504; duplolimbata Kilimanjaro PP03 OP99609 Sireta dapiklimbata UKI71504; fulginoides Kilimanjaro PP04 OP999609 Sireta dapiklimbata UKI71505; fulginoides Kilimanjaro PP04 OP999605 Sireta dapiklimbata UKI71505; fulginoides Kilimanjaro PP04 OP999655 Sireta dapiklimbata UKI71505; fulginoides Kilimanjaro PP04 OP999573 Sireta fulginoides UKI7088; fulginoides Kilimanjaro PP04 OP999575 Sireta fulginoides UKI71485; fulginoides Kilimanjaro PP04 OP999575 Sireta fulginoides UKI71485; fulginoides Kilimanjaro PP04 OP999575 Sireta fulginoides UKI71485; fulginoides Kilimanjaro PP04 OP999575 Sireta fulginoides (agg) UKI7075; fulginoides Kilimanjaro PP03 - Sireta fulginoides (agg) UKI7075; fulginoides Kilimanjaro PP04 - Sireta fulginoides (agg) UKI7075; fulginoides Kilimanjaro PP05 - Sireta fulginoides (agg) UKI7075; fulginoides Kilimanjaro PP05 - Sireta fulginoides (agg) UKI71455; fulginoides Kilimanjaro P	Sticta duplolimbata	UK1714720	-	Kilimanjaro	FO:4	-
Selta daplacimulatOLD 14907clapboundal1KilimanjaroPOCsCD7999807Sitta daplatimbataUK171497cduploimbata1KilimanjaroPOC3CD7999562Sitta daplatimbataUK171497cduploimbata1KilimanjaroPOD1CD7999573Sitta daplatimbataUK171497cduploimbata1KilimanjaroPOD1CD7999573Sitta daploimbataUK171502bduploimbata1KilimanjaroPOD1CD799575Sitta daploimbataUK171502bduploimbata1KilimanjaroPOD1CD799575Sitta daploimbataUK171502bduploimbata1KilimanjaroPOD2CD7999576Sitta daploimbataUK1715193duploimbata1KilimanjaroPOC5CD7999585Sitta daploimbataUK171519gduploimbata2KilimanjaroPOC5-Sitta daploimbataUK171519qduploimbata2KilimanjaroPP03CD7999605Sitta daploimbataUK171590qduploimbata1KilimanjaroPP03CD7999610Sitta daploimbataUK171485cfulginoides1KilimanjaroPP03CD7999494Sitta fulginoidesUK171485cfulginoides1KilimanjaroPP04CP399575Sitta fulginoidesUK171485cfulginoides1KilimanjaroPP04CP399575Sitta fulginoidesUK171485cfulginoides1KilimanjaroPP04CP399575Sitta fulginoidesUK171485cfulginoides1KilimanjaroPP04-Sitta fulginoidesUK171485cful	Sticta duplotimbata	UK171405g	-	Killinanjalo Vilinaniana	FO(4 FO-2	- OB000E(7
Strict duploimbatiUK171495cduploimbataHillmanjaroPOC3-Strict duploimbatiUK171497cduploimbataKilimanjaroPOD1OP999579Strict duploimbatiUK171497fduploimbataKilimanjaroFOD1OP999573Strict duploimbatiUK171497fduploimbataKilimanjaroFOD1OP999573Strict duploimbataUK171502cduploimbataKilimanjaroFOD1OP999575Strict duploimbataUK171502cduploimbataKilimanjaroFOD2OP999576Strict duploimbataUK171504bduploimbataKilimanjaroFOD2OP999575Strict duploimbataUK171519gduploimbataKilimanjaroFO2OP999576Strict duploimbataUK171594bduploimbataKilimanjaroFO3OP999605Strict duploimbataUK171594cduploimbataKilimanjaroFP3OP999605Strict duploimbataUK171594cfulignoidesKilimanjaroFP3OP999605Strict duploimbataUK171596cduploimbataKilimanjaroFP3OP999605Strict duploimbataUK171597cduploimbataKilimanjaroFP04OP999572Strict duploindesUK171485cfulignoidesKilimanjaroFP04OP999575Strict dufginoidesUK171485cfulignoidesKilimanjaroFP01-Strict dufginoidesUK171485cfulignoidesKilimanjaroFP01-Strict dufginoidesUK171485cfulignoidesKilimanj		UK171490f	dupiolimbata1	Kilimanjaro	FOC3	019999567
Strict aluploimbataUK171497eduploimbatalKilmanjaroFODIOP999572Siteta duploimbataUK171497eduploimbatalKilmanjaroFODIOP999573Siteta duploimbataUK171502bduploimbatalKilmanjaroFODIOP999575Siteta duploimbataUK171502bduploimbatalKilmanjaroFODIOP999575Siteta duploimbataUK171502c-KilmanjaroFODI-Siteta duploimbataUK171503c-KilmanjaroFODI-Siteta duploimbataUK171513fduploimbatalKilmanjaroFOC5OP999582Siteta duploimbataUK171519gduploimbatalKilmanjaroFOC5-Siteta duploimbataUK171590qduploimbata2KilmanjaroFPA3OP999609Siteta duploimbataUK171590qduploimbata1KilmanjaroFPA3OP999609Siteta duploimbataUK171590qduploimbata1KilmanjaroFPA3OP999609Siteta duploimbataUK171886pduploimbata1KilmanjaroFPD3OP999494Siteta fulginoidesUK171887fulginoidesKilmanjaroFPD3OP999499Siteta fulginoidesUK171488ffulginoidesKilmanjaroFPD3OP9999572Siteta fulginoidesUK171488ffulginoidesKilmanjaroFPD1OP999572Siteta fulginoidesUK171488ffulginoidesKilmanjaroFPD2OP999572Siteta fulginoidesUK171488ffulginoidesKilmanjaroFPD1 <td>Sticta duplolimbata</td> <td>UK1714936</td> <td>-</td> <td>Kilimanjaro</td> <td>FOc3</td> <td>-</td>	Sticta duplolimbata	UK1714936	-	Kilimanjaro	FOc3	-
<ul> <li>Shita duplolimbata</li> <li>UK171497</li> <li>duplolimbata</li> <li>Kilimanjaro</li> <li>FODI</li> <li>OP99573</li> <li>Shita duplolimbata</li> <li>UK171502</li> <li>duplolimbata</li> <li>Kilimanjaro</li> <li>FODI</li> <li>OP99575</li> <li>Shita duplolimbata</li> <li>UK171502</li> <li>duplolimbata</li> <li>Kilimanjaro</li> <li>FODI</li> <li>OP99575</li> <li>Shita duplolimbata</li> <li>UK171502</li> <li>duplolimbata</li> <li>UK171504</li> <li>duplolimbata</li> <li>UK171504</li> <li>duplolimbata</li> <li>UK171504</li> <li>duplolimbata</li> <li>UK171514</li> <li>duplolimbata</li> <li>UK171514</li> <li>duplolimbata</li> <li>UK171514</li> <li>duplolimbata</li> <li>UK171514</li> <li>Kita duplolimbata</li> <li>UK171514</li> <li>Kita duplolimbata</li> <li>UK171514</li> <li>Kita duplolimbata</li> <li>UK171504</li> <li>duplolimbata</li> <li>Kilimanjaro</li> <li>FP03</li> <li>OP999605</li> <li>Sitcia duplolimbata</li> <li>UK1708086</li> <li>fulignoides</li> <li>Kilimanjaro</li> <li>FP14</li> <li>OP999494</li> <li>Sitcia fulignoides</li> <li>UK170884</li> <li>fulignoides</li> <li>KIL714854</li> <li>fulignoides</li> <li>KIL714854</li> <li>fulignoides</li> <li>KIL714854</li> <li>fulignoides</li> <li>KIL71484</li> <li>fulignoides</li> <li>KIL71577</li> <li>fulignoides</li> <li>KIL71578</li> <li>Kilimanjaro</li> <li>FP01</li> <li>FP14</li> <li>OP99957</li> <li>Sitcia ful</li></ul>	Sticta duplolimbata	UK171495e	duplolimbata1	Kilimanjaro	FOc3	OP999569
Shitca duplolimbataUK171497fduplolimbata1KilimanjaroFOD1OP999573Shitca duplolimbataUK171502bduplolimbata1KilimanjaroFOD1OP999574Shitca duplolimbataUK171503c-KilimanjaroFOD1-Shitca duplolimbataUK171503c-KilimanjaroFOD2OP999575Shitca duplolimbataUK171513fduplolimbata1KilimanjaroFOC5OP999582Shitca duplolimbataUK171513fduplolimbata1KilimanjaroFOC5-Shitca duplolimbataUK171518gduplolimbata2KilimanjaroFPO3OP999609Shitca duplolimbataUK171590gduplolimbata2KilimanjaroFPO3OP999609Shitca duplolimbataUK171590gduplolimbata1KilimanjaroFPO3OP999609Shitca duplolimbataUK17080efulginoides1KilimanjaroFPO3OP999609Shitca duplolimbataUK17044cfulginoides1KilimanjaroFPD4OP999499Shitca fulginoidesUK17044cfulginoides1KilimanjaroFPD4OP999499Shitca fulginoidesUK171485fulginoides1KilimanjaroFPD4OP999552Shitca fulginoidesUK171485fulginoides1KilimanjaroFPD1OP999553Shitca fulginoidesUK171485fulginoides1KilimanjaroFPD1-Shitca fulginoidesUK170775-KilimanjaroFPD3Shitca fulginoides (agg.)UK170776-Kilimanja	Sticta duplolimbata	UK171497e	duplolimbata1	Kilimanjaro	FOD1	OP999572
Stitca duplolimbataUK171502bduplolimbata1KilimanjaroFOD1OP999575Stitca duplolimbataUK171502cduplolimbata1KilimanjaroFOD1-Stitca duplolimbataUK171504bduplolimbata1KilimanjaroFOD2OP999576Stitca duplolimbataUK171504bduplolimbata1KilimanjaroFOc5OP999582Stitca duplolimbataUK171519gduplolimbata1KilimanjaroFOc5OP999685Stitca duplolimbataUK171519gduplolimbata2KilimanjaroFPo3OP999605Stitca duplolimbataUK171590gduplolimbata2KilimanjaroFPo3OP999609Stitca duplolimbataUK171590gduplolimbata1KilimanjaroFPo3OP999609Stitca duplolimbataUK171580eduplolimbata1KilimanjaroFPD3OP999609Stitca fulginoidesUK17080efulginoides1KilimanjaroFPD3OP9999050Stitca fulginoidesUK171486fulginoides1KilimanjaroFPD3OP999955Stitca fulginoidesUK171486fulginoides1KilimanjaroFPD1OP99957Stitca fulginoidesUK171486fulginoides1KilimanjaroFPD2OP99957Stitca fulginoidesUK171486fulginoides1KilimanjaroFPD1-Stitca fulginoidesUK171486fulginoides1KilimanjaroFPD1-Stitca fulginoidesUK1714777fulginoides1KilimanjaroFPD1-Stitca fulginoides (agg.)UK1714786 <td>Sticta duplolimbata</td> <td>UK171497f</td> <td>duplolimbata1</td> <td>Kilimanjaro</td> <td>FOD1</td> <td>OP999573</td>	Sticta duplolimbata	UK171497f	duplolimbata1	Kilimanjaro	FOD1	OP999573
Stitch alpholimbataUK171502cduplolimbatalKilimanjaroFOD1OP999575Stitch alpholimbataUK171504bduplolimbata1KilimanjaroFOD2OP999576Stitch alpholimbataUK171513fduplolimbata1KilimanjaroFOC5OP999582Stitch alpholimbataUK171513fduplolimbata1KilimanjaroFOC5OP999585Stitch alpholimbataUK171521h-KilimanjaroFOC5Stitch alpholimbataUK171556pduplolimbata2KilimanjaroFP03OP999605Stitch alpholimbataUK171556pduplolimbata2KilimanjaroFP03OP999605Stitch alpholimbataUK171556eduplolimbata2KilimanjaroFP03OP999610Stitch alpholimbataUK170808efuliginoides1KilimanjaroFP03OP9999909Stitch alpholimbataUK170484cfuliginoides1KilimanjaroFP03OP999952Stitch alpholimoidesUK171488ffuliginoides1KilimanjaroFP04OP999553Stitch alpholimoidesUK171488ffuliginoides1KilimanjaroFP01OP999575Stitch alpholimoidesUK171488ffuliginoides1KilimanjaroFP01Stitch alpholimoidesUK171456fuliginoides1KilimanjaroFP01Stitch aliginoidesUK170775c-<	Sticta duplolimbata	UK171502b	duplolimbata1	Kilimanjaro	FOD1	OP999574
Siteta duplolimbataUK171504b-KilimanjaroFOD1-Siteta duplolimbataUK171514fduplolimbata1KilimanjaroFOC5OP999582Siteta duplolimbataUK171514fduplolimbata1KilimanjaroFOC5OP999585Siteta duplolimbataUK171514h-KilimanjaroFOC5-Siteta duplolimbataUK171514h-KilimanjaroFPO3OP999605Siteta duplolimbataUK171590qduplolimbata2KilimanjaroFPO3OP999609Siteta duplolimbataUK170590qduplolimbata2KilimanjaroFPD3OP999404Siteta duplolimbataUK170808efuliginoides1KilimanjaroFPD3OP999499Siteta fulginoidesUK170808efulginoides1KilimanjaroFPD4OP999505Siteta fulginoidesUK170484ffulginoides1KilimanjaroFPD2OP999575Siteta fulginoidesUK171488ffulginoides1KilimanjaroFD22OP999577Siteta fulginoidesUK171485cfulginoides1KilimanjaroFD01-Siteta fulginoidesUK170775c-KilimanjaroFP01-Siteta fulginoides (agg.)UK170786g-KilimanjaroFP04-Siteta fulginoides (agg.)UK170786g-KilimanjaroFP01-Siteta fulginoides (agg.)UK170786g-KilimanjaroFP03-Siteta fulginoides (agg.)UK170786g-KilimanjaroFP04-Siteta f	Sticta duplolimbata	UK171502c	duplolimbata1	Kilimanjaro	FOD1	OP999575
Sittet duplolimbataUK171504bduplolimbata1KilimanjaroFOD2OIP99976Sittet duplolimbataUK171519gduplolimbata1KilimanjaroFOC5OIP999882Sittet duplolimbataUK171519gduplolimbata1KilimanjaroFOC5-Sittet duplolimbataUK171586pduplolimbata2KilimanjaroFPO3OIP999605Sittet duplolimbataUK171596pduplolimbata2KilimanjaroFPO3OIP999609Sittet duplolimbataUK171596eduplolimbata1KilimanjaroFPD3OIP999099Sittet duplolimbataUK170808efuliginoides1KilimanjaroFPD4OIP9999305Sittet duplojinidesUK170884cfuliginoides1KilimanjaroFPD4OIP999552Sittet fuliginoidesUK171486fuliginoides1KilimanjaroFPD4OIP999558Sittet fuliginoidesUK171485cfuliginoides1KilimanjaroFPD1OIP999574Sittet fuliginoidesUK171504cfuliginoides1KilimanjaroFPD1OIP999577Sittet fuliginoidesUK170775c-KilimanjaroFPD1Sittet fuliginoides (agg.)UK17075c-KilimanjaroFPD3Sittet fuliginoides (agg.)UK170886g-KilimanjaroFPD3Sittet fuliginoides (agg.)UK170886g-KilimanjaroFPD3Sittet fuliginoides (agg.)UK17075c-KilimanjaroFPD3Sittet fuligino	Sticta duplolimbata	UK171503c	-	Kilimanjaro	FOD1	-
Siteta duplolimbataUK171513fduplolimbata1KilimanjaroPOc5OP999882Sticta duplolimbataUK171521h-KilimanjaroPOc5OP999585Sticta duplolimbataUK17152h-KilimanjaroPOc5-Sticta duplolimbataUK17159qduplolimbata2KilimanjaroPP03OP999609Sticta duplolimbataUK17159qduplolimbata2KilimanjaroFP03OP999609Sticta duplolimbataUK17059qduplolimbata2KilimanjaroFP04OP999101Sticta fulginoidesUK170808efulginoides1KilimanjaroFP03OP999505Sticta fulginoidesUK17088efulginoides1KilimanjaroFP04OP999505Sticta fulginoidesUK17148ffulginoides1KilimanjaroFP01OP999575Sticta fulginoidesUK17148cfulginoides1KilimanjaroFP01OP999577Sticta fulginoidesUK17148cfulginoides1KilimanjaroFP01-Sticta fulginoidesUK17077c-KilimanjaroFP01-Sticta fulginoidesUK17078c-KilimanjaroFP01-Sticta fulginoides (agg.)UK17078c-KilimanjaroFP03-Sticta fulginoides (agg.)UK17088g-KilimanjaroFP01-Sticta fulginoides (agg.)UK17078c-KilimanjaroFP03-Sticta fulginoides (agg.)UK17087g-KilimanjaroFP03-Sticta fulginoides (agg.)	Sticta duvlolimbata	UK171504b	duplolimbata1	Kilimaniaro	FOD2	OP999576
Stitch duplolimbataUK171519gduplolimbata1KilimanjaroFOc5OP999885Stitch duplolimbataUK171521h-KilimanjaroFPo3OP999605Stitch duplolimbataUK171586pduplolimbata2KilimanjaroFPo3OP999605Stitch duplolimbataUK171596eduplolimbata2KilimanjaroFPo3OP999610Stitch duplolimbataUK171596eduplolimbata1KilimanjaroFPD3OP999610Stitch duplolimbataUK170808efuliginoides1KilimanjaroFPD4OP999910Stitch fuliginoidesUK170844cfuliginoides1KilimanjaroFPD4OP999905Stitch fuliginoidesUK171486fuliginoides1KilimanjaroFPD1OP999558Stitch fuliginoidesUK171485cfuliginoides1KilimanjaroFPD2OP99957Stitch fuliginoidesUK171577ifuliginoides1KilimanjaroFPD1-Stitch fuliginoides (agg.)UK170775c-KilimanjaroFPD1-Stitch fuliginoides (agg.)UK170775c-KilimanjaroFPD4-Stitch fuliginoides (agg.)UK170775c-KilimanjaroFPD3-Stitch fuliginoides (agg.)UK170889g-KilimanjaroFPD4-Stitch fuliginoides (agg.)UK170885g-KilimanjaroFPD3-Stitch fuliginoides (agg.)UK170897g-KilimanjaroFPD3-Stitch fuliginoides (agg.)UK170485h-KilimanjaroFPD1 <td>Sticta duplolimbata</td> <td>UK171513f</td> <td>duplolimbata1</td> <td>Kilimaniaro</td> <td>FOc5</td> <td>OP999582</td>	Sticta duplolimbata	UK171513f	duplolimbata1	Kilimaniaro	FOc5	OP999582
Sticta duplolimbataUK171521h-KilimanjaroFOc5-Sticta duplolimbataUK171590qduplolimbata2KilimanjaroFPo3OP999609Sticta duplolimbataUK171590qduplolimbata2KilimanjaroFPo3OP999609Sticta duplolimbataUK171590qduplolimbata2KilimanjaroFPo3OP999609Sticta duplolimbataUK170808efuliginoides1KilimanjaroFPD4OP999494Sticta fuliginoidesUK170808efuliginoides1KilimanjaroFPD3OP999499Sticta fuliginoidesUK170486fuliginoides1KilimanjaroFFb4OP999552Sticta fuliginoidesUK171486fuliginoides1KilimanjaroFPD1OP999572Sticta fuliginoidesUK171485cfuliginoides1KilimanjaroFPD1OP999977Sticta fuliginoidesUK171485cfuliginoides1KilimanjaroFPD1-Sticta fuliginoides (agg.)UK170775c-KilimanjaroFPO1-Sticta fuliginoides (agg.)UK170826g-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK170888g-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK170887g-KilimanjaroFPO5-Sticta fuliginoides (agg.)UK170897g-KilimanjaroFPO5-Sticta fuliginoides (agg.)UK17145h-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK17145h-KilimanjaroFPO1- <td>Sticta dunlolimbata</td> <td>UK171519ø</td> <td>duplolimbata1</td> <td>Kilimaniaro</td> <td>FOc5</td> <td>OP999585</td>	Sticta dunlolimbata	UK171519ø	duplolimbata1	Kilimaniaro	FOc5	OP999585
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Sticta fuliginoides (agg.)UK170845m-KilimanjaroFPD3-Sticta fuliginoides (agg.)UK170888g-KilimanjaroFPo5-Sticta fuliginoides (agg.)UK170887g-KilimanjaroFPo5-Sticta fuliginoides (agg.)UK170897g-KilimanjaroFD04-Sticta fuliginoides (agg.)UK171439h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK17145bh-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK17145bh-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171475bm-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171467j-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK1714771d-KilimanjaroFD1-Sticta fuliginoides (agg.)UK1714771d-KilimanjaroFD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFD2-Sticta fuliginoides (agg.)UK171514d-KilimanjaroFD2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFP02-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFP02-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFP03-Sticta fuliginoides (agg.)UK1715841-Kilimanjaro <td>Sticta fuliginoides (agg.)</td> <td>UK170826g</td> <td>-</td> <td>Kilimanjaro</td> <td>FPD4</td> <td>-</td>	Sticta fuliginoides (agg.)	UK170826g	-	Kilimanjaro	FPD4	-
Sticta fuliginoides (agg.)UK170888g-KilimanjaroFPo5-Sticta fuliginoides (agg.)UK170897g-KilimanjaroFPo5-Sticta fuliginoides (agg.)UK170897g-KilimanjaroFD04-Sticta fuliginoides (agg.)UK171439h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171439h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171456b-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171458m-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK17155d-KilimanjaroFO2-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFO2-Sticta fuliginoides (agg.)UK171584i-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171580r-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584i-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171580r-KilimanjaroFPD3-Sticta fuliginoides (agg.)UK171580r-Kilimanjaro <td>Sticta fuliginoides (agg.)</td> <td>UK170845m</td> <td>-</td> <td>Kilimanjaro</td> <td>FPD3</td> <td>-</td>	Sticta fuliginoides (agg.)	UK170845m	-	Kilimanjaro	FPD3	-
Sticta fuliginoides (agg.)UK170889e-KilimanjaroFPo5-Sticta fuliginoides (agg.)UK170897g-KilimanjaroFOD4-Sticta fuliginoides (agg.)UK171439h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171445h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171456b-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171457b-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171477am-KilimanjaroFD1-Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFO2-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFD2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFP02-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFP03-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFP03-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFP03-Sticta fuliginosaJR09A46fuliginosa1Taita Hills <td>Sticta fuliginoides (agg.)</td> <td>UK170888g</td> <td>-</td> <td>Kilimaniaro</td> <td>FPo5</td> <td>-</td>	Sticta fuliginoides (agg.)	UK170888g	-	Kilimaniaro	FPo5	-
Sticta fuliginoides (agg.)UK170897g-KilimanjaroFOD4Sticta fuliginoides (agg.)UK171439h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171445h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171456b-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK171458m-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFP1-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFO2-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita Hills <td>Sticta fuliginoides (agg.)</td> <td>UK170889e</td> <td>-</td> <td>Kilimaniaro</td> <td>FPo5</td> <td>-</td>	Sticta fuliginoides (agg.)	UK170889e	-	Kilimaniaro	FPo5	-
Sticta fuliginoides (agg.)UK171439h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK17145h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK17145b-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK17145b-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK17147d-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171477am-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171514d-KilimanjaroFO22-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D1Bfuliginosa1Taita HillsNgangaoOP999380	Sticta fuliginoides (ago.)	UK170897ø	-	Kilimaniaro	FOD4	-
Sticta fuliginoides (agg.)UK171445h-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK17145b-KilimanjaroFEr2-Sticta fuliginoides (agg.)UK17145b-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171467j-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFO25-Sticta fuliginoides (agg.)UK17152j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK17152j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsVuriaOP909309	Sticta fuliginoides (agg.)	UK171439b	-	Kilimaniaro	FFr2	-
Sticta fuliginoides (agg.)UK171456b-KilimanjaroFEr2Sticta fuliginoides (agg.)UK171458m-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171467j-KilimanjaroFEr4-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFO25-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPo2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPO2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsVuriaOP909309	Sticta fuliginoides (200	UK171445b	_	Kilimanjaro	FEr2	_
Sticta fuliginoides (agg.)UK171450b-KilimanjaroFEr4Sticta fuliginoides (agg.)UK171467j-KilimanjaroFEr4Sticta fuliginoides (agg.)UK171467j-KilimanjaroFPD1Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD1Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2Sticta fuliginoides (agg.)UK171514d-KilimanjaroFO22Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPD2Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPO3Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsVuriaOP999390	Sticta fuliginoides (2000)	UK171456b		Kilimanjaro	FEr2	
Sticta fuliginoides (agg.)UK171450in-KnimalijatoFEr4Sticta fuliginoides (agg.)UK171467j-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171514d-KilimanjaroFO22-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384	Stictu Juliginoides (agg.)	UK1714500	-	Kilimanjaro	FEr4	-
Sticta fuliginoides (agg.)UK17146)-KilimalijaroFP14-Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171514d-KilimanjaroFO2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584h-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584h-KilimanjaroFPD3-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384	Stictu Juliginoides (agg.)	UK171458III	-	Killinanjaro	FEI4 EE=4	-
Sticta fuliginoides (agg.)UK171471d-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171514d-KilimanjaroFOc5-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFP02-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK1715841-KilimanjaroFPD3-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgungaoOP999384	Stictu Juliginoides (agg.)	UK171407J	-	Killinanjaro	FEI4 EDD1	-
Sticta fuliginoides (agg.)UK171473m-KilimanjaroFPD1-Sticta fuliginoides (agg.)UK171497ab-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171514d-KilimanjaroFOc5-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPo2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPD3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999390	Stictu fuliginoides (agg.)	UK171471d	-	Kilimanjaro	FPD1	-
Sticta fuliginoides (agg.)UK 17149/ab-KilimanjaroFOD1-Sticta fuliginoides (agg.)UK 171505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK 171514d-KilimanjaroFOc5-Sticta fuliginoides (agg.)UK 171523m-KilimanjaroFPo2-Sticta fuliginoides (agg.)UK 171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK 171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK 171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK 171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384	Sticta fuliginoides (agg.)	UK171473m	-	Kilimanjaro	FPDI	-
Sticta fuliginoides (agg.)UK1/1505d-KilimanjaroFOD2-Sticta fuliginoides (agg.)UK171514d-KilimanjaroFOc5-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPo2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPo3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384	Sticta fuliginoides (agg.)	UK171497ab	-	Kilimanjaro	FODI	-
Sticta fuliginoides (agg.)UK171514d-KilimanjaroFOc5-Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPo2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPo3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384	Sticta fuliginoides (agg.)	UK171505d	-	Kilimanjaro	FOD2	-
Sticta fuliginoides (agg.)UK171523m-KilimanjaroFPo2-Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPo3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384Sticta fuliginosaIR10076fuliginosa1Taita HillsVuriaOP909309	Sticta fuliginoides (agg.)	UK171514d	-	Kilimanjaro	FOc5	-
Sticta fuliginoides (agg.)UK171582j-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPO3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPO3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384Sticta fuliginosaB10076fuliginosa1Taita HillsVuriaOP909309	Sticta fuliginoides (agg.)	UK171523m	-	Kilimanjaro	FPo2	-
Sticta fuliginoides (agg.)UK171584l-KilimanjaroFPD2-Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPo3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384Sticta fuliginosaUR10076fuliginosa1Taita HillsVuriaOP909309	Sticta fuliginoides (agg.)	UK171582j	-	Kilimanjaro	FPD2	-
Sticta fuliginoides (agg.)UK171586m-KilimanjaroFPo3-Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384Sticta fuliginosaUR10076fuliginosa1Taita HillsVuriaOP909399	Sticta fuliginoides (agg.)	UK1715841	-	Kilimanjaro	FPD2	-
Sticta fuliginoides (agg.)UK171590r-KilimanjaroFPo3-Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384Sticta fuliginosaIR10076fuliginosa1Taita HillsVuriaOP909399	Sticta fuliginoides (agg.)	UK171586m	-	Kilimanjaro	FPo3	-
Sticta fuliginosaJR09A46fuliginosa1Taita HillsNgangaoOP999381Sticta fuliginosaJR09D21Bfuliginosa1Taita HillsNgangaoOP999384Sticta fuliginosaIR10076fuliginosa1Taita HillsVuriaOP999399	Sticta fuliginoides (agg.)	UK171590r	-	Kilimanjaro	FPo3	-
Sticta fuliginosa JR09D21B fuliginosa1 Taita Hills Ngangao OP999384 Sticta fuliginosa JR10076 fuliginosa1 Taita Hills Vuria OP909399	Sticta fuliginosa	JR09A46	fuliginosa1	Taita Hills	Ngangao	OP999381
Sticta fulicinosa IR10076 fulicinosa1 Taita Hills Vuria OP000300	Sticta fuliginosa	JR09D21B	fuliginosa1	Taita Hills	Ngangao	OP999384
	Sticta fuliginosa	JR10076	fuliginosa1	Taita Hills	Vuria	OP999399

Species	Collection ID	ITS Variant	Collection Location		Accession
Sticta fuliginosa	JR10151	fuliginosa1	Taita Hills	Yale	OP999405
Sticta fuliginosa	JR10190B	fuliginosa1	Taita Hills	Yale	OP999413
Sticta fuliginosa	JR10245	fuliginosa2	Taita Hills	Mwachora	OP999425
Sticta fuliginosa	JR105A	fuliginosa1	Taita Hills	Vuria	OP999428
Sticta fuliginosa	JR105B	fuliginosa1	Taita Hills	Vuria	OP999429
Sticta fuliginosa	JR10K564	-	Mt. Kasigau	Plot W12	-
Sticta fuliginosa	IR16335	fuliginosa1	Taita Hills	Sagalla	OP999448
Sticta fuliginosa	IR16354	fuliginosa1	Taita Hills	Vuria	OP999450
Sticta fuliginosa	IR16358	fuliginosa1	Taita Hills	Vuria	OP999452
Sticta fuliginosa	IR16457	-	Taita Hills	Mbololo	
Sticta fuliginosa	IR16463	fuliginosa1	Taita Hills	Mbololo	OP999468
Sticta fuliginosa	IR19	-	Taita Hills	Yale	-
Sticta fuliginosa	IR3	fuliginosa1	Taita Hills	Yale	OP999469
Sticta fuliginosa	UK110504b	-	Taita Hills	Ngangao	-
Sticta fuliginosa	UK110512a	-	Taita Hills	Vuria	-
Sticta fuliginosa	UK170794g	fuliginosa1	Kilimaniaro	FOc2	OP999486
Sticta fuliginosa	UK170796a	fuliginosa1	Kilimaniaro	FOc2	OP999487
Sticta fuliginosa	UK170797i	fuliginosa1	Kilimaniaro	FOc1	OP999488
Sticta fuliginosa	UK170846f	fuliginosa1	Kilimaniaro	FPD3	OP999502
Sticta fuliginosa	UK170900h	fuliginosa1	Kilimaniaro	FOD4	OP999513
Sticta fuliginosa	UK170906b	fuliginosal	Kilimaniaro	FOD4	OP999515
Sticta fuliginosa	UK170930b	fuliginosal	Kilimaniaro	Flm1	OP999522
Sticta fuliginosa	UK171494n	fuliginosal	Kilimaniaro	FOc3	OP999568
Sticta fuliginosa	UK171504m	fuliginosal	Kilimanjaro	FOD2	OP999579
Sticta fuliginosa	UK171594e	-	Kilimanjaro	Flm2	-
Sticta marginalis	IR 58 7	marginalis3	Mt Kasigau	Plot W14	OP999379
Sticta marginalis	IR090X8a	-	Taita Hills	Chawia	-
Sticta marginalis	IR09D12A	marginalis1	Taita Hills	Ngangao	OP999383
Sticta marginalis	IR10028B	marginalis1	Taita Hills	Vuria	OP999391
Sticta marginalis	IR10176A	marginalis1	Taita Hills	Vale	OP999410
Sticta marginalis	IR10193A	marginalis1	Taita Hills	Yale	OP999415
Stieta marginalis	IR10202B	marginalis1	Taita Hille	Vale	OP999417
Sticta marginalis	IR10K532	-	Mt Kasigan	Plot W/9	-
Sticta marginalis	IR10K552		Mt Kasigau	Plot W11	_
Sticta marginalis	JR10K552R JR10K552B	_	Mt Kasigau	Plot W11	_
Stieta marginalis	IR10K563	_	Mt Kasigau	Plot W12	_
Sticta marginalis	IR110030A	marginalis4	Taita Hille	Vuria	OP999432
Sticta marginalis	IR110055	marginalis1	Taita Hills	Vuria	OP999433
Sticta marginalis	JR110055 IR16248	marginalis1	Taita Hills	Mbololo	OP999441
Stieta marginalis	IR16294a	-	Taita Hille	Sagalla	-
Sticta marginalis	IR16312	marginalis1	Taita Hille	Sagalla	OP999446
Sticta marginalis	JR16322a	marginalis1	Taita Hills	Sagalla	OP999447
Sticta marginalis	IR16420	-	Taita Hills	Mbololo	-
Stieta marginalis	IR16440	_	Taita Hille	Mbololo	_
Sticta marginalis	UK110501a		Taita Hille	Ngangao	_
Sticta marginalis	UK110535b	_	Taita Hills	Vuria	-
Sticta marginalis	UK170800m	marginalis?	Kilimaniaro	FOc1	OP999490
Stieta marginalis	UK170927a	-	Kilimanjaro	Flm6	-
Sticta maroinalis	UK170932b	marginalis1	Kilimanjaro	Flm1	OP999525
Sticta maroinalis	UK170933b	marginalis1	Kilimanjaro	Flm1	OP999526
Sticta maroinalis	UK170934b	-	Kilimaniaro	Flm1	-
Sticta maroinalis	UK170937i	-	Kilimaniaro	Flm1	_
Sticta marginalis	UK170942c	- marginalis1	Kilimanjaro	Flm1	OP999527
Sticta marginalis	UK170943d	-	Kilimanjaro	Flm1	-
Sticta marginalis	UK170950d	_	Kilimanjaro	Flm1	-
Stieta marginalis	UK171183a	marginalis1	Kilimanjaro	FOD3	OP999540
Sticta marginalis	UK171183b	-	Kilimanjaro	FOD3	-
Sticta marginalis	UK171186a	_	Kilimanjaro	FOD3	-
Sticta maroinalis	UK171504k	marginalis1	Kilimaniaro	FOD2	OP999578
Sticta marcinalis	UK1715961	marginalis1	Kilimaniaro	Flm2	OP999611
Sticta munda	UK170888c	-	Kilimaniaro	FPo5	-
Sticta munda	UK171497d	munda3	Kilimaniaro	FOD1	OP999571
Sticta munda	UK171508i	mundal	Kilimanjaro	FOD2	OP999580
Sticta munda	UK1715101	mundal	Kilimaniaro	FOD2	OP999581
Sticta munda	UK171582i	munda?	Kilimanjaro	FPD2	OP990508
Sticta munda	UK17158411	mundal	Kilimanjaro	FPD2	OP999600
Sticta munda	UK1715861	mundal	Kilimanjaro	FPo3	OP999604
Sticta munda	UK1715861	-	Kilimanjaro	FPo3	-
	0.1713001	-	Kiiiiiaiijai0	1100	-

Sizie auklimbaisJR0A-60sublimbaisTata HillsNgangaoOP99382Sirier sublimbaisJR09DAsublimbaisTata HillsNgangaoOP99385Sirier sublimbaisJR09V12asublimbaisTata HillsMbolohOP99385Sirier sublimbaisJR09V12asublimbaisTata HillsMbolohOP99382Sirier sublimbaisJR09712bsublimbaisTata HillsMbolohOP99392Sirier sublimbaisJR0056AsublimbaisTata HillsShornot HillOP99392Sirier sublimbaisR10056AsublimbaisTata HillsShornot HillOP99392Sirier sublimbaisJR1056AsublimbaisTata HillsShornot HillOP99397Sirier sublimbaisJR1024AsublimbaisTata HillsStateOP993941Sirier sublimbaisJR1024AsublimbaisTata HillsYaleOP99392Sirier sublimbaisJR1024AsublimbaisTata HillsYaleOP99421Sirier sublimbaisJR1024AsublimbaisTata HillsMachanOP99422Sirier sublimbaisJR1024AsublimbaisTata HillsMachanOP99424Sirier sublimbaisJR1024AsublimbaisTata HillsMachanOP99424Sirier sublimbaisJR1024AsublimbaisTata HillsMachanOP99424Sirier sublimbaisJR1024AsublimbaisTata HillsMachanOP99424Sirier sublimbaisJR1024AsublimbaisTata HillsMachan <t< th=""><th>Species</th><th>Collection ID</th><th>ITS Variant</th><th>Collection Location</th><th></th><th>Accession</th></t<>	Species	Collection ID	ITS Variant	Collection Location		Accession
Siche solutionhubJRUPDEAsublimbabatolTanb HillsNgorngionCOP999385Siche solutionhubJRUPV12asublimbabatoTiata HillsMetolobCOP99386Siche solutionhubJRUPV12bsublimbatatoTiata HillsMetolobCOP99386Siche solutionhubJRUPV12bsublimbatatoTiata HillsMetolobCOP99386Siche solutionhubJRUPV2bsublimbatatoTiata HillsNeuroth HillCOP99390Siche solutionhubJRU0066AsublimbatatoTiata HillsShormoth HillCOP99398Siche solutionhubJRU0066AsublimbatatoTiata HillsShormoth HillCOP99398Siche solutionhubJRU0066AsublimbatatoTiata HillsValeCOP99398Siche solutionhubJRU02AsublimbatatoTiata HillsValeCOP99398Siche solutionhubJRU02AsublimbatatoTiata HillsValeCOP99418Siche solutionhubJRU02AsublimbatatoTiata HillsMocehoraCOP99421Siche solutionhubJRU02AsublimbatatoTiata HillsMocehoraCOP99421Siche solutionhubJRU02AsublimbatatoTiata HillsMocehoraCOP99421Siche solutionhubJRU02AsublimbatatoTiata HillsMocehoraCOP99421Siche solutionhubJRU02AsublimbatatoTiata HillsMucehoraCOP99421Siche solutionhubJRU02AsublimbatatoTiata HillsVuriaCOP99421Siche solutionhub<	Sticta sublimbata	JR09A60	sublimbata1	Taita Hills	Ngangao	OP999382
State auklimbaisJR09W12asublimbaisaM. KasigauOP99387State sublimbaisTR09V12bsublimbaisTata HillsMeolobOP99398State sublimbaisTR09V12bsublimbaisTata HillsMeolobOP99399State sublimbaisTR09V12bsublimbaisTata HillsMeolobOP99390State sublimbaisTR002BsublimbaisTata HillsShornoto HillOP99397State sublimbaisR10056AsublimbaisTata HillsShornoto HillOP99397State sublimbaisR10066AsublimbaisTata HillsShornoto HillOP99397State sublimbaisR10208AsublimbaisTata HillsNaleOP99391State sublimbaisR10214BsublimbaisTata HillsNaleOP99414State sublimbaisR1021AsublimbaisTata HillsMachoaOP99423State sublimbaisR1021AsublimbaisTata HillsMachoaOP99424State sublimbaisR1021AsublimbaisTata HillsMachoaOP99424State sublimbaisR1021AsublimbaisTata HillsMachoaOP99424State sublimbaisR1024AsublimbaisTata HillsMachoaOP99424State sublimbaisR1024AsublimbaisTata HillsMachoaOP99424State sublimbaisR1024AsublimbaisTata HillsMachoaOP99424State sublimbaisR1024AsublimbaisTata HillsMachoaOP99424	Sticta sublimbata	JR09D6A	sublimbata1	Taita Hills	Ngangao	OP999385
Shirts sublimbating         [R69Y12b]         sublimbating         Tata Hills         Mbolob         OT998389           Stricts sublimbating         Tata Hills         Ngangao         OT998390           Stricts sublimbating         Tata Hills         Ngangao         OT998389           Stricts sublimbating         R1002A         sublimbating         Tata Hills         Shommto Hill         OT998389           Stricts sublimbating         R1002A         sublimbating         Tata Hills         Shommto Hill         OT999389           Stricts sublimbating         R1007B         sublimbating         Tata Hills         Shommto Hill         OT999418           Stricts sublimbating         R102BA         sublimbating         Tata Hills         Yale         OT999414           Stricts sublimbating         R102DA         sublimbating         Tata Hills         Mwachora         OT999421           Stricts sublimbating         R102DA         sublimbating         Tata Hills         Mwachora         OT999422           Stricts sublimbating         R102AA         sublimbating         Tata Hills         Mwachora         OT999421           Stricts sublimbating         R102AA         sublimbating         Tata Hills         Mwachora         OT999422           Stricts sublimbating <td>Sticta sublimbata</td> <td>JR09W12a</td> <td>sublimbata8</td> <td>Mt. Kasigau</td> <td>-</td> <td>OP999387</td>	Sticta sublimbata	JR09W12a	sublimbata8	Mt. Kasigau	-	OP999387
Skrite soldimbrie         [JR971]         sublimbata         Tata Hills         Mbolo         OT999390           Strict soldimbrie         [R10032A         sublimbata         Tata Hills         Shormoto Hill         OT999390           Strict soldimbrie         [R10036A         sublimbata         Tata Hills         Shormoto Hill         OT999390           Strict soldimbrie         [R10086A         sublimbata         Tata Hills         Shormoto Hill         OT999397           Strict soldimbrie         [R10086A         sublimbata         Tata Hills         Shormoto Hill         OT999397           Strict soldimbrie         [R1024A         sublimbata         Tata Hills         Yale         OT999421           Strict soldimbrie         [R1022AA         sublimbata         Tata Hills         Mwachora         OT999423           Strict soldimbrie         [R1023AA         sublimbata         Tata Hills         Mwachora         OT999424           Strict soldimbrie         [R1023AA         sublimbata         Tata Hills         Mwachora         OT999423           Strict soldimbrie         [R1023A         sublimbata         Tata Hills         Mwachora         OT999423           Strict soldimbrie         [R1025A         sublimbata         Tata Hills         Macha	Sticta sublimbata	JR09Y12a	sublimbata6	Taita Hills	Mbololo	OP999388
Skick sublimbataJR0822sublimbata2Tata HillsNganga0OT999890Skick sublimbataJR10078Asublimbata2Tata HillsShomoto HillOT999893Skick sublimbataJR10066Asublimbata2Tata HillsShomoto HillOT999893Skick sublimbataJR10066Asublimbata2Tata HillsShomoto HillOT999893Skick sublimbataJR10066Asublimbata2Tata HillsShomoto HillOT999411Skick sublimbataJR1021Asublimbata2Tata HillsYaleOT999421Skick sublimbataJR1022DAsublimbata1Tata HillsWavchoraOT999423Skick sublimbataJR1022DAsublimbata1Tata HillsMwachoraOT999423Skick sublimbataJR1024Dsublimbata1Tata HillsMwachoraOT999423Skick sublimbataJR1024Dsublimbata1Tata HillsMwachoraOT999423Skick sublimbataJR1027Dsublimbata1Tata HillsMwachoraOT999424Skick sublimbataJR1027Dsublimbata2Tata HillsWachoraOT999424Skick sublimbataJR1027Dsublimbata2Tata HillsWachoraOT999424Skick sublimbataJR1027Dsublimbata2Tata HillsWariaOT999424Skick sublimbataJR1047Dsublimbata2Tata HillsWariaOT999424Skick sublimbataJR1047Dsublimbata2Tata HillsWariaOT999453Skick sublimbataJR1047Dsublimbata2	Sticta sublimbata	JR09Y15b	sublimbata6	Taita Hills	Mbololo	OP999389
Skrie soldimbetaJE10029Asublimbat2Tata HillsShormoto HillO'999932Sitch soldimbetaJR10066Asublimbat2Tata HillsShormoto HillO'999937Sitch soldimbetaJR10066Asublimbat2Tata HillsShormoto HillO'999375Sitch soldimbetaJR1007Asublimbat2Tata HillsYaleO'1999414Sitch soldimbetaJR102AAsublimbat2Tata HillsYaleO'1999413Sitch soldimbetaJR102AAsublimbat2Tata HillsYaleO'1999423Sitch soldimbetaJR102AAsublimbat2Tata HillsWavechoraO'1999423Sitch soldimbetaJR102AAsublimbat2Tata HillsMwachoraO'1999423Sitch soldimbetaJR102AAsublimbat3Tata HillsMwachoraO'1999423Sitch soldimbetaJR102AAsublimbat3Tata HillsMwachoraO'1999423Sitch soldimbetaJR102AAsublimbat3Tata HillsMwachoraO'1999424Sitch soldimbetaJR16375sublimbat2Tata HillsVariaO'1999435Sitch soldimbetaJR16375sublimbat2Tata HillsVariaO'1999436Sitch soldimbetaJR16376sublimbat2Tata HillsVariaO'1999436Sitch soldimbetaJR16376sublimbat2Tata HillsVariaO'1999436Sitch soldimbetaJR16376sublimbat2Tata HillsVariaO'1999436Sitch soldimbetaJR16376sublimbat2Tata Hills <td>Sticta sublimbata</td> <td>JR09Z2</td> <td>sublimbata1</td> <td>Taita Hills</td> <td>Ngangao</td> <td>OP999390</td>	Sticta sublimbata	JR09Z2	sublimbata1	Taita Hills	Ngangao	OP999390
Shirta sublimbata         [D10056A         sublimbata2         Tatia Hills         Shomoto Hill         OP999393           Sinta sublimbata         [R10066A         sublimbata2         Tatia Hills         Shomoto Hill         OP99398           Sinta sublimbata         [R10191         sublimbata2         Tatia Hills         Shomoto Hill         OP99398           Sinta sublimbata         [R1021A         sublimbata1         Tatia Hills         Yale         OP99413           Sinta sublimbata         [R1021A         sublimbata1         Tatia Hills         Yale         OP99423           Sinta sublimbata         [R1022AD         sublimbata1         Tatia Hills         Wachona         OP99423           Sinta sublimbata         [R1023AA         sublimbata1         Tatia Hills         Mwachona         OP99423           Sinta sublimbata         [R1024B         -         Mt. Kasigau         Plot W5         -           Sinta sublimbata         [R1024B         -         Mt. Kasigau         Plot W5         -           Sinta sublimbata         [R1024B         -         Mt. Kasigau         Plot W5         -           Sinta sublimbata         [R10276         sublimbata2         Tatia Hills         Wara         OP99442           Sinta sublim	Sticta sublimbata	JR10032A	sublimbata2	Taita Hills	Shomoto Hill	OP999392
Sticts sublimistat         [R10066A]         sublimistat2         Tata Hills         Shornoto Hill         OP99378           Sticts sublimistat         [R10191]         sublimistat2         Tata Hills         Vale         OP99318           Sticts sublimistat         [R1028A]         sublimistat5         Tata Hills         Vale         OP99412           Stricts sublimistat         [R1021B]         sublimistat2         Tata Hills         MacAura         OP99421           Stricts sublimistat         [R1022B]         sublimistat2         Tata Hills         MacAura         OP99422           Stricts sublimistat         [R1022B]         sublimistat1         Tata Hills         MacAura         OP99423           Stricts sublimistat         [R1022B]         sublimistat2         Tata Hills         MacAura         OP99423           Stricts sublimistat         [R10576]         sublimistat2         Tata Hills         MacAura         OP99421           Stricts sublimistat         [R16576]         sublimistat2         Tata Hills         Varia         OP99451           Stricts sublimistat         [R16373]         sublimistat2         Tata Hills         Varia         OP99442           Stricts sublimistat         [R16374]         sublimistat2         Tata Hills         Varia <td>Sticta sublimbata</td> <td>JR10039B</td> <td>sublimbata2</td> <td>Taita Hills</td> <td>Shomoto Hill</td> <td>OP999393</td>	Sticta sublimbata	JR10039B	sublimbata2	Taita Hills	Shomoto Hill	OP999393
Sicies aublimbata[R10050B]sublimbata2Tatia HillsNote HillOP99936Sicies aublimbata[R10214B]sublimbata3Tatia HillsValeOP999414Sicies aublimbata[R10214B]sublimbata3Tatia HillsValeOP99420Sicies aublimbata[R1022AA]sublimbata2Tatia HillsMwachoraOP99421Sicies aublimbata[R1022AA]sublimbata1Tatia HillsMwachoraOP99423Sicies aublimbata[R1022A]sublimbata1Tatia HillsMwachoraOP99423Sicies aublimbata[R1022A]sublimbata1Tatia HillsMwachoraOP99423Sicies aublimbata[R10275]sublimbata2Tatia HillsMwachoraOP99423Sicies aublimbata[R10275]sublimbata2Tatia HillsMwachoraOP99443Sicies aublimbata[R10376]sublimbata2Tatia HillsVuriaOP994451Sicies aublimbata[R10476]su	Sticta sublimbata	JR10066A	sublimbata2	Taita Hills	Shomoto Hill	OP999397
Sricts sublimbataFR1011sublimbata1Tata HillsValeOP99418Sricts sublimbataR1021ABsublimbata5Tata HillsValeOP99420Sricts sublimbataR1021ABsublimbata2Tata HillsMwachoraOP99421Sricts sublimbata[R1022ADsublimbata1Tata HillsMwachoraOP99423Sricts sublimbata[R1023ADsublimbata1Tata HillsMwachoraOP99423Sricts sublimbata[R1023ADsublimbata1Tata HillsMwachoraOP99424Sricts sublimbata[R1023CDsublimbata1Tata HillsMwachoraOP99427Sricts sublimbata[R1023CDsublimbata1Tata HillsMwachoraOP99427Sricts sublimbata[R1025CD-Mr. KasigauPlot WS-Sricts sublimbata[R1025CDsublimbata2Tata HillsWaraOP99427Sricts sublimbata[R1025CDsublimbata2Tata HillsWaraOP99423Sricts sublimbata[R1025CDsublimbata2Tata HillsWaraOP99435Sricts sublimbata[R1027Asublimbata2Tata HillsWaraOP99443Sricts sublimbata[R1027Asublimbata2Tata HillsWaraOP994461Sricts sublimbata[R1027Asublimbata2Tata HillsWaraOP994461Sricts sublimbata[R1027Asublimbata2Tata HillsWara-Sricts sublimbata[R1027Asublimbata2Tata HillsWara-<	Sticta sublimbata	JR10066B	sublimbata2	Taita Hills	Shomoto Hill	OP999398
Sicka sublimbata [R10208A sublimbata] Taia Hills Vale OP99912) Sicka sublimbata [R1021A sublimbata] Taia Hills Vale OP99923) Sicka sublimbata [R1022A sublimbata] Taia Hills Macchora OP999242 Sicka sublimbata [R1023A sublimbata] Taia Hills Macchora OP999242 Sicka sublimbata [R1023B sublimbata] Taia Hills Macchora OP999242 Sicka sublimbata [R1024] sublimbata] Taia Hills Macchora OP999424 Sicka sublimbata [R1024] sublimbata] Taia Hills Macchora OP999424 Sicka sublimbata [R1024] sublimbata Sicka sublimbata [R1024] sublimbata Sicka sublimbata [R1037A sublimbata] Taia Hills Vira OP99945 Sicka sublimbata [R1037A sublimbata] Taia Hills Vira OP99946 Sicka sublimbata [R1037A sublimbata] Taia Hills Vira OP99946 Sicka sublimbata [R1037A sublimbata] Taia Hills Vira OP99946 Sicka sublimbata [R1037A sublimbata] Taia Hills Mbololo OP99946 Sicka sublimbata [R1037A sublimbata] Taia Hills Vira - Sicka sublimbata [R1037A sublimbata] Taia Hills Vira - Sicka sublimbata [R1047] sublimbata Taia Hills Vira - - Sicka sublimbata [R1047] sublimbata Taia Hills Vira - - Sicka sublimbata [R1047] sublimbata Taia Hills Vira OP99947 Sicka sublimbata [R1047] sublimbata [R	Sticta sublimbata	JR10191	sublimbata1	Taita Hills	Yale	OP999414
Skie sublinka (* 181221.4) Skie sublinka (* 181220.4) Skie sublinka (* 18120.4) Skie subli	Sticta sublimbata	JR10208A	sublimbata5	Taita Hills	Yale	OP999418
Sicia sublimbata[R1022DAsublimbataTaita HillsMwachoraOP99422Sicia sublimbata[R1023DAsublimbataTaita HillsMwachoraOP99422Sicia sublimbata[R10241sublimbataTaita HillsMwachoraOP99424Sicia sublimbata[R10241sublimbataTaita HillsMwachoraOP99424Sicia sublimbata[R105494-Mt KasigauPlot W5-Sicia sublimbata[R10575sublimbataTaita HillsSogallaOP99424Sicia sublimbata[R16375sublimbataTaita HillsVariaOP99425Sicia sublimbata[R16376sublimbataTaita HillsVariaOP99454Sicia sublimbata[R16374]sublimbataTaita HillsVariaOP99455Sicia sublimbata[R16374]sublimbataTaita HillsVariaOP99461Sicia sublimbata[R16374]sublimbataTaita HillsVariaOP99463Sicia sublimbata[R16374]sublimbataTaita HillsMoololoOP99464Sicia sublimbata[R16374]sublimbataTaita HillsMoololoOP99464Sicia sublimbata[R16376]sublimbataTaita HillsMoololoOP99464Sicia sublimbata[R16376]sublimbataTaita HillsMoololoOP99464Sicia sublimbata[R16376]sublimbataTaita HillsMoololoOP99464Sicia sublimbata[R16376]sublimbataTaita HillsMoololoOP99464<	Sticta sublimbata	JR10214B	sublimbata1	Taita Hills	Yale	OP999420
Sicia subilmentani JR1022BD subilmental Taita Hills Mwachora OP999422 Sicia subilmentani JR10241 subilmental Taita Hills Mwachora OP999423 Sicia subilmentani JR10241 subilmental Taita Hills Macha OP999427 Sicia subilmentani JR10282B subilmental Taita Hills Macha OP999427 Sicia subilmentani JR10275 subilmentani Taita Hills Varia OP999427 Sicia subilmentani JR10275 subilmentani Taita Hills Varia OP999451 Sicia subilmentani JR10373 subilmentani Taita Hills Varia OP999455 Sicia subilmentani JR10373 subilmentani Taita Hills Varia OP999455 Sicia subilmentani JR10374 subilmentani Taita Hills Varia OP999456 Sicia subilmentani JR10374 subilmentani Taita Hills Varia OP999463 Sicia subilmentani JR10374 subilmentani Taita Hills Mbololo OP99466 Sicia subilmentani JR10417 subilmentani Taita Hills Varia - Sicia subilmentani JR10417 subilmentani Taita Hills Varia - Sicia subilmentani UK110502 - Taita Hills Parurur OP999473 Sicia subilmentani UK1105054 - Kalia Hills Parurur OP999474 Sicia subilmentani UK1105757 - Kalia Hills Parurur OP999474 Sicia subilmentani UK1105544 - Kalia Hills Parurur OP999474 Sicia subilmentani UK1105757 - Kalia Hills Varia - Sicia subilmentani UK1105757 - Kalia Hills Varia OP994040 Sicia subilmentani UK1105756 - Kalia Hills Varia OP994040 Sicia subilmentani U	Sticta sublimbata	JR10220A	sublimbata2	Taita Hills	Mwachora	OP999421
Sicies sublimbata[R1024]sublimbatalTaita HillsMwachoraOP999423Sicies sublimbata[R1024]sublimbatalTaita HillsMwachoraOP99424Sicies sublimbata[R105494]-Mt KasigauPlot W5-Sicies sublimbata[R10575]sublimbatalTaita HillsSagallaOP99421Sicies sublimbata[R16375]sublimbata2Taita HillsVuriaOP99451Sicies sublimbata[R16376]sublimbata2Taita HillsVuriaOP99455Sicies sublimbata[R16376]sublimbata2Taita HillsVuriaOP994561Sicies sublimbata[R163774]sublimbata2Taita HillsVuriaOP994561Sicies sublimbata[R16374]sublimbata2Taita HillsVuriaOP99461Sicies sublimbata[R16374]sublimbata3Taita HillsMoololoOP99461Sicies sublimbata[R16376]sublimbata3Taita	Sticta sublimbata	JR10228D	sublimbata1	Taita Hills	Mwachora	OP999422
Sicka sublimbataJR10241sublimbata1Taita HillsMachaOP999427Sicka sublimbataJR10282Bsublimbata1Taita HillsMachaOP999427Sicka sublimbataJR10K494-Mt.KasigauPlot W5-Sicka sublimbata1JR10K495-Mt.KasigauPlot W5-Sicka sublimbata1JR10555sublimbata2Taita HillsVuriaOP999451Sicka sublimbata1JR16367asublimbata2Taita HillsVuriaOP999455Sicka sublimbata1JR16377asublimbata2Taita HillsVuriaOP999459Sicka sublimbata1JR16374sublimbata3Taita HillsVuriaOP999459Sicka sublimbata1JR16374sublimbata3Taita HillsMbololoOP999463Sicka sublimbata1JR16417sublimbata3Taita HillsMbololoOP999463Sicka sublimbata1JR16417sublimbata3Taita HillsVuria-Sicka sublimbata1UK110502-Taita HillsVuria-Sicka sublimbata1UK110520A-Taita HillsVuria-Sicka sublimbata1UK110574sublimbata1Taita HillsParuruOP999473Sicka sublimbata1UK1105754-KillmanjaronHome3-Sicka sublimbata1UK1105754-KillmanjaronHome3-Sicka sublimbata1UK1105754-KillmanjaronHome3-Sicka sublimbata1UK1105755-Killma	Sticta sublimbata	JR10230A	sublimbata1	Taita Hills	Mwachora	OP999423
Sticta sublimbataIR10522Bsublimbata1Taita HillisMachaOP99927Sticta sublimbataIR105494-Mt. KasigauPlot VS-Sticta sublimbataIR16275sublimbata2Taita HillisSagalaOP999451Sticta sublimbataIR16357sublimbata2Taita HillisVuriaOP999451Sticta sublimbataIR163670sublimbata2Taita HillisVuriaOP999455Sticta sublimbataIR16373sublimbata2Taita HillisVuriaOP999459Sticta sublimbataIR16374sublimbata3Taita HillisVuriaOP999461Sticta sublimbataIR16374sublimbata3Taita HillisMbololoOP999463Sticta sublimbataIR16417sublimbata3Taita HillisMbololoOP999466Sticta sublimbataIR16418sublimbata3Taita HillisMbololoOP999466Sticta sublimbataUK110510A-Taita HillisNgangaO-Sticta sublimbataUK110510A-Taita HillisNyara-Sticta sublimbataUK11052A-Taita HillisVuria-Sticta sublimbataUK11052A-Taita HillisVuria-Sticta sublimbataUK11053A-Taita HillisVuria-Sticta sublimbataUK110547bsublimbata1Taita HillisVuria-Sticta sublimbataUK110552m-Taita HillisVuriaOP999473Sticta sublimbataUK110552m	Sticta sublimbata	JR10241	sublimbata1	Taita Hills	Mwachora	OP999424
Shich sublimbataJR10K494-Mt. KasigauPlot W5-Shich sublimbataJR10K495-Mt. KasigauPlot W5-Shich sublimbataJR16355sublimbata?Taita HillsVuriaOP994121Shich sublimbataJR16357sublimbata?Taita HillsVuriaOP99453Shich sublimbataJR16367asublimbata?Taita HillsVuriaOP994545Shich sublimbataJR16374sublimbata?Taita HillsVuriaOP99455Shich sublimbataJR16374sublimbata?Taita HillsVuriaOP99461Shich sublimbataJR16374sublimbata?Taita HillsMbololoOP994661Shich sublimbataJR16417sublimbata?Taita HillsMbololoOP994664Shich sublimbataJR16418sublimbata?Taita HillsMbololoOP994664Shich sublimbataUK110510-Taita HillsMora-Shich sublimbataUK110520h-Taita HillsVuria-Shich sublimbataUK110520h-Taita HillsVuria-Shich sublimbataUK11057hsublimbata1Taita HillsVuria-Shich sublimbataUK11057hsublimbata1Taita HillsChawia-Shich sublimbataUK11057hsublimbata1Taita HillsChawia-Shich sublimbataUK11057hsublimbata1Taita HillsUraOP99473Shich sublimbataUK11057hsublimbata1	Sticta sublimbata	JR10282B	sublimbata1	Taita Hills	Macha	OP999427
Sicia sublimbataIR16275sublimbata2Taita HillsSagalaOP999451Sicia sublimbataIR16275sublimbata2Taita HillsVuriaOP999451Sicia sublimbataIR163676sublimbata2Taita HillsVuriaOP999453Sicia sublimbataIR163771sublimbata2Taita HillsVuriaOP999453Sicia sublimbataIR16373sublimbata2Taita HillsVuriaOP999459Sicia sublimbataJR16374sublimbata2Taita HillsVuriaOP999461Sicia sublimbataJR16374sublimbata2Taita HillsMololoOP99463Sicia sublimbataJR16417sublimbata3Taita HillsMololoOP99464Sicia sublimbataJR16418sublimbata7Taita HillsMololoOP99464Sicia sublimbataUK110510-Taita HillsVuria-Sicia sublimbataUK110520-Taita HillsVuria-Sicia sublimbataUK110520-Taita HillsVuria-Sicia sublimbataUK110574sublimbata1Taita HillsVuria-Sicia sublimbataUK110574sublimbata1Taita HillsVuria-Sicia sublimbataUK110574-Taita HillsChavia-Sicia sublimbataUK110574-Taita HillsChavia-Sicia sublimbataUK1105754-Taita HillsVuriaOP999473Sicia sublimbataUK1105754-Kilimanjaro <td>Sticta sublimbata</td> <td>JR10K494</td> <td>-</td> <td>Mt. Kasigau</td> <td>Plot W5</td> <td>-</td>	Sticta sublimbata	JR10K494	-	Mt. Kasigau	Plot W5	-
Sticta sublimbata[R1635]sublimbata9Tata HillsVuriaOP99442Sticta sublimbata[R16367asublimbata2Tata HillsVuriaOP99451Sticta sublimbata[R16367asublimbata2Tata HillsVuriaOP99455Sticta sublimbata[R16373]sublimbata4Tata HillsVuriaOP99455Sticta sublimbata[R16374]sublimbata4Tata HillsVuriaOP99455Sticta sublimbata[R16374]sublimbata2Tata HillsVuriaOP99463Sticta sublimbata[R1641]sublimbata2Tata HillsMoololoOP99463Sticta sublimbata[R1641]sublimbata3Tata HillsMoololoOP99466Sticta sublimbata[R1643]sublimbata3Tata HillsMoololoOP99466Sticta sublimbata[R1643]sublimbata3Tata HillsVuria-Sticta sublimbata[R1643]sublimbata1Tata HillsVuria-Sticta sublimbata[R1643]sublimbata1Tata HillsVuria-Sticta sublimbata[R16197]sublimbata1Tata HillsVuria-Sticta sublimbata[R16197]sublimbata1Tata HillsVuria-Sticta sublimbata[R16197]sublimbata1Tata HillsChavia-Sticta sublimbata[R1619656]-Tata HillsChavia-Sticta sublimbata[R1619657]-Killia HillsVuriaOP999473Sticta sublimbata[	Sticta sublimbata	JR10K495	-	Mt. Kasigau	Plot W5	-
Sicita sublimbata[R16357]sublimbata2Taita HillsVuriaOP99451Sicita sublimbata[R16367b]sublimbata2Taita HillsVuriaOP99455Sicita sublimbata[R16373]sublimbata2Taita HillsVuriaOP99455Sicita sublimbata[R16374a]sublimbata1Taita HillsVuriaOP99459Sicita sublimbata[R16374a]sublimbata1Taita HillsVuriaOP99459Sicita sublimbata[R16374a]sublimbata3Taita HillsMbololoOP99461Sicita sublimbata[R16417]sublimbata3Taita HillsMbololoOP99463Sicita sublimbata[R16413]sublimbata7Taita HillsMbololoOP99464Sicita sublimbataUK11050a-Taita HillsVuria-Sicita sublimbataUK11050a-Taita HillsVuria-Sicita sublimbataUK11050a-Taita HillsVuria-Sicita sublimbataUK11050a-Taita HillsFururuOP99473Sicita sublimbataUK110547bsublimbata1Taita HillsFururuOP99473Sicita sublimbataUK110556a-Taita HillsChavia-Sicita sublimbataUK10557P-KillmanjaroHome3-Sicita sublimbataUK10557P-KillmanjaroHome3-Sicita sublimbataUK10557P-KillmanjaroHome3-Sicita sublimbataUK10557P-Killmanjar	Sticta sublimbata	JR16275	sublimbata9	Taita Hills	Sagalla	OP999442
Sicita sublimbata[R16367a]sublimbata2Taita HillsVuriaOP99455Sitita sublimbataR16373sublimbata4Taita HillsVuriaOP99455Sitita sublimbataR16373sublimbata4Taita HillsVuriaOP99455Sitita sublimbata[R16374csublimbata2Taita HillsVuriaOP99461Sitita sublimbata[R16417sublimbata3Taita HillsMbololoOP99463Sitita sublimbata[R16419sublimbata7Taita HillsMbololoOP99464Sitita sublimbata[R16413sublimbata8Taita HillsNgangao-Sitita sublimbata[R16413sublimbata8Taita HillsNgangao-Sitita sublimbataUK110502-Taita HillsVuria-Sitita sublimbataUK110504-Taita HillsVuria-Sitita sublimbataUK1105474sublimbata1Taita HillsFururuOP999473Sitita sublimbataUK1105574-Taita HillsChawia-Sitita sublimbataUK10652m-KilimanjaroHome3-Sitita sublimbataUK10652m-KilimanjaroHome3-Sitita sublimbataUK106552m-KilimanjaroHome3-Sitita sublimbataUK106552m-KilimanjaroHome3-Sitita sublimbataUK106554tomentosa1Taita HillsVuriaOP99400Sitita tomentosaR10686tomentosa1Taita Hills <td>Sticta sublimbata</td> <td>JR16355</td> <td>sublimbata2</td> <td>Taita Hills</td> <td>Vuria</td> <td>OP999451</td>	Sticta sublimbata	JR16355	sublimbata2	Taita Hills	Vuria	OP999451
Sitchs sublimbataJR16373sublimbata2Taita HillsVuriaOP99455Sitchs sublimbataIR16374Asublimbata1Taita HillsVuriaOP99459Sitchs sublimbataIR16374Asublimbata1Taita HillsVuriaOP99459Sitchs sublimbataIR16374Asublimbata2Taita HillsWorlaOP99461Sitchs sublimbataIR16417sublimbata3Taita HillsMbololoOP99463Sitchs sublimbataIR16419sublimbata3Taita HillsMbololoOP99464Sitchs sublimbataUK10502-Taita HillsVuria-Sitchs sublimbataUK10504-Taita HillsVuria-Sitchs sublimbataUK10504-Taita HillsVuria-Sitchs sublimbataUK10504-Taita HillsFururuOP99473Sitchs sublimbataUK105054-Taita HillsFururuOP99473Sitchs sublimbataUK10556-Taita HillsFururuOP99473Sitchs sublimbataUK105527-KillmanjaroHome3-Sitchs sublimbataUK100557-KillmanjaroHome3-Sitchs sublimbataUK100557-KillmanjaroHome3-Sitchs sublimbataUK100557-KillmanjaroHome3-Sitchs sublimbataUK100557-KillmanjaroHome3-Sitchs sublimbataUK100557-KillmanjaroHome3-Sitchs su	Sticta sublimbata	JR16367a	sublimbata2	Taita Hills	Vuria	OP999454
Sitcla sublimbataIRI6373sublimbata4Taita HillsVuriaOP99458Sitcla sublimbataIRI6374sublimbata2Taita HillsVuriaOP99463Sitcla sublimbataIRI647sublimbata2Taita HillsMbololoOP99464Sitcla sublimbataIRI6419sublimbata7Taita HillsMbololoOP99464Sitcla sublimbataJRI6419sublimbata7Taita HillsMbololoOP99464Sitcla sublimbataJRI6419sublimbata7Taita HillsMbololoOP99464Sitcla sublimbataUK110502-Taita HillsVuria-Sitcla sublimbataUK110504-Taita HillsVuria-Sitcla sublimbataUK110574sublimbata1Taita HillsVuria-Sitcla sublimbataUK110574sublimbata1Taita HillsFururuOP99473Sitcla sublimbataUK110574sublimbata1Taita HillsChavia-Sitcla sublimbataUK110576-Taita HillsChavia-Sitcla sublimbataUK105576-KilimanjaroHome3-Sitcla sublimbataJR10086tomentosa1Taita HillsVuriaOP99400Sitcla undertosaJR10086tomentosa1Taita HillsVuriaOP99409Sitcla undertosaJR10364-KilimanjaroHome3-Sitcla undertosaJR10364-KilimanjaroFIn1-Sitcla undertosaJR10364-Kilimanjaro <td< td=""><td>Sticta sublimbata</td><td>JR16367b</td><td>sublimbata2</td><td>Taita Hills</td><td>Vuria</td><td>OP999455</td></td<>	Sticta sublimbata	JR16367b	sublimbata2	Taita Hills	Vuria	OP999455
Sitcla sublimbata[R16374sublimbata1Taita HillsVuriaOP999463Sitcla sublimbata[R16374sublimbata3Taita HillsMbololoOP999461Sitcla sublimbata[R16417sublimbata3Taita HillsMbololoOP999466Sitcla sublimbata[R16419sublimbata3Taita HillsMbololoOP999466Sitcla sublimbata[R16443sublimbata8Taita HillsMbololoOP999466Sitcla sublimbataUK110510a-Taita HillsVuria-Sitcla sublimbataUK110510a-Taita HillsVuria-Sitcla sublimbataUK11057asublimbata1Taita HillsVuria-Sitcla sublimbataUK110574bsublimbata1Taita HillsFururuOP99474Sitcla sublimbataUK110574bsublimbata1Taita HillsChavia-Sitcla sublimbataUK110576-Taita HillsChavia-Sitcla sublimbataUK105574-KilimanjaroHome3-Sitcla sublimbataUK106577-KilimanjaroHome3-Sitcla sublimbataUK106576-KilimanjaroHome3-Sitcla sublimbataUK10520tomentosa1Taita HillsVuriaOP999400Sitcla tomentosaJR10095Atomentosa1Taita HillsVuriaOP999400Sitcla sublimbataUK10520tomentosa1Taita HillsVuriaOP999426Sitcla tomentosaJR1026tomentosa1 </td <td>Sticta sublimbata</td> <td>JR16373</td> <td>sublimbata4</td> <td>Taita Hills</td> <td>Vuria</td> <td>OP999458</td>	Sticta sublimbata	JR16373	sublimbata4	Taita Hills	Vuria	OP999458
Sticta sublimbataJR16374csublimbata2Taita HillsVuriaOP999461Sticta sublimbataJR16417sublimbata7Taita HillsMbololoOP999463Sticta sublimbataJR16413sublimbata7Taita HillsMbololoOP999464Sticta sublimbataJR16413sublimbata8Taita HillsMbololoOP999466Sticta sublimbataUK110502-Taita HillsVuria-Sticta sublimbataUK110520a-Taita HillsVuria-Sticta sublimbataUK110547asublimbata1Taita HillsVuria-Sticta sublimbataUK110547asublimbata1Taita HillsFururuOP999473Sticta sublimbataUK110547asublimbata1Taita HillsChawia-Sticta sublimbataUK110556a-Taita HillsChawia-Sticta sublimbataUK160557h-KilimanjaroHome1-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataJR1632tomentosa1Taita HillsVuriaOP99400Sticta sublimbataJR16357tomentosa1Taita HillsVuria <t< td=""><td>Sticta sublimbata</td><td>JR16374a</td><td>sublimbata1</td><td>Taita Hills</td><td>Vuria</td><td>OP999459</td></t<>	Sticta sublimbata	JR16374a	sublimbata1	Taita Hills	Vuria	OP999459
Sitela sublimbataJR16417sublimbata3Taita HillsMbololoOP999463Sitela sublimbataJR16413sublimbata7Taita HillsMbololoOP999466Sitela sublimbataUK110502-Taita HillsMbololoOP999466Sitela sublimbataUK110510a-Taita HillsVuria-Sitela sublimbataUK110510a-Taita HillsVuria-Sitela sublimbataUK110520a-Taita HillsVuria-Sitela sublimbataUK1105475sublimbata1Taita HillsFururuOP999473Sitela sublimbataUK110556a-Taita HillsChawia-Sitela sublimbataUK10556a-Taita HillsChawia-Sitela sublimbataUK160552rn-KilimanjaroHome1-Sitela sublimbataUK160557f-KilimanjaroHome3-Sitela sublimbataUK160557f-KilimanjaroHome3-Sitela sublimbataUK160557f-KilimanjaroHome3-Sitela sublimbataUK160557f-KilimanjaroHome3-Sitela tomentosaJR1095Atomentosa1Taita HillsVuriaOP999401Sitela tomentosaJR10365tomentosa1Taita HillsVuriaOP999473Sitela tomentosaJR10365tomentosa1Taita HillsVuriaOP999473Sitela tomentosaJR10364tomentosa1Taita HillsVuriaOP999475 <td>Sticta sublimbata</td> <td>JR16374c</td> <td>sublimbata2</td> <td>Taita Hills</td> <td>Vuria</td> <td>OP999461</td>	Sticta sublimbata	JR16374c	sublimbata2	Taita Hills	Vuria	OP999461
Sticta sublimbataJR16419sublimbata7Taita HillsMbololoOP999464Sticta sublimbataJR16413sublimbata8Taita HillsMbololoOP999466Sticta sublimbataUK110502-Taita HillsNgangao-Sticta sublimbataUK110502-Taita HillsVuria-Sticta sublimbataUK110520a-Taita HillsVuria-Sticta sublimbataUK110547asublimbata1Taita HillsFururuOP999473Sticta sublimbataUK110547asublimbata1Taita HillsFururuOP999474Sticta sublimbataUK110554a-Taita HillsChawia-Sticta sublimbataUK10554a-Taita HillsChawia-Sticta sublimbataUK160557m-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK16057h-KilimanjaroHome3-Sticta sublimbataUK16057h-KilimanjaroHome4-Sticta sublimbataUK16057h<	Sticta sublimbata	JR16417	sublimbata3	Taita Hills	Mbololo	OP999463
Sticta sublimbataItale 443sublimbata8Taita HillsMbololoOP999466Sticta sublimbataUK110502-Taita HillsNganga0-Sticta sublimbataUK110520a-Taita HillsVuria-Sticta sublimbataUK110539d-Taita HillsVuria-Sticta sublimbataUK110539d-Taita HillsVuria-Sticta sublimbataUK110547Asublimbata1Taita HillsFururuOP999473Sticta sublimbataUK110556a-Taita HillsFururuOP999474Sticta sublimbataUK110556a-Taita HillsChawia-Sticta sublimbataUK100556a-KilimanjaroHome1-Sticta sublimbataUK160552m-KilimanjaroHome3-Sticta sublimbataUK160557f-KilimanjaroHome3-Sticta sublimbataUK160559b-KilimanjaroHome3-Sticta sublimbataUK160557f-KilimanjaroHome3-Sticta sublimbataUK160550b-KilimanjaroHome3-Sticta tomentosaJR10260tomentosa1Taita HillsVuriaOP999400Sticta tomentosaJR10567tomentosa1Taita HillsVuriaOP999419Sticta tomentosaJR16362tomentosa1Taita HillsVuriaOP999425Sticta tomentosaJR16368tomentosa1Taita HillsVuriaOP999457Stict	Sticta sublimbata	JR16419	sublimbata7	Taita Hills	Mbololo	OP999464
Sticta sublimbataUK110502-Taita HillsNgangao-Sticta sublimbataUK110510a-Taita HillsVuria-Sticta sublimbataUK110520a-Taita HillsVuria-Sticta sublimbataUK110539d-Taita HillsVuria-Sticta sublimbataUK110547Asublimbata1Taita HillsFururuOP999473Sticta sublimbataUK110547Asublimbata1Taita HillsFururuOP999474Sticta sublimbataUK110554a-Taita HillsChawia-Sticta sublimbataUK160552m-KilimanjaroHome3-Sticta sublimbataUK160552m-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta sublimbataUK160557b-KilimanjaroHome3-Sticta sublimbataUK160557h-KilimanjaroHome3-Sticta tomentosaJR10086tomentosa1Taita HillsVuriaOP999400Sticta tomentosaJR10560tomentosa1Taita HillsVuriaOP999426Sticta tomentosaJR16352tomentosa1Taita HillsVuriaOP999475Sticta tomentosaJR16368tomentosa1Taita HillsVuriaOP999475Sticta tomentosaUK170934c-KilimanjaroFlm1-Sticta tomentosaUK170934c-KilimanjaroFlm1-Sticta tomentosa </td <td>Sticta sublimbata</td> <td>JR16443</td> <td>sublimbata8</td> <td>Taita Hills</td> <td>Mbololo</td> <td>OP999466</td>	Sticta sublimbata	JR16443	sublimbata8	Taita Hills	Mbololo	OP999466
Sticta sublimbataUK110510a-Taita HillsVuria-Sticta sublimbataUK110520a-Taita HillsVuria-Sticta sublimbataUK110539d-Taita HillsVuria-Sticta sublimbataUK110547asublimbata1Taita HillsFururuOP999474Sticta sublimbataUK110547bsublimbata1Taita HillsFururuOP999474Sticta sublimbataUK110554a-Taita HillsChawia-Sticta sublimbataUK100556a-KilimanjaroHome3-Sticta sublimbataUK100552m-KilimanjaroHome3-Sticta sublimbataUK100557f-KilimanjaroHome3-Sticta sublimbataUK100586tomentosa1Taita HillsVuriaOP999400Sticta tomentosaJR10086tomentosa1Taita HillsVuriaOP999409Sticta tomentosaJR10086tomentosa1Taita HillsVuriaOP999426Sticta tomentosaJR16352tomentosa1Taita HillsVuriaOP999437Sticta tomentosaJR16368tomentosa1Taita HillsVuriaOP999457Sticta tomentosaJR16362tomentosa1Taita HillsVuriaOP999457Sticta tomentosaUK170936f-KilimanjaroFlm1-Sticta tomentosaUK170936f-KilimanjaroFlm1-Sticta tomentosaUK170936f-KilimanjaroFlm1-<	Sticta sublimbata	UK110502	-	Taita Hills	Ngangao	-
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Sticta umbilicariiformisUK170821dKlimanjaroFPD4-Sticta umbilicariiformisUK170821humbilicariiformis1KilimanjaroFPD4-Sticta umbilicariiformisUK170826f-KilimanjaroFPD4-Sticta umbilicariiformisUK17082df-KilimanjaroFPD4-Sticta umbilicariiformisUK170842dumbilicariiformis3KilimanjaroFPD3OP999497	Sucu unoncurujormis Stieta umbilioariiformie	UK1708082	umbilicariiformis2	Kilimanjaro	FPD4	OF 777472 OP000402
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Stieta umbilicariiformis UK170842d umbilicariiformis3 Kilimaniaro FPD3 OP999497	Sticta umbilicariiformis	UK170826f	-	Kilimanjaro	FPD4	-
	Sticta umbilicariiformis	UK170842d	umbilicariiformis3	Kilimanjaro	FPD3	OP999497

Species	Collection ID	ITS Variant	Collection Location	n	Accession
Sticta umbilicariiformis	UK170846d	umbilicariiformis3	Kilimanjaro	FPD3	OP999500
Sticta umbilicariiformis	UK170858d	umbilicariiformis3	Kilimanjaro	FPo4	OP999504
Sticta umbilicariiformis	UK171102b	umbilicariiformis1	Kilimanjaro	FED5	OP999531
Sticta umbilicariiformis	UK171106b	umbilicariiformis2	Kilimanjaro	FED5	OP999532
Sticta umbilicariiformis	UK171119b	umbilicariiformis5	Kilimaniaro	FED5	OP999533
Sticta umbilicariiformis	UK171131a	umbilicariiformis5	Kilimaniaro	FED4	OP999534
Sticta umbilicariiformis	UK171131b	umbilicariiformis1	Kilimanjaro	FED4	OP999535
Stieta umbilicariiformis	UK1713200	umbilicariiformis4	Kilimanjaro	FED1	OP999541
Stieta umbilicariiformic	UK1713206	umbilicariiformis4	Kilimanjaro	FED1	OP000542
Stieta umbilicariiformic	UK1713201	umbilicariiformis4	Kilimanjaro	FED1	OP000542
Sticta umbilicariiformic	UK171320g	umbilicariiformia1	Kilimanjaro	FED1	OP000544
	UK171337	unibilicarinorinisi	Killinarijaro Kilina ani ana	FED1	01 999044
Sticta umbilicariiformis	UK171340s	-	Kilimanjaro	FEDI	-
Sticta umbilicariiformis	UK171404e	umbilicariiformisi	Kilimanjaro	FEr4	OP9999546
Sticta umbilicariiformis	UK171405f	umbilicariiformisl	Kilimanjaro	FEr4	OP999547
Sticta umbilicariiformis	UK171411c	umbilicariiformis4	Kilimanjaro	FEr4	OP999550
Sticta umbilicariiformis	UK171429	umbilicariiformis4	Kilimanjaro	FEr3	OP999551
Sticta umbilicariiformis	UK171433a	-	Kilimanjaro	FEr3	-
Sticta umbilicariiformis	UK171435f	-	Kilimanjaro	FEr3	-
Sticta umbilicariiformis	UK171438h	umbilicariiformis4	Kilimanjaro	FEr2	OP999553
Sticta umbilicariiformis	UK171439u	umbilicariiformis1	Kilimanjaro	FEr2	OP999555
Sticta umbilicariiformis	UK171442b	-	Kilimanjaro	FEr2	-
Sticta umbilicariiformis	UK171449i	umbilicariiformis4	Kilimanjaro	FEr2	OP999556
Sticta umbilicariiformis	UK171455h	umbilicariiformis1	Kilimanjaro	FEr2	OP999557
Sticta umhilicariiformis	UK171458h	-	Kilimaniaro	FEr4	-
Sticta umbilicariiformis	UK171467k	-	Kilimanjaro	FEr4	_
Sticta umbilicariiformis	UK1714680	umbilicariiformis3	Kilimanjaro	FPD1	OP999559
Stieta umbilicariiformis	UK171468f	umbilicariiformis3	Kilimanjaro	EPD1	OP000560
Stieta umbilicariiformis	UK1714001	unioncarmorniss	Kilimanjato	FOr2	01 999500
Sticta umbilicarilformis	UK171494K	-	Kilimanjaro	FOC3	-
sticta umbilicariiformis	UK171514C	umbilicariiformis3	Kilimanjaro	FOc5	OP999583
Sticta umbilicariiformis	UK171521f	umbilicariiformis3	Kilimanjaro	FOc5	OP999588
sticta umbilicariiformis	UK171524b	umbilicariiformis3	Kilimanjaro	FPo2	OP999589
Sticta umbilicariiformis	UK171563a	umbilicariiformis2	Kilimanjaro	FED2	OP999593
Sticta umbilicariiformis	UK171569d	umbilicariiformis4	Kilimanjaro	FED2	OP999594
Sticta umbilicariiformis	UK171577h	umbilicariiformis1	Kilimanjaro	FPD2	OP999596
Sticta umbilicariiformis	UK171578t	-	Kilimanjaro	FPD2	-
Sticta umbilicariiformis	UK171584x	umbilicariiformis2	Kilimanjaro	FPD2	OP999602
Sticta umbilicariiformis	UK171584y	umbilicariiformis1	Kilimanjaro	FPD2	OP999603
Sticta umbilicariiformis	UK171590j	umbilicariiformis3	Kilimanjaro	FPo3	OP999608
Sticta sp. A (fuliginoides agg.)	UK170858f	A1	Kilimanjaro	FPo4	OP999506
Sticta sp. A (fuliginoides agg.)	UK170884b	A1	Kilimaniaro	FPo5	OP999508
Sticta sp. A (fuliginoides agg.)	UK171519h	A1	Kilimaniaro	FOc5	OP999586
Sticta sp. A (fuliginoides agg.)	UK1715210	-	Kilimaniaro	FOc5	-
Sticta sp. B (ciliata ago)	IR09D8A	B1	Taita Hills	Ngangao	OP999386
Sticta sp. B (ciliata 2003)	IR10060C	B1 B2	Taita Hills	Shomoto Hill	OP000306
Sticta sp. B (ciliata agg.)	LIK 170702~	B1	Kilimaniaro	FOr2	OP00040E
Stieta en B (ciliata esc.)	UK170/924	DI B1	Kilimaniara	FOLZ	OD000E14
Chiefa and C (chiefa agg.)	UN1/0901D		Kiimanjaro	ruu4 Chaui-	OF9999314
Niciu sp. C (weigein agg.)	JK090A3			Cnawia	OP999380
sticta sp. C (weigelii agg.)	JR10180B	CI	laita Hills	Yale	OP999411
sticta sp. C (weigelii agg.)	JR10180C	-	Taita Hills	Yale	-
Sticta sp. C (weigelii agg.)	JR10212B	C1	Taita Hills	Yale	OP999419
Sticta sp. C (weigelii agg.)	JR14634/082	-	Taita Hills	Maktau Hill	-
Sticta sp. C (weigelii agg.)	JR16201a	C2	Taita Hills	Fururu	OP999439
Sticta sp. C (weigelii agg.)	JR16201b	C2	Taita Hills	Fururu	OP999440
Sticta sp. C (weigelii agg.)	JR16295	C1	Taita Hills	Sagalla	OP999444
Sticta sp. C (weigelii agg.)	JR16310	C1	Taita Hills	Sagalla	OP999445
Sticta sp. C (weigelii agg.)	JR16439	C1	Taita Hills	Mbololo	OP999465
Sticta sp. C (weigelii agg.)	JR16462	C1	Taita Hills	Mbololo	OP999467
Sticta sp. C (weigelii agg.)	UK110555e		Taita Hills	Chawia	-
Sticta sp. D	UK171519k	D1	Kilimaniaro	FOc5	OP999587
Sticta sp. D	UK171586a	D1	Kilimaniaro	FPo3	OP000606
Sticta en 2	IR00V12h	-	Taita Hille	Mbalala	-
Sticta sp. 2	ID00V12	-	Taita Lills	Mbalala	-
Sticte on 2	JAUY 1 15 ID101/202	-		Diat E15	- OD000420
Sucu sp. 2	JK10K502	sp. ∠	wit. Kasigau	PIOT E15	OF999430
ticks on 1	TK10K303	sp. 2	Mt. Kasigau	Plot E15	OP999431

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