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H. J. BEENTJE

A MONOGRAPH ON STROPHANTHUS DC. (APOCYNACEAE)

Proefschrift
ter verkrijging van de graad van
doctor in de landbouwwetenschappen,
op gezag van de rector magnificus,
dr. C. C. Oosterlee,
hoogleraar in de veeteeltwetenschap,
in het openbaar te verdedigen
op vrijdag 3 december 1982
des namiddags te vier uur in de aula
van de Landbouwhogeschool te Wageningen

H. VEENMAN & ZONEN B. V. – WAGENINGEN – 1982

STELLINGEN

1.

Strophanthus is nauw verwant met *Nerium* en *Adenium*.

2.

De morfologie van antheren, clavuncula, en de verbindingen hiertussen, vormt een goed kenmerk ter opsplitsing van de *Apocynaceae* in onderfamilies en tribus.

(P. T. NGAN (1965) – A revision of the genus *Wrightia*, Ann. Missouri Bot. Garden 52,2: 115–175)

3.

De Sangha Rivier Interval gaat niet op voor de verspreiding van *Strophanthus* soorten.

(F. WHITE (1979) – The Guineo-Congolian Region and its relationships to other phytochoria, Bull. Jard. Bot. Belg. 49: 11–55)

4.

Sloten vormen een bij uitstek Nederlands biotoop; daarom dient getracht te worden cultuurtechnische maatregelen in typische slootgebieden meer in overeenstemming te brengen met de biologische waarden van deze sloten.

(Uitvoeringsbesluit ruilverkaveling Giethoorn/Wanneperveen 1982)

5.

Waterpeilverlaging in veengebieden is vergelijkbaar met Sisyphus-arbeid en dient daarom te worden afgeraden.

6.

Hoewel de bijzonder fraaie slootvegetaties van Noordwest Overijssel bestaan dankzij het beheer van de boeren, dreigen zij door overmatige industrialisatie van de landbouw tot afvalgreppels te vervallen.

7.

In de duinen van Europa dient meer naaldhout te worden vervangen door hier van nature voorkomende vegetaties.

8.

Op toeristenkaarten van Nederland dient het weinige reliëf, dat ons land kent, duidelijker te worden weergegeven.

(ANWB kaarten 1:100.000)

9.

De rechten van de mens gaan vergezeld van de plicht de rechten der dieren te erkennen; walvisachtigen en mensapen dienen rechten te krijgen, vergelijkbaar met de rechten van de mens.

10.

Het mooiste wat we kunnen beleven, is het mysterie.

(A. EINSTEIN (1937) – What I believe)

11.

De ware reiziger loopt.

H. J. BEENTJE – A monograph on the genus Strophanthus (Apocynaceae)

Wageningen, 3 december 1982

ABSTRACT

1. This monograph is written on the genus Strophanthus, and is mainly based on the study of herbarium material.
2. The genus occurs in Africa including Madagascar, and in South Asia.
3. From the 141 taxonomic names existing, 38 species are recognized, one of which has 2 varieties. Forty-five names are reduced to synonyms for the first time.
4. The general part of the monograph consists of short paragraphs on various subjects.
5. The systematic part consists of a genus description, a discussion of the relationships within the genus, separate keys for flowering and fruiting specimens, and species diagnoses with lists of synonyms, uses and local names, phenology, notes on systematics, and illustrations. Lists of doubtful species, intermediates, nomina nuda, exluded species, old commercial names, and a index of exsiccatae are provided.

SAMENVATTING

Deze publicatie is een taxonomische revisie van het genus Strophanthus, op monografische wijze samengesteld. De auteur heeft van 7 soorten zelf veldstudies gemaakt en herbarium verzameld; tevens heeft hij enkele soorten levend in de kas geobserveerd.

In deze revisie is voor alle soorten materiaal geanalyseerd en zijn compleet nieuwe beschrijvingen opgesteld. De determinatietabellen zijn door verschillende collegae getest.

Van de 141 taxa, die beschreven waren binnen het genus, zijn in deze publicatie 38 soorten gehandhaafd; één soort telt 2 variëteiten. 45 namen worden hier voor het eerst tot synoniem gereduceerd.

De revisie bestaat uit een algemeen en een taxonomisch gedeelte.

Het algemene gedeelte bevat hoofdstukken over geschiedenis, geografie, enige biologische aspecten, chemie en medicinale eigenschappen, palynologie, chromosomen, locale namen en verwantschappen met andere genera.

Het taxonomische gedeelte bevat een genusbeschrijving, een bespreking van de verwantschappen binnen het genus, determinatietabellen voor bloeiende of vruchtdragende planten, diagnoses voor de soorten inclusief verspreidingskaartjes en tekeningen en aan het eind van de revisie zijn lijsten opgenomen van soortsnamen, waarvan de identiteit niet te achterhalen is, van tussenvormen, nomina nuda, soorten die tot andere genera behoren en van oude handelsnamen; tot slot een index van exsiccatae.

CURRICULUM VITAE

Henk Jaap Beentje werd op 7 november 1951 geboren te Bakkum (NH).

Na het gymnasium β diploma te Alkmaar behaald te hebben, legde hij aan de Universiteit van Amsterdam het doctoraal examen in de biologie in 1978 met goed gevolg af, met als hoofdvak: plantensystematiek van de tropen en de subtropen, waaraan hij vooral te Wageningen werkte; en als bijvakken vegetatiekunde en milieukunde.

Van 1979 tot 1982 was hij werkzaam bij de vakgroep Plantensystematiek en -geografie van de Landbouwhogeschool te Wageningen, op een promotiebeurs van genoemde instelling.

Hij is getrouwd en heeft een zoon.

CONTENTS

INTRODUCTION AND ACKNOWLEDGEMENTS

The present publication is a monograph on the genus *Strophanthus,* represented by 30 species in continental Africa, 1 on Madagascar, and 7 species in Asia. This monograph is based on the study of approximately 4700 herbarium specimens preserved in 54 herbaria. Living plants of 9 species were studied in the field and in cultivation.

The last revision of *Strophanthus* as a whole was made by GILG (1903), who studied about 250 herbarium specimens. At present flowering specimens abound, but of some species fruiting material is scarce, and of 3 species no fruits are known.

Fortunately, most of the type material could be traced. In many cases lectotypes were designated by the present author, while 5 neotypes had to be chosen. Of 100 species and 41 infraspecific taxa previously published, 38 species and 2 infraspecific taxa are maintained.

The distribution maps are the first ever made for *Strophanthus* (except for some country-specific maps for Ghana and South Africa). Nine species are illustrated for the first time, and new drawings were made for all the other species.

Two keys are provided, one based on flowering and one on fruiting specimens. Specimens without either flowers or fruits proved to be very difficult to identify.

The author is very grateful to the following persons and institutions:

Dr. A. J. M. LEEUWENBERG for his invaluable professional guidance throughout the course of this monograph, and his thorough checking of the final text;

Miss Y. F. TAN and Miss J. WILLIAMSON for their professional drawings and their advice for his own drawings. Plates 6-7-8-12-13-14-15-18-19-22-26-27-29-30-31-32-33-35-36-39-41-42-43-45 were made by Miss TAN; plates 17-20-24 and parts of plates 10-21-34-38 were made by Miss WILLIAMSON; plates 1-2-3-4-5-9-11-16-23-25-28-37-40-44 and parts of plates 10-21-34-38 were made by the author;

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The directors and curators of the herbaria cited below, for putting their material at my disposal:
A, AAU, B, BM, BOL, BP, BR, C, CAL, COI, E, EA, FHO, FI, G, GB, GENT, GOET, HAL, HBG, K, L, LD, LE, LINN, LISC, LISJC, LISU, M, MAU, MO, MPU, NH, NY, OXF, P, PRE, S, SAM, SING, SRGH, TCD, U, UC, UPS, US, W, WAG, WU, YA, Z, ZT.

GENERAL PART

HISTORY OF THE GENUS

A. P. DE CANDOLLE (1802) described the genus *Strophanthus*, basing it on *S. hispidus, S. sarmentosus* and one of its synonyms, and on *S. caudatus* which had already been described in *Echites* by LINNAEUS (1767). A. P. DE CANDOLLE placed *Strophanthus* between *Nerium* and *Echites,* as he considered these genera the most related ones. The name *Strophanthus* comes from the Greek *στρὸφος*, twisted band, and *ἄνθος*, flower, referring to the twisted corolla tails.

G. DON (1837) enumerated 9 species, and A. DE CANDOLLE (1844) 11; between 1870 and 1903 the number of new names increased rapidly, due to the large amount of taxonomic work done on the genus. This was a result of pharmaceutical interest, as seed extracts were used for the regulation, and slowing, of the heartbeat. Important revisions of these years were those by PAX (1892) with 25 species, FRANCHET (1893b) with 34 species, and SCHUMANN (1897, 1900) with 29 species; STAPF (1902, 1904) recognized 29 species from continental Africa, and GILG (1903) made the last complete revision, treating 43 species: 31 from continental Africa, 2 from Madagascar, and 10 from Asia. By this time the genera *Cercocoma, Christya, Roupellia* and *Zygonerion* had been reduced into the synonymy of *Strophanthus.*

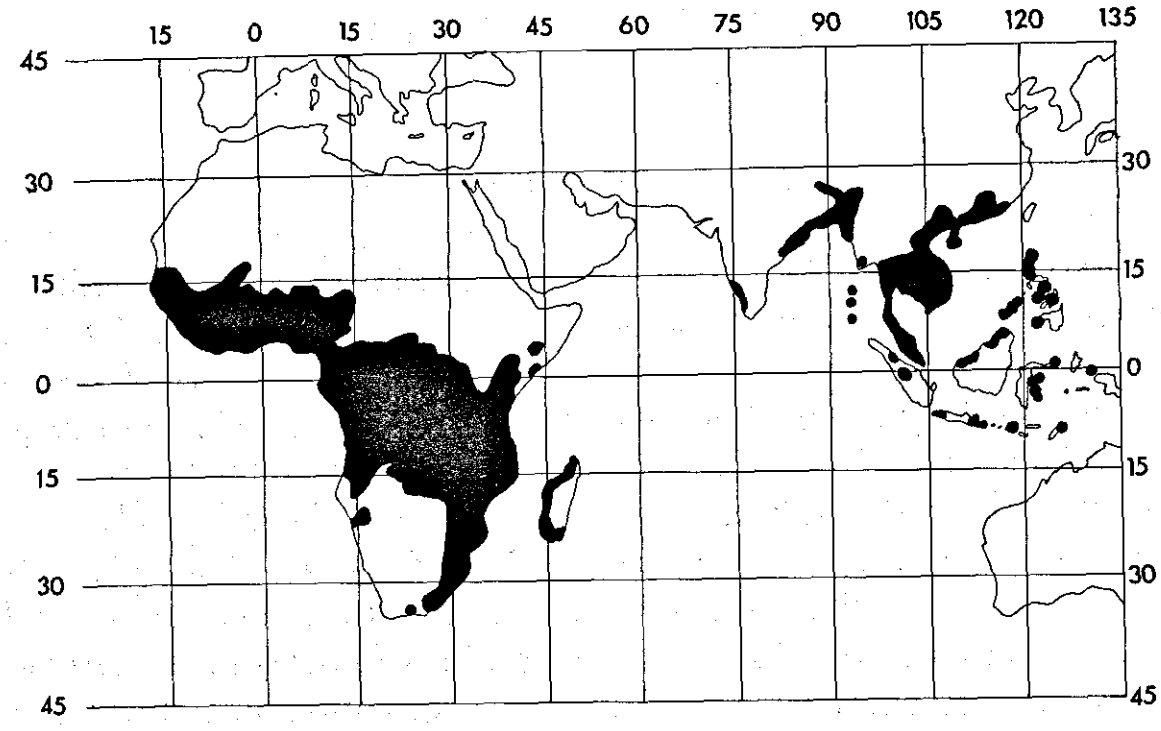
GILG supposed that not many new species were to be discovered, but after 1903, 24 new species and 12 infra-specific taxa have been described. After 1903 two important regional revisions were published: HUTCHINSON & DALZIEL (1931) and HUBER (1963) for West Africa, and STANER & MICHOTTE (1934) for Zaïre. PICHON (1950) reviewed *Strophanthus* on the genus level, and attributed 40 African and 12 Asian species to it. He based two monotypic genera, *Christya* from S. Africa, and *Roupellina* from Madagascar, on species formerly placed in *Strophanthus.*

In the years 1949–1951, interest in the genus grew again, when seeds of *Strophanthus* species were considered to be the main source of the anti-arthritic drug cortisone. Six separate expeditions were organized to comb Africa for *Strophanthus,* and large amounts of herbarium material were gathered; but as the seeds varied considerably in quality, even within the same species, interest faded, and cortisone was soon synthesized from other plants. KRUKOFF & LETOUZEY (1950) published on the material from one of those expeditions, and MONACHINO (1950, 1951, 1953) studied more than 3000 specimens: he named a new section and two new species, while rejecting some superfluous names.

The last comprehensive key was published by GILG (1903).

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY

The distribution of the genus is shown on MAP 1. *Strophanthus* is found in



MAP 1. Distribution of the genus *Strophanthus* DC.

the tropics of the Old World; none of the species is represented in both Africa and Asia.

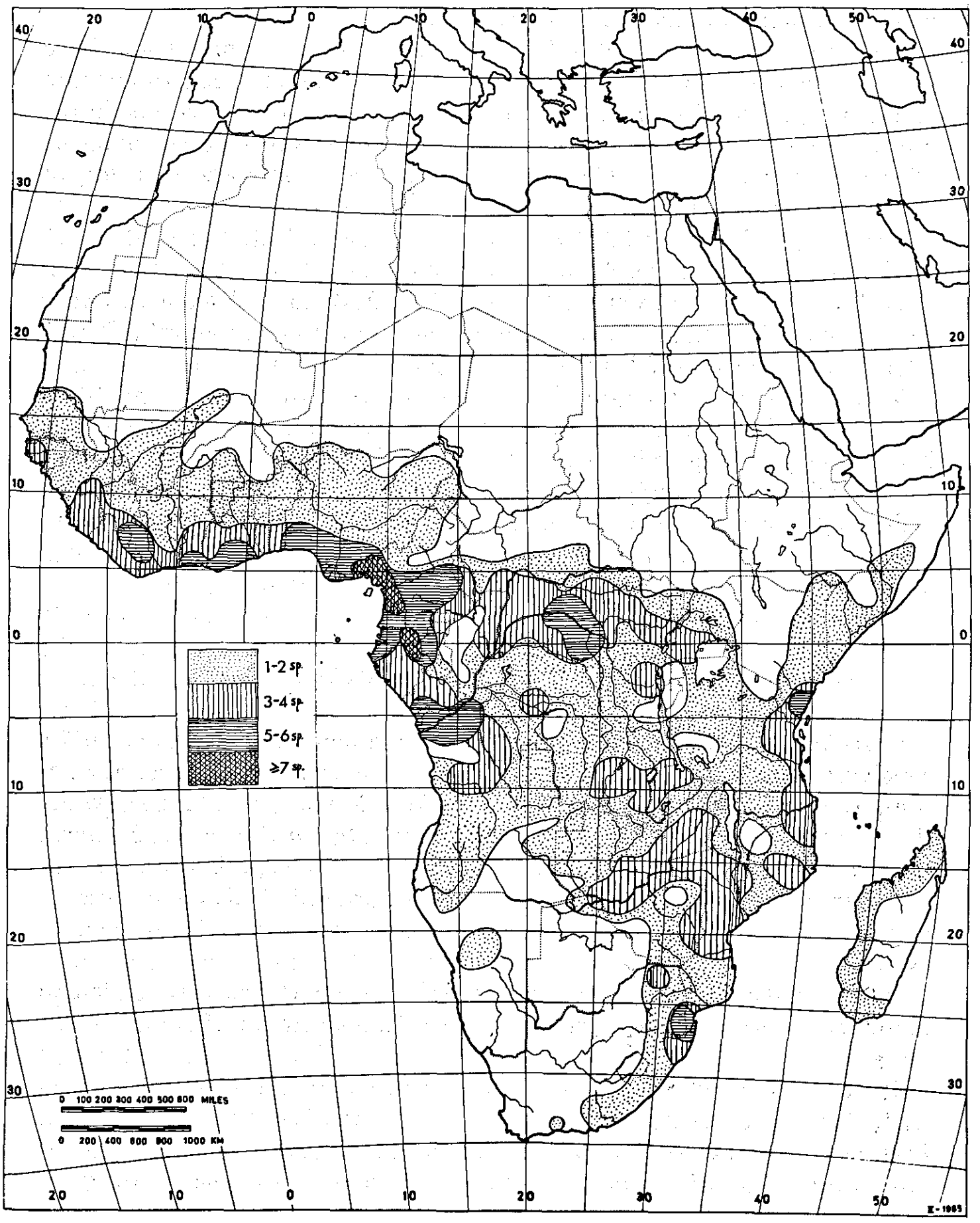
The distribution areas of the species show a great range of variation. Six species are widely distributed: in Africa, *S. amboensis, S. eminii, S. hispidus* and *S. sarmentosus* var. *sarmentosus* occur in more than one phytochorion sensu WHITE 1979 and also, except for *S. eminii,* sensu DENYS 1980 (a phytochorion is a phytogeographical unit with at least 50% of its species confined to it, and with at least one thousand endemic species). In Asia, *S. caudatus* and *S. wallichii* seem to occur in more than one main phytogeographical unit, but correlation between African and Asian distribution areas is difficult.

10 species occur in Africa in a single phytochorion as well as in one or more transition zones or regional mosaics (sensu WHITE 1979). 22 species are endemic to a single phytochorion or (in 3 cases) to a single transition zone; in Africa 10 species are endemic to the Guineo-Congolian Region, 1 to the Zambezian Region, 3 to the Afromontane Region (sensu DENYS 1980), and 1 species is endemic to the Guineo-Congolia/Zambezia Transition Zone.

MAP 2 illustrates the number of sympatric species per area. The largest numbers of sympatric species are correlated with the areas with the highest rainfall. Only 2 species, *S. amboensis* and *S. mirabilis,* grow in very dry areas.

S. arnoldianus, S. bequaertii, S. puberulus and *S. sarmentosus* var. *glabriflorus* have, according to the studied material, a very restricted distribution area.

Some species show gaps in their currently known areas of distribution. In some cases, this is due to very incomplete botanic knowledge of certain areas, as for example the western part of the border between Tanzania and Moçambique, and large parts of Kalimantan (Borneo). Other gaps are probably caused by areas of comparatively low rainfall (e.g. *S. congoensis, S. mortehanii*), or to



MAP 2. Number of sympatric species per area.

gaps in the rain forest itself (e.g. *S. gratus, S. barteri*).

The areas of distribution of *S. hispidus* and *S. sarmentosus* presumably have become smaller due to the encroachment of the desert in the Sahel, for no more plants were collected in their formerly northernmost distribution area in the last fifty years. Also, *S. parviflorus* and *S. sarmentosus* were collected in a part of their distribution area in Congo and adjacent Zaïre much less frequently in the last fifty years than previously.

Three pairs of closely related vicarious species are to be found in Africa. *S. gardeniiflorus* from Central Africa is morphologically close to *S. thollonii* from West Africa; *S. hispidus* from Western and Central Africa is related to *S. kombe* from Eastern Africa; and *S. sarmentosus* from Western and Central Africa is related to *S. petersianus* from Eastern Africa.

Most *Strophanthus* species, and especially those from the forest, are relatively rare in their distribution area. Several species, predominantly from woodland habitats, may be frequently encountered within their area, but only *S. divaricatus, S. eminii,* and *S. nicholsonii* are common in part of their area. *S. eminii* is the only species reported as abundant in places (BUSSE 1900, 1912).

HABIT AND GROWTH

Most *Strophanthus* species are sarmentose and lianescent, and even species which usually grow as shrubs are occasionally lianescent. The only species that is exclusively a shrub or tree is *S. boivinii* from Madagascar. Predominantly shrubby species grow in the drier woodlands and *Acacia* steppes: i.e. *S. eminii, S. hypoleucos, S. mirabilis, S. nicholsonii, S. vanderijstii* and probably *S. sarmentosus* var. *glabriflorus*. All other species are either exclusively lianas, or sarmentose shrubs in more open habitats which become lianescent when support is available.

Lianas wind either to the right or to the left, or support themselves on lateral branches. Lianas of over 100 m long and with a diameter of 25 cm have been observed.

The architecture of *Strophanthus* is not very clear. *S. boivinii* branches exclusively dichotomously, and shows elements of the models of KWAN-KORIBA and LEEUWENBERG (HALLÉ, OLDEMAN & TOMLINSON 1978). Other species (e.g. *S. sarmentosus, S. welwitschii*) show distinct affinities with the model of CHAMPAGNAT.

Flowering takes place terminally, often on short lateral branches which bear 2–5 pairs of leaves below the inflorescence. But several species (e.g. *S. mortehanii, S. sarmentosus,* and *S. welwitschii*) often show short inflorescence-bearing lateral branches, where flowers appear before the leaves, even when other parts of the plant are already bearing leaves. Short inflorescence-bearing branches occur in general on long sarmentose shoots.

MORPHOLOGY

Roots: very few data are available on the underground parts of *Strophanthus*. A few species from woodland habitats were reported to have thick, fleshy, and moniliform roots (Fig. 1). *S. vanderijstii* produces many shoots from a subterraneous rootstock running parallel to the surface. In other species (e.g. *S. gratus*, *S. nicholsonii*) taproots were reported.

Trunk and branches: in several species the lenticels become larger and lignified on older branches, forming knobs or, as in *S. gratus* and *S. sarmentosus*, longitudinal corky ridges.

In *S. courmontii, S. gerrardii* and *S. petersianus,* triangular corky protuberances may form at the nodes, and in *S. gerrardii* these protuberances lengthen and combine with the lignified lenticels to form long corky ridges.

In some plants the latex has been observed to be white in the roots, trunk, and older branches, while it was clear in the younger branches and leaves.

Stipules: true stipules do not occur in *Strophanthus,* although several authors (e.g. LUBBOCK 1891, GILG 1903, and GLÜCK 1919) have interpreted the small colleters in the axil of the petiole as such. These colleters are situated at the very base of the petiole, and remain on the stem when the leaf is shed; but in *S. speciosus* they are situated on the base of petiole, and are shed with the leaf (Fig. 1). These colleters resemble the colleters in the axil of the bracts and sepals.

Corolla: the tube may widen near its base (in *S. gerrardii*) or near its mouth (in *S. bullenianus*) or at various levels in between.

The 10-lobed corona with partly fused pairs of lobes is typical for the genus, but varies considerably in shape and size.

The corolla lobes also vary considerably; one extreme is *S. gratus,* with nearly orbicular lobes, and at the other end of the range is *S. preussii,* with lobes that narrow at their apex into linear tails up to 30 cm long. Several species from Asia bear very small flowers, with lobes which may be only 4 mm long in *S. singaporianus*; four species from Africa have large untailed lobes which are acute at the apex; and *S. boivinii* has long undulate lobes which are obtuse at the apex.

Seeds: in some species the beak of the grain may bear the coma over its whole length, but in most species the part of the beak next to the grain is glabrous, and the coma is borne on the apical part of the beak. Only in *S. bullenianus* the coma is implanted on the grain itself as well as on the beak.

The shape of the grain, as well as the length of the beak and the coma, are influenced to some degree by the relative position of the seed in the follicle.

FLOWERING AND FRUITING SEASONS

If distinct dry and rainy seasons alternate in their distribution area, *Strophanthus* species flower towards the end of the dry and the beginning of the rainy season; fruits are then mature in the dry season. If no distinct dry period occurs,

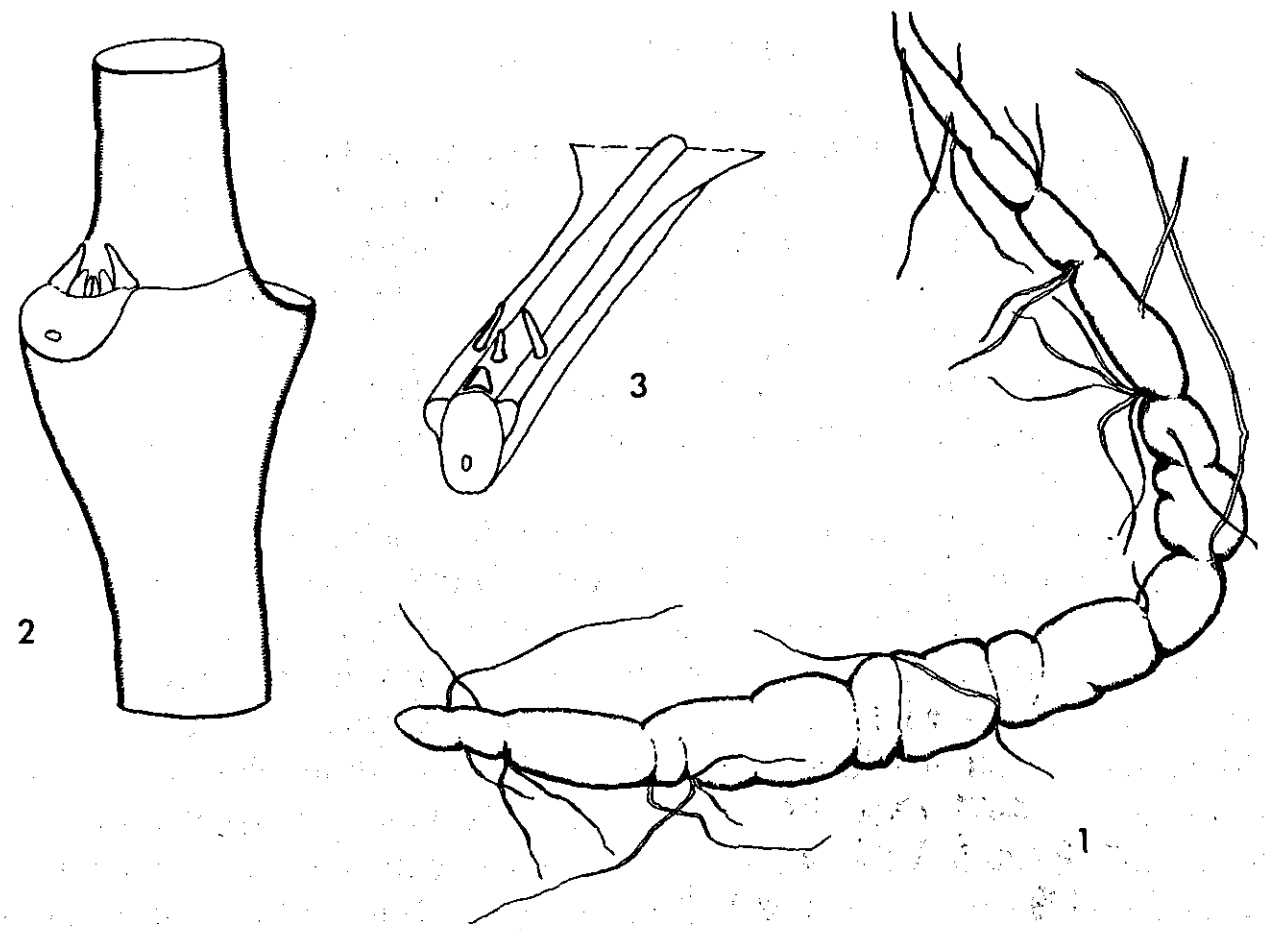


FIG. 1. 1. *Strophanthus kombe* Oliver: moniliform roots of a young plant, $\frac{2}{3}$ ×; 2. *Strophanthus thollonii* Franch.: leaf scar with colleters, 6 ×; 3. *Strophanthus speciosus* (Ward & Harvey) Reber: base of petiole with colleters, 6 ×. (1. after FRASER 1890; 2. *Beentje 1551*; 3. *Beentje 1619*).

some species flower the whole year round with a peak in the relatively driest period, and others in this driest period.

In ten woodland species the flowers appear before the leaves, but flowering continues when the leaves appear at the beginning of the rainy season.

POLLINATION

Except for a report of the butterfly *Danais chrysippus* visiting flowers of a cultivated *S. speciosus* (MARLOTH 1932), no data on pollinators of *Strophanthus* seems to exist.

Indications for psichophily or butterfly pollination can be found in the morphology of the flowers, the fragrance reported for many species, and the predominant colour pattern: white or yellow outside, sometimes contrasted with pink, red, or purple, and white or yellow inside with a corona that is most often red or purple, with red or purple streaks and spots leading from the corona lobes to the base of the anther cone (Fig. 2). Movements of the corolla tails in the wind could also be attractive to possible pollinators (FAEGRI & VAN DER PIJL 1979).

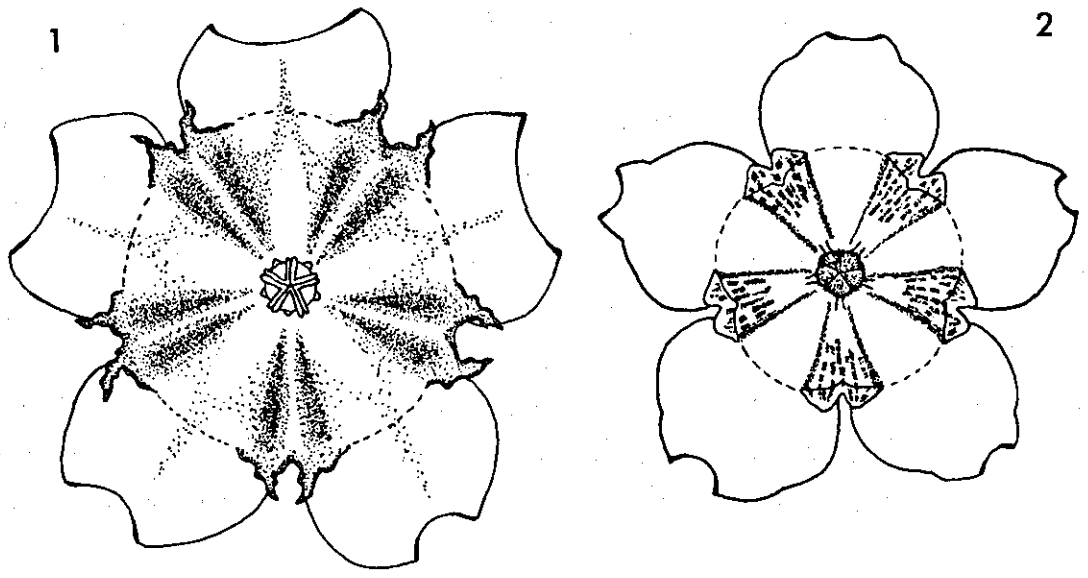


FIG. 2. 1. *Strophanthus sarmentosus* DC.: corolla from above, $1\frac{1}{2}\times$; 2. *Strophanthus preussii* Engl. & Pax: corolla from above, $1\frac{1}{2}\times$. (1. *Beentje 1621*; 2. *Beentje 1548*).

The anther cone seals off the clavuncula and stigma from above and from the sides. In experiments carried out with cultivated *S. gratus* by WIT (1941), pollination where pollen was applied to the apex of the clavuncula and the stigma led to fertilization in 1% of all flowers; but when pollen was applied to the base of the clavuncula, this led to fertilization in 60% of the flowers. This supports the thesis of SCHUMANN (1897) that the inner side of the reflexed frill at the base of the clavuncula is the receptive zone.

DISPERSAL OF SEEDS

The mature fruit splits along the adaxial side longitudinally, exposing the seeds to the wind (Fig. 3). The seed coma reacts mechanically to changes in atmospheric humidity, being almost erect and pressed closely together in damp air, and spreading in dry air; by this motion the seeds move, to some extent, out of the fruit.

In Cameroun I observed *Strophanthus* seeds floating at treetop level for considerable distances.

FIG. 3. *Strophanthus sarmentosus* DC.: cross sections of follicle, to show opening of follicle; only exo- and endocarp drawn; $\frac{2}{3}\times$. (*Beentje 248*).

ANATOMY

According to METCALFE & CHALK (1950) the leaf stomata are of the rubiaceous type, and small accessory bundles are present in the petiole, as in *Nerium* and *Wrightia*.

CHI (1957) described the xylem anatomy, and mentions as distinguishing generic characters: the presence of irregular, ragged marginal parenchyma; the absence of septate fibres; and the 1-3–seriate rays.

Details of seed-, fruit-, and leaf anatomy were described and illustrated by BLONDEL (1888a), FRASER (1890), PLANCHON (1894), and TSIRCH & OESTERLE (1900). The vascular anatomy of the flower was described in WOODSON & MOORE (1938).

CHEMISTRY AND PHARMACOLOGY

REICHSTEIN (1963) observed '*Strophanthus* is a particularly unfavourable object in which to study the connection between chemistry and taxonomy'. However, he published many articles on its chemistry, and proved that differences in glycoside composition in the seed are genetically determined within four chemical forms of *S. sarmentosus*; these forms are geographically and ecologically separate, and show minor morphological differences in the fruit.

Most chemical studies are on the composition of the seed glycosides; studies comparing several species are those of BISSET (1953, 1955), HEFTMANN et al. (1954), and WATT & BREYER-BRANDWYCK (1962). Based on their results, four groups of species can be distinguished according to their seed glycosides:

OUABAIN GROUP

- S. gardeniiflorus
- S. gratus
- S. thollonii

SARMENTOGENIN/SARVEROGENIN GROUP

- S. welwitschii (this species has some affinities with the Ouabain group)
- S. amboensis
- S. congoensis
- S. courmontii
- S. gerrardii
- S. petersianus
- S. sarmentosus

STROPHANTHIDIN/STROPHANTHIDOL/PERIPLOGENIN GROUP

- S. arnoldianus
- S. barteri
- S. eminii
- S. gracilis
- S. hispidus
- S. hypoleucos
- S. kombe
- S. ledienii
- S. mirabilis
- S. mortehanii
- S. nicholsonii
- S. preussii

DIVARICOSIDE/CAUDOSIDE GROUP

- S. caudatus
- S. divaricatus
- S. wightianus

Other chemical constituents, e. g. triterpenes, saponins, and alkaloids, have hardly been investigated.

Bibliographies on chemical and pharmaceutical investigations within the genus, covering large numbers of publications, are given in DE VISSER SMITS (1951), BISSET (1953, 1955) and REICHSTEIN (1963).

Serious doubts should be cast on the determination of material consisting only of seeds. Investigations carried out with such material do not have a very firm base.

PALYNOLOGY

The pollen of 17 species has been studied by Dr. S. NILSSON of the Palynological Laboratory of the Naturhistoriska Riksmuseet of Stockholm. Although there is a certain variability in pore size and -number, as well as in the inner surface, this does not seem systematically significant (personal communication by Dr. NILSSON, 24 May 1982).

CHROMOSOME NUMBERS

(by J. C. ARENDS and F. M. VAN DER LAAN)

Squash preparations of root tips of *S. divaricatus* (voucher *van der Laan 340*), *S. gratus* (voucher *Leeuwenberg 12030*), *S. hispidus* (voucher *Leeuwenberg 12365*), and *S. sarmentosus* (voucher *Beentje 1621*), all four plants belonging to the living plant collection of the Department of Plant Taxonomy and Plant Geography, yielded $2n = 18$ chromosomes. Photographs 1 and 2 show the chromosomes as observed in the root tip cells of *S. divaricatus* and *S. sarmentosus* respectively.

Some of the chromosomes always show a centromere region which is relatively long when compared to those of the other chromosomes (see arrows). This feature is particularly evident when chromosomes are observed in late prometaphase. It explains why WITKUS (1951) invariably published $2n = 20$ for all species he investigated. It is often possible to indicate in the photographs given by WITKUS several chromosomes which in fact represent two arms of a single chromosome.

The record of $2n = 18$ by SNOAD (1952), MANGENOT & MANGENOT (1962), and MIÈGE (1962) is corraborated by this investigation.

A number of $2n = 18$ is not frequent within the *Apocynaceae*: the majority of species have numbers based on $x = 11$. Nevertheless a number of $2n = 22$ for *S. caudatus* is given by ROY TAPADAR & SEN (1960), and $n = 11$ for *S. wallichii* (voucher *Bedi 25488*, not seen) by BEDI et al. (1981).

Most countings in literature are not supported by vouchers, and therefore of doubtful value.

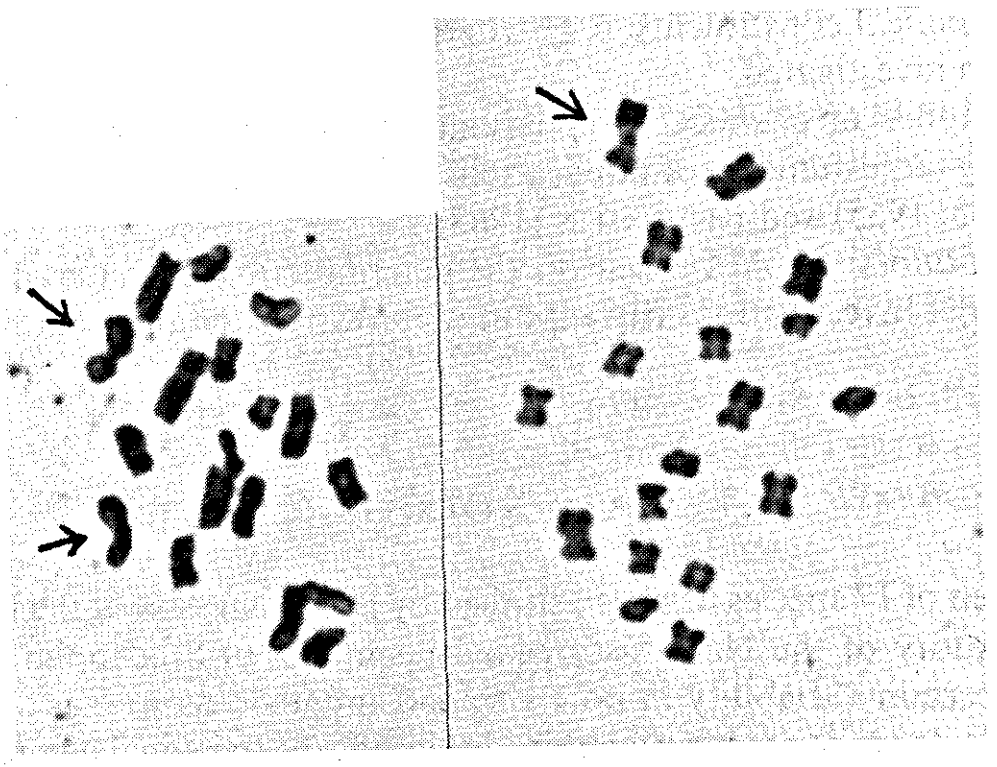


PHOTO 1. Somatic chromosomes in the root tip cells of *S. divaricatus*.

PHOTO 2. Somatic chromosomes in the root tip cells of *S. sarmentosus*.

Arrows indicate chromosomes with a relatively long centromere. Both photographs × 3000. Hydroxyquinolin pretreatment, orcein staining, phase contrast. Photographs by J. C. AREND S.

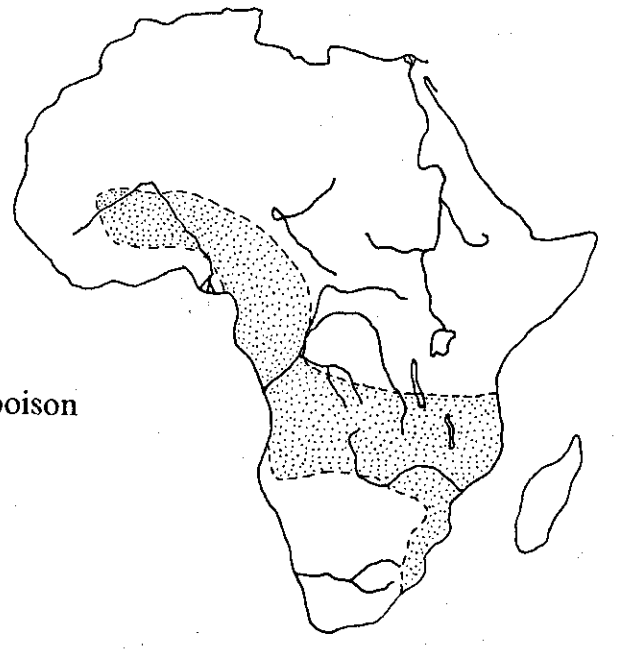
LOCAL NAMES

From the field notes on the herbarium labels, an extensive, very heterogenous list of local names was compiled, covering nearly all species. Sometimes a name is used for more than one species: in the Turumbu language (Zaïre) 'Libobo' is used for 5 species, sometimes with a specific epithet as 'li tokembe' for *S. hispidus*, or 'li baina' for *S. preussii*. Names with the root '-bulembe' are used for 6 species in nine different languages in Angola, Zaïre, and Zambia.

With the descriptions of the individual species, local names are given only when such names were reported at least twice and by different collectors.

USES AND ECONOMIC IMPORTANCE

Since time immemorial, *Strophanthus* seeds and latex were used in Africa and Asia for the preparation of arrow poison (MAP 3). The poison acts quickly, and even very small quantities are effective: the usual practice was to crush a single seed and to smear the resulting pulp on the tip or barbs of an arrow, sometimes with an adhesive added. The arrow was launched by blowpipe, bow, or crossbow, and when the poison entered the bloodstream, death resulted, in humans usually within a quarter of an hour, in large animals like the elephant after a longer time. When the animal killed in this manner was to be eaten, the meat directly around the wound was cut away.



MAP 3. *Strophanthus* as main source of arrow poison (adapted from PERROT & VOGT 1912).

The active component of the poison is one of a group of glycosides called ouabain, sarmentogenin, strophanthidin, and divaricoside. These glycosides affect the muscular fibres of the body and especially those of the heart; the heartbeat slows and soon the heart contracts permanently in systole. As an antidote tannic acid, vinegar, or the decoction of the bark of the baobab (*Adansonia digitata*) may be employed by smearing one of these onto the wound; presumably, any strong acid will serve as an antidote.

The possible use of these glycosides in medicine was discovered by KIRK (LIVINGSTONE 1865): he had, with difficulty, obtained some seeds of *S. kombe* which are used for the preparation of arrow poison in East Africa. He kept these seeds in the pocket where he also kept his toothbrush. He was running a slight fever at the time, and discovered that whenever he brushed his teeth, his heartbeat slowed and his temperature dropped. From the bitter taste he concluded that this was the action of the seeds.

In Western Africa *S. hispidus* and *S. sarmentosus* have been cultivated and protected for a long time in order to provide a steady supply of poison, and the plants were highly valued. The former colonial administrations tried to eradicate the plants from 1920 onwards, and as a result the plants seemed to become scarce; but when in 1949 a British expedition was sent to Nigeria to collect *Strophanthus sarmentosus* for research on cortisone, the Emir of Katsina ordered the collection of 'Kwankwani' (*S. sarmentosus*), and in four days ten thousand follicles were gathered.

Nearly a third of all species are reported as having been used for arrow poison. Medicinal use for the treatment of a wide range of afflictions is also reported for many species: rheumatism, venereal diseases, worms, fever, and snakebite are repeatedly named as treatable afflictions.

Extracts of *S. gratus* and *S. kombe* are used in modern medicine, either obtained from forest dwelling peoples (e.g. Pygmies) who gather the seeds in the forest, or taken from cultivated plants. Around 1970, 3–5 tons a year were imported by France, mainly from Cameroun, to a value of FF 5.000.000. In other

countries the drug strophanthin is also used, but figures of amounts were not available.

The drug is prescribed for acute heart conditions, e.g. cardial asthma and myocardinal infarct.

RELATIONSHIPS WITH OTHER GENERA

Strophanthus shows stamens which are adherent to the upper part of the gynoecium, and anthers with sterile basal tails. Therefore it is placed in the subfamily *Apocynoideae* (*Echitoideae*). The subdivision of this subfamily is still under discussion.

PICHON (1948a, 1950) proposes 4 tribes, based mainly on the morphology of the retinacle (the organ by which the anthers adhere to the clavuncula), and supported by other more fragmentary evidence. NGAN (1965) rejects this subdivision on the ground that the morphology of the retinacle is not of sufficient constancy, and cannot be observed in dried specimens.

PICHON divides his tribe *Nerieae* into 9 subtribes, of which the subtribe *Strophanthinae* consists of *Strophanthus* and its synonyms *Christya* and *Roupellina*; he suggests (PICHON 1950) with his sequence of the nine subtribes relationships between *Strophanthus* and *Nerium*, *Vallaris*, *Beaumontia*, *Mascarenhasia*, *Alafia*, and *Farquharia*.

NGAN proposes a subtribe *Neriinae* (as *Neriineae*) consisting of *Nerium*, *Wrightia*, *Pleioceras* and *Strophanthus*, based on the presence of a corona and the lack of a disk.

ALLORGE et al. (1981) follow, in this subfamily, the sequence of tribes by PICHON.

ZWETSLOOT (1981) suggests relationships between *Strophanthus* and *Beaumontia*, *Vallaris*, *Wrightia*, *Pleioceras* and *Farquharia*.

While agreeing with PICHON in his use of the retinacle for the subdivision of the *Apocynoideae*, I consider his subtribes as too small in scope. Most of PICHON's subtribes consist of one or two genera; his largest subtribe, the *Neriinae* (which PICHON calls *Amphineuriinae*), consists of five genera, of which *Amphineurion* and *Dewevrella* should be placed in other tribes.

Most authors consider *Strophanthus* to be allied to *Nerium*. I agree for the following reasons: similarities in the morphology of the corolla, the presence of a corona, and the similarities in gynoecium and androecium; several species of *Strophanthus* show characteristics of *Nerium*, e.g. verticellate leaves, suprapetiolar colleters, and a long acumen of the anther. I also consider *Strophanthus* to be allied to *Adenium*, *Wrightia*, and *Pleioceras*, mainly because of the presence of a corona, the absence of a disk, and the morphology of the clavuncula.

Superficial similarities exist with *Funtumia* and *Kibatalia*, as the seeds of these genera show a seed beak which is glabrous in its basal part; but while in *Strophanthus* the beaked coma is directed towards the apex of the follicle, in *Funtumia* and *Kibatalia* it points the other way.

Fruits of *Parquetina nigrescens* (*Asclepiadaceae*) have been confused with those of *Strophanthus,* and indeed closely resemble them; but the seeds of *Parquetina* are completely different, as the coma is not borne on a beak but directly on the grain.

The Asclepiad genus *Cryptolepis* has flowers which in some species are tailed at the lobes, and these species are often confused with *Strophanthus. S. radcliffei* S. Moore turned out to be *C. sanguinolenta,* and *S. divaricatus* G. Don (not [Lour.] Hook. & Arn.) is *C. sinensis*. Distinction of the two genera is made by comparison of the corolla lobes, overlapping to the right in *Strophanthus,* and to the left in *Cryptolepis*.

CITATION OF SPECIMENS

An Index of Exsiccatae is provided, because when a species is represented by more than 50 collections, only a selection of specimens has been cited with the species diagnoses. These selections are based on the distribution maps: for each dot or cluster of dots, one specimen is cited.

Fortunately nearly all type specimens could be traced; only a few were not seen and are indicated as such. Lectotypes, unless marked as 'designated by', were designated by the present author. In five cases neotypes were designated.

DEFINITIONS

All sizes are from dried material.

The filaments are measured, when curved, over their height and not over their length (Fig. 4).

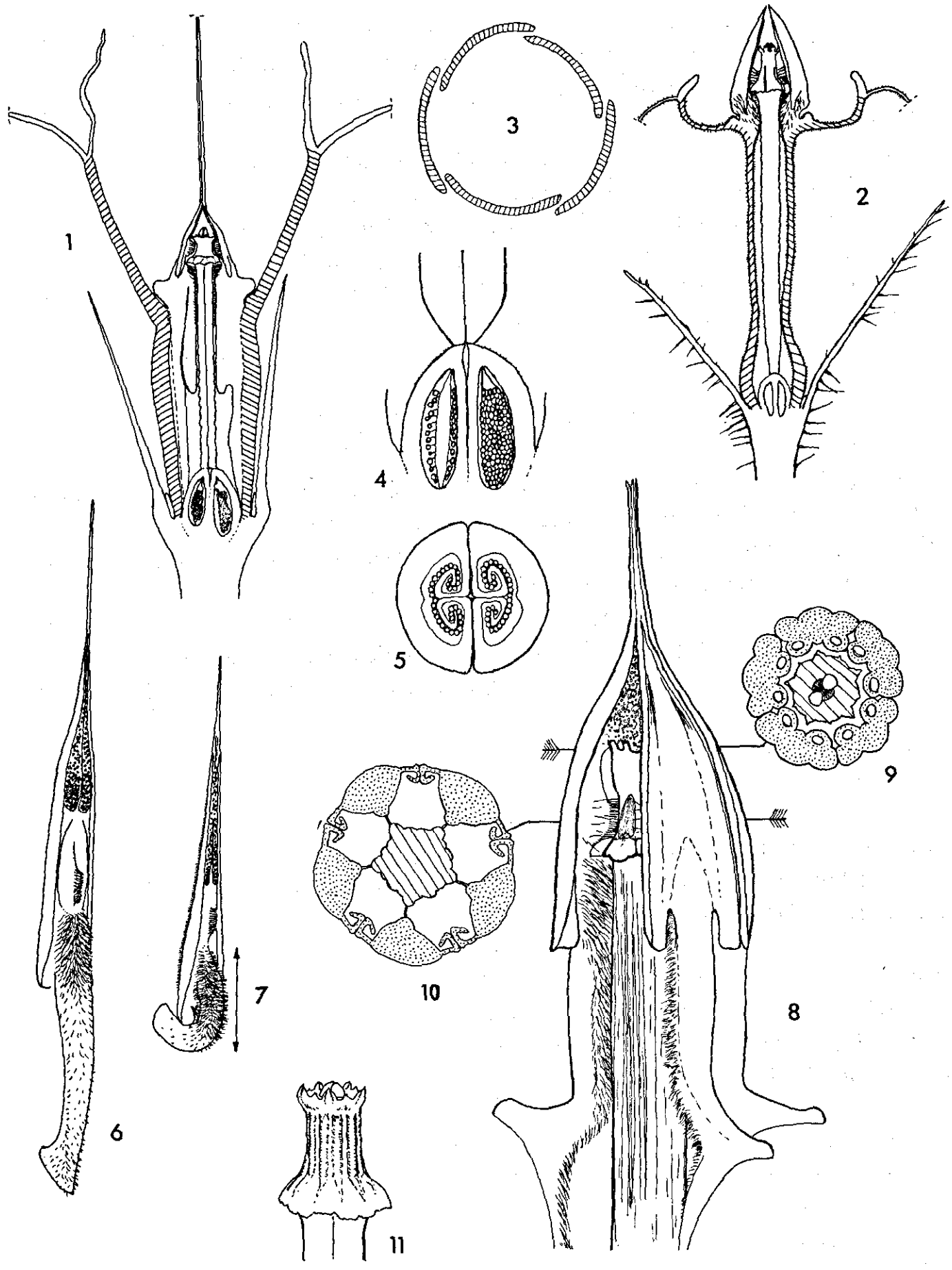


FIG. 4. 1. *Strophanthus caudatus* (L.) Kurz: section of flower, 2 ×; 2. *S. bullenianus* Mast.: section of flower, 3 ×; 3–5. *S. sarmentosus* DC: 3. position of sepals, schematic; 4. longitudinal section of ovary, 8 ×; 5. cross section of ovary, 8 ×; 6. *S. petersianus* Klotzsch: stamen with straight filament, 6 ×; 7. *S. preussii* Engl. & Pax: stamen with curved filament, 6 ×; 8–10. *S. sarmentosus* DC.: 8. anther cone, one stamen removed to show clavuncula, 8 ×; 9. cross section of anthers and clavuncula at the apex of the clavuncula; 10. cross section of anthers and clavuncula at retinacle level. (1. *van Beusekom & Phengklai 377*; 2. *Leeuwenberg 8646*; 3–5. *Leeuwenberg 11952*; 6. *Neves Rosa 79*; 7. *Beentje 352*; 8–10. *Leeuwenberg 11952*).

TAXONOMIC PART

THE GENUS STROPHANTHUS DC.

Strophanthus DC. 1802: 122; G. Don 1837: 84; A. de Candolle 1844: 417; Bentham & Hooker f. 1876: 714; Baillon 1889: 198; Franchet 1893b: 249; K. Schumann 1897: 180; Stapf 1902: 167; Gilg 1903: 7; Pichon 1950: 63; Codd 1963: 289; Dyer 1975: 469.

Lectotype species: *S. sarmentosus* DC.

Homotypic synonyms: sect. *Eustrophanthus* Baill. 1888: 198.

Subsect. *Sarmentosi* Pax 1892: 372.

Subsect. *Strophanthemum* Gilg 1903: 8.

Heterotypic synonyms: *Cercocoma* Wall. ex G. Don 1837: 83, except for *C. wallichii*; A. de Candolle 1844: 432; Miquel 1856: 445. Type species: *C. singaporiana* G. Don (= *S. singaporianus* (G. Don) Gilg).

Christya Ward & Harvey 1842: 134; A. de Candolle 1844: 416; Pichon 1949: 63, 1950: 62. Type species: *C. speciosa* Ward & Harvey [= *S. speciosus* (Ward & Harvey) Reber]. Homotypic synonym: subsect. *Christya* (Ward & Harvey) Pax 1892: 376.

Roupellia Wall. & Hook. 1849: t. 4466; Walpers 1852: 36; Bentham & Hooker f. 1876: 713; Backer & Bakhuizen van den Brink jr. 1965: 240. Type species: *R. grata* Wall. & Hook. (= *S. gratus* (Wall. & Hook.) Baill.). Homotypic synonyms: sect. *Roupellia* (Wall. & Hook.) Baill. 1888: 757. Subsect. *Roupellia* (Wall. & Hook.) Gilg 1903; 8.

Zygonerion Baill. 1888: 758; K. Schumann 1897: 194. Type species: *Z. welwitschii* Baill. (= *S. welwitschii* (Baill.) K. Schum.).

Sect. *Roupellina* Baill. 1888: 758; Pax 1892: 381; Franchet 1893b: 249; K. Schumann 1897: 182; Gilg 1903: 7. Type species: *S. boivinii* Baill. Homotypic synonym: *Roupellina* Pichon 1949: 64, 1950: 62; Markgraf 1976: 243.

Sect. *Strophanthellus* Pax 1892: 376; K. Schumann 1897: 182; Pichon 1950: 65. Type species: *S. caudatus* (L.) Kurz (lectotype). Homotypic synonyms: subsect. *Dichotomi* Pax 1892: 379; subsect. *Strophanthellus* (Pax) Gilg 1903: 8.

Subsect. *Acuminati* Pax 1892: 367. Type species: *S. ledienii* Stein (lectotype).

Subsect. *Divergentes* Pax 1892: 377. Type species: *S. divaricatus* (Lour.) Hook. & Arn. (lectotype).

Subsect. *Graciles* Pax 1892: 368. Type species: *S. gracilis* K. Schum. & Pax (lectotype).

Subsect. *Hispidi* Pax 1892: 365. Type species: *S. hispidus* DC. (lectotype).

Subsect. *Tomentosi* Pax 1892: 371. Type species: *S. schuchardtii* Pax (lectotype).

Sect. *Synclinocarpus* Monach. 1950: 370, syn. nov. Type species: *S. bullenianus* Mast.

Sect. *Intermedii* Hess 1952: 101, syn. nov. Type species: *S. amboensis* (Schinz) Engl. & Pax (lectotype).

Erect or sarmentose *shrubs, lianas*, or rarely *trees*; latex present, often sticky. *Trunk* dichotomously or rarely trichotomously branched or with single or opposite lateral branches; diameter up to 25 cm in lianas, up to 40 cm in trees or shrubs; bark often rough, sometimes corky; branches unarmed, terete, smooth or sulcate, sometimes with corky protuberances, lenticellate; branchlets green or pale (reddish) brown, sometimes lenticellate. *Stipules* reduced to straight rims connecting the bases of the petioles. *Leaves* decussate or less often ternate, rarely quaternate, those of a pair or whorl (sub-)equal; petiolate or less often subsessile, often inserted on distinct leaf cushions; petioles rounded below, channeled above when dry; in the axil with 2–20 colleters, with the outer 2 larger than the inner, or rarely with 5 colleters on the upper base of the petiole itself; blade entire, ovate, elliptic, or obovate, acuminate or rarely rounded at the apex, papyraceous or coriaceous, smooth or bullate; midrib straight and distinct, prominent beneath; secondary veins mostly distinct and more or less prominent beneath, in 3–14(–20) pairs, anastomizing at the leaf margin; tertiary venation reticulate, sometimes conspicuous; leaf size on short lateral flowering branches increasing towards the apex, often with the basal leaves emarginate at the apex. *Inflorescence* terminal, rarely axillary or apparently so, often on short leafy or less often leafless lateral branches, or in forks of the branches; single- to many-flowered, in simple or compound mostly dichasial cymes, sessile or pedunculate; bracts persistent or deciduous, mostly erect, the apical smaller than the basal, (sub-) opposite or rarely ternate, sepal-like or scarious, with a distinct midrib, with 2–8 colleters at the base inside. *Flowers* 5-merous, actinomorphic or with only the sepals unequal, sometimes fragrant. *Calyx* mostly deciduous when the fruit develops; sepals mostly erect, equal or unequal, imbricate-quincuncial, free or connate at the extreme base, linear, ovate, or less often obovate; rounded, acute, or rarely emarginate at the apex, sometimes undulate, frequently with a thick midrib and membranaceous margins, less often scarious, sometimes carinate; inside at the base with 0–8(–14) colleters per sepal, sometimes concentrated on the inner sepals, and, if few, than situated at the margins; occasionally eglandulose; colleters simple or lobed. *Corolla* consisting of tube, corona, and lobes which often narrow into filiform, involute tails; colour pattern based on white, turning yellow, and red, turning purple with age; thin or more or less fleshy; tube with a lower cylindrical part, and an upper part wider than the lower and cylindrical, infundibuliform, or cup-shaped; corona inserted at the base of the corolla lobes, 10-lobed with the lobes erect or rarely spreading, arranged in partly connate pairs at the margins of the corolla lobes or rarely with all 10 lobes connate at the base, lingulate or narrowly triangular, often concave, obliquely inserted at the base, rounded or acute at the apex, often fleshy, smooth or minutely papillose; corolla lobes alternating with the sepals, overlapping to the right, open flowers spreading or recurved; basal part of the lobe ovate, rarely orbicular or narrowly oblong, and, when not tailed, acute or rounded at the apex; tails – if present – spreading or pendulous. *Stamens* included or partly exserted; filaments inserted at the level where the corolla tube widens, shorter than the anthers, straight or curved, sometimes with an abaxial swelling, mostly densely

pubescent inside near the apex and there adhering to the style, at the base continuing down the corolla tube as more or less conspicuous ridges, mostly tapering towards the base but occasionally ending abruptly and obtusely; anthers connivent in a closed cone around the clavuncula and stigma, connate to each other, basifixed, introrse, auriculate or slightly sagittate at the base, mucronate or acuminate at the apex, glabrous or variously hairy on the abaxial side, near the base of the connective with a retinacle, a vertical ridge of stiff connate hairs by which the anthers adhere to the middle of the clavuncula; cells 2, discrete, parallel, fertile in the apical part only and there dehiscent throughout by a longitudinal slit, with at the base of the fertile part a small knob that fits between 2 lobes of the clavuncular crown. *Disk* absent. *Pistil*: ovary 2-celled, hemi-inferior or rarely superior, ovoid and abruptly narrowing into the style; cells connate at the base for 10–60% of their length, each cell with one axial placenta, adnate to the wall of the cell at the base and the apex, ovuliferous on the abaxial side only, with 8–16 transverse rows of 14–36 ovules; style terete, consisting of 2 connate strands, often widening towards the apex, smooth or blistered, glabrous; clavuncula consisting of a basal reflexed, lobed, membranaceous frill, then a central ridged column, and at the apex with a 10-lobed crown surrounding the central stigma, the crown solid or composed entirely of hairs; stigma minute or almost as large as the clavuncula, bifid, slender, and papillose. Only the calyx and ovary remain on the inflorescence when the corolla is shed; style and clavuncula remain attached to the filaments and anthers, and are shed with the corolla. *Infrutescence* bearing a single fruit or rarely two fruits on a claviform, woody pedicel; fruit composed of 2 follicles, divergent at an angle of 150–270°, rarely at a more acute angle or parallel, rigid or rarely pendulous, connate at the extreme base, adaxially dehiscent throughout by a longitudinal slit, almost fusiform with the largest diameter in the basal half, 8–58 cm long, hardly narrowing or rarely tapering towards the base, either with a broad and obtuse apex or tapering towards the apex and ending in a narrow and obtuse tip or in a knob, many-, or sometimes few-seeded; exocarp thick and hard (1.5–8 mm thick) or thin and brittle (less than 0.5 mm thick), woody, smooth, sulcate, or rarely with protuberances, glabrous or less often variously hairy; endocarp at maturity detached from the exocarp and adherent only at the base and the apex, stiff, yellowish, and parchmentaceous, smooth, glabrous. Seeds (Fig. 5) with a deciduous basal coma and a beaked apical coma, grain almost fusiform, more or less flattened, often flat or concave on one side and convex on the other, 8–26 mm long and 1.5–5.2 mm wide at or below the middle, acute or rounded at the base, narrowing into a beak at the apex; basal coma 5–40 mm long; apical beak glabrous in its basal part or bearing the coma over its whole length; beak slender, whitish, and brittle; coma erect, spreading, or reflexed; testa thin, smooth, and densely pubescent or puberulous, less often glabrous and slightly rough; hilum central on one side of the grain with a raphe ascending to the apex of the grain; endosperm in a thin layer completely surrounding the embryo; embryo spatulate, straight, cotyledons longer than the terete radicle, parallel, flat, more or less elliptic, cuneate or auriculate at the base, rounded or acute at the apex,

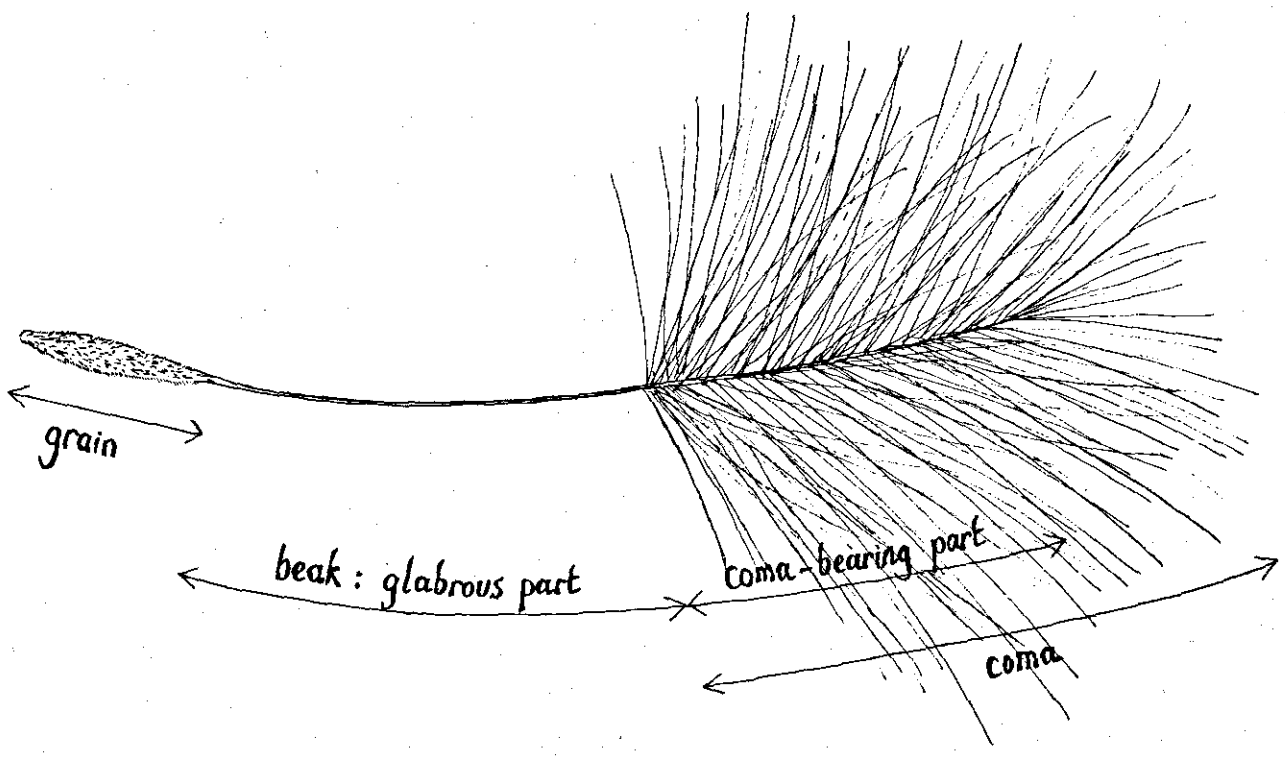


FIG. 5. *Strophanthus kombe* Oliver: seed, 1 × (*Chase 5814*).

sometimes with a conspicuous midrib. *Seedling* sometimes with a swollen primary root, cotyledons elliptic or ovate, obtuse at the apex, primary and first leaves resembling mature leaves but often more narrow.

SECTIONAL ARRANGEMENT

A. DE CANDOLLE (1844) made the first sectional arrangement of the genus, although without naming the sections: one for the Asian species and another for the African ones, the subdivision, apart from geography, being based on the length of the acumen of the anthers. *S. speciosus* appears twice, once in a monotypic genus *Christya* (as *C. speciosa*), and once under *Strophanthus* as *S. capensis*.

BENTHAM & HOOKER F. (1876) reduced the genera *Cercocoma* and *Christya* to synonyms of *Strophanthus*, and emphasized the relationship between *Strophanthus* and *Roupellia* (= *S. gratus*). BAILLON (1889) reduced *Roupellia* to a synonym. He also made a new section *Roupellina*, based on *S. boivinii* and one of its synonyms. This section was distinguished by the shape of the corolla lobes and the position of the inflorescence. BAILLON considered it to be intermediate between his section *Roupellia* (*S. gratus*) and the other continental African species, housed in section *Eustrophanthus*. He also described the monotypic genus *Zygonerion*, based on *Z. welwitschii* (= *S. welwitschii*).

PAX (1892) distinguished the sections *Eustrophanthus* (which he subdivided into 6 subsections) and *Roupellina*, and described a new section *Strophanthellus* (subdivided in 2 subsections) consisting of all Asian species. Neither *S. gratus* nor *Zygonerion* were taken into account.

FRANCHET (1893) united *Eustrophanthus, Strophanthellus,* and *Roupellia*; only the section *Roupellina* was considered to be distinct from the section *Eustrophanthus* sensu lato.

SCHUMANN (1897) reinstated the old sections *Eustrophanthus* sensu stricto, *Strophanthellus, Roupellia*, and *Roupellina*; this last section consisted of *S. boivinii* and a synonym of *S. welwitschii.*

STAPF (1902) only treated the continental African species, and recognized the sections *Eustrophanthus* and *Roupellia*; this last section consisted of *S. gratus* and *S. thollonii.*

GILG (1903) distinguished two sections: *Roupellina* sensu Baillon, and *Eustrophanthus*, which he subdivided into 3 subsections: *Strophanthellus* with the Asian species; *Roupellia* with *S. gratus, S. thollonii,* and *S. gardeniiflorus*; and *Strophanthemum* with the remaining African species, including *S. welwitschii.* Distinctive characters were the size of the flowers and sepals, the shape of the corolla lobes, the acumen of the anthers, and the indumentum of the seed.

PICHON (1950) placed *S. speciosus* in a monotypic genus *Christya*, and *S. boivinii* in a monotypic genus *Roupellina*; in the genus *Strophanthus* he distinguished the sections *Eustrophantus, Strophanthellus,* and *Roupellia* sensu Gilg.

MONACHINO (1950) described a new section *Synclinocarpus,* consisting of *S. bullenianus,* one of its synonyms, and *S. parviflorus.* This section was based on fruit characters, although fruits of *S. parviflorus* were unknown.

HESS (1952) described a new section *Intermedii,* consisting of *S. amboensis* and its synonyms, *S. vanderijstii,* and *S. bequaertii,* although he knew these two last species only from descriptions. This section was distinguished mainly on characters derived from corolla and bracts.

In this revision the genus is not divided into sections, as all characters used previously for the delimitation of sections turned out to be inconsistent; the only clearcut character would seem to be the apex of the corolla lobes, but even here there is a range of variation from the orbicular lobes of *S. gratus,* via the acute lobes of *S. welwitschii* and the acuminate lobes of *S. courmontii,* to the tailed lobes of most *Strophanthus* species.

Sections for African and Asian species would be mainly based on geographical data, which is not considered desirable.

DISCUSSION OF THE RELATIONSHIPS WITHIN THE GENUS

The more or less reticulate relationship is illustrated in Chart 1. Relevant characters used for the composition of groups of species or for indicating relationships through dotted lines are:

1. the shape of the corolla lobes. Most species have tailed lobes, but those of *S. gratus* are orbicular. *S. courmontii, S. gardeniiflorus, S. thollonii,* and *S. welwitschii* have acute or acuminate lobes. *S. singaporianus* is one of two small-

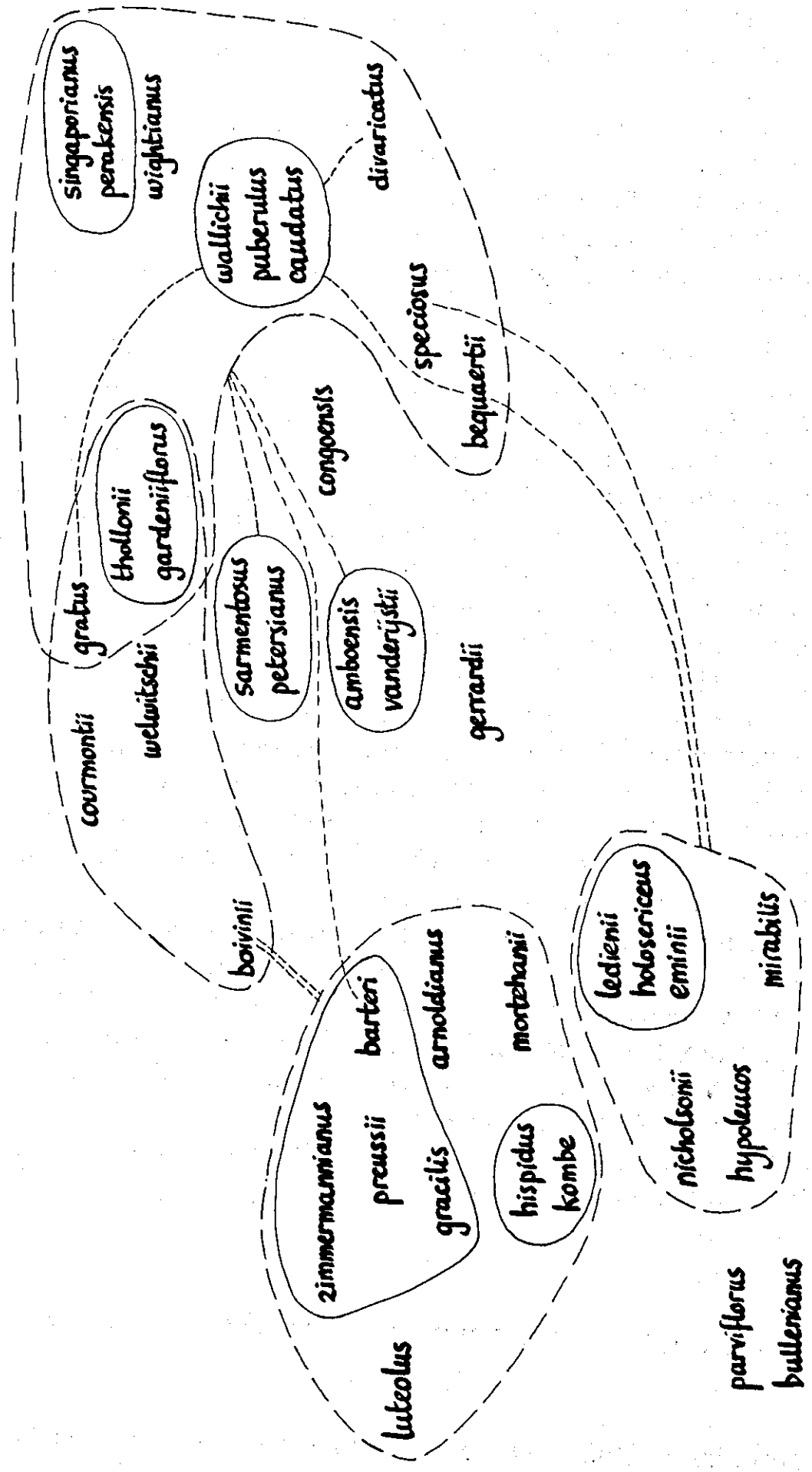


CHART 1. Relationships within *Strophanthus*.

flowered species and has acute lobes, while the other, *S. perakensis,* has short-tailed lobes.

2. the acumen of the anthers. All Asian species and the African *S. gardeniiflorus, S. gratus* and *S. thollonii* have a long acumen; *S. amboensis, S. barteri, S. petersianus* and *S. sarmentosus* have an acumen the length of which is intermediate between the long acumen of the above-mentioned species and the the short mucro of the majority of African species.

3. the shape of the filaments. In most species, the filaments are straight or nearly so, but in several species they are curved and nearly S-shaped: i.e. *S. arnoldianus, S. barteri, S. gracilis, S. hispidus, S. kombe, S. luteolus, S. mortehanii,* and *S. zimmermannianus.*

4. the base of the filament ridges. While the filament gradually merges with the wall of the tube in most species, it ends abruptly in a short obtuse spur in *S. bequaertii, S. caudatus, S. perakensis, S. puberulus, S. singaporianus, S. wallichii,* and *S. wightianus*; it is merely obtuse, and not ending in a short spur, in *S. divaricatus, S. gratus,* and *S. speciosus*; and in *S. courmontii, S. gardeniiflorus,* and *S. thollonii* it ends rather abruptly and nearly obtusely.

5. a large abaxial swelling near the apex of the filament. This is present in *S. bequaertii, S. eminii, S. holosericeus, S. hypoleucos, S. ledienii, S. mirabilis,* and *S. nicholsonii.* A small abaxial swelling near the base of the filament is present in *S. bullenianus, S. caudatus, S. divaricatus, S. gracilis, S. hispidus, S. kombe, S. parviflorus, S. perakensis, S. singaporianus, S. wallichii,* and *S. wightianus.* In *S. puberulus* this remains doubtful due to the lack of adequate material.

6. the indumentum of the ovary. The species mentioned under 3 show an ovary that may be puberulous or pubescent; this is also the case in *S. boivinii, S. eminii, S. holosericeus, S. hypoleucos, S. ledienii, S. mirabilis, S. nicholsonii, S. puberulus, S. sarmentosus, S. speciosus,* and *S. wallichii.* The ovary of *S. amboensis* and *S. perakensis* may be either glabrous or puberulous to pubescent.

7. the shape of the corona lobes. This is squat and lingulate in the same species as mentioned under 3, with the exception of *S. mortehanii,* where it is more slender. The corona lobes are also squat and lingulate in *S. bullenianus, S. hypoleucos, S. nicholsonii,* and *S. parviflorus.* In *S. amboensis, S. bequaertii, S. boivinii, S. congoensis, S. courmontii, S. divaricatus, S. eminii, S. gerrardii, S. holosericeus, S. ledienii, S. mirabilis, S. speciosus,* and *S. vanderijstii* the lobes are more slender, while in the remaining species they are narrowly triangular.

The following additional characters were used: the level at which the corolla tube widens; the indumentum of the seedcoat and the length of the glabrous part of the beak; the indumentum of the anthers; and the ending of the follicles in a knob.

Aberrant in a single character are:

S. bullenianus as regards the insertion of the coma on the seed;

S. eminii as regards the structure of the exocarp; *S. holosericeus* and *S. ledienii* show a tendency towards this structure.

S. speciosus as regards the petiolar colleters.

Closely allied species are:

S. amboensis and *S. vanderijstii*;
S. caudatus, S. puberulus, and *S. wallichii*;
S. eminii, S. holosericeus, and *S. ledienii*;
S. kombe and *S. hispidus*;
S. perakensis and *S. singaporianus*;
S. preussii, S. barteri, S. gracilis, and *S. zimmermannianus*;
S. sarmentosus and *S. petersianus*;
S. thollonii and *S. gardeniiflorus*.

The chemical investigations, summarized in the chapter on chemistry and pharmacology, confirm this proposed grouping. It would be interesting to know how *S. bequaertii, S. boivinii,* and *S. speciosus* relate chemically to the other species.

KEY FOR FLOWERING SPECIMENS

Notes: the tails of the corolla lobes are sometimes broken off in dried material.

The 'widening of the corolla tube' refers to the more or less abrupt transition of the lower, cylindrical part of the tube into the wider upper part.

'Anther acumen' refers to the filiform, sterile apical part present in most species.

1. Corolla lobes rounded or obtuse 2
   Corolla lobes acute, acuminate, or tailed 3
2. Corolla lobes nearly orbicular, 15–32 mm wide; corona lobes 5–15 mm long; anther acumen 6–12 mm long. West and Central Africa . . . . . **15. S. gratus**
   Corolla lobes narrowly oblong, 1.5–8 mm wide; corona lobes 0.4–3 mm long; anther acumen less than 0.5 mm long. Madagascar **5. S. boivinii**
3. Corolla lobes acute or acuminate, not tailed 4
   Corolla lobes tailed, the linear part at least as long as the ovate part of the lobe 9
4. Corolla tube less than 10 mm long, at the mouth less than 6 mm wide; corolla lobes smaller than 10 × 4 mm 5
   Corolla tube more than 15 mm long, at the mouth more than 11 mm wide; corolla lobes larger than 17 × 10 mm 6
5. Leaves with 8–16 pairs of secondary veins which are straight and form an angle of 70–90° with the midrib; corolla lobes 5–10 mm long; anther acumen 4–4.3 mm long. Burma to Malaysia . . . . . **26. S. perakensis**
   Leaves with 5–9 pairs of secondary veins which are curved and form an angle of 45–65° with the midrib; corolla lobes 4–8.5 mm long; anther acumen 1.8–2 mm long. Malaysia . . . . . **31. S. singaporianus**
6. Anthers exserted for 8–18 mm, anther acumen 12.5–20 mm long; corona lobes long-pubescent; corolla tube glabrous inside; narrow, lower part of tube 13–19 mm long 7

Anthers included for 2–16 mm, anther acumen 0.2–2 long; corona lobes puberulous; corolla tube puberulous or pubescent inside; narrow, lower part of tube 3–12 mm long 8

7. Calyx 12–26 mm long; sepals 1.8–3(–5) × as long as wide; leaves acute or acuminate, acumen up to 13 mm long. Nigeria to Gabon **33. S. thollonii**

Calyx 6–12.5 mm long; spelas 1.2–2.2 × as long as wide; leaves rounded or acuminate, acumen up to 3 mm long. South-East Zaïre, Zambia . . . . . **12. S. gardeniiflorus**

8. Branchlets glabrous; older branches with corky, laterally compressed protuberances at the nodes; corona lobes obtuse, 2–6 mm long; petiole 3–11 mm long. East and Southern Central Africa . . . . . **9. S. courmontii**

Branchlets minutely puberulous; older branches without corky protuberances; corona lobes acute, 5–23 mm long; petiole 1–5 mm long. Southern Central and East Africa . . . . . **36. S. welwitschii**

9. Leaves and flowers present 10

Only flowers present, as they appear before the leaves 51

10. Leaves glabrous 11

Leaves with indumentum 38

11. Corolla, including the tails, in the mature bud less than 25 mm long; pedicel 1–4.5 mm long 12

Corolla, including the tails, in the mature bud more than 28 mm long or – when shorter – then with a 6–21 mm long pedicel 13

12. Corona lobes 1–2 mm long; corolla lobes 5–10 mm long; anthers and ovary pubescent; anther acumen 4–4.3 mm long. Burma to Malaysia . . . . . **26. S. perakensis**

Corona lobes 2.2–3.4 mm long; corolla lobes 8–15 mm long; anthers and ovary glabrous; anther acumen 1.4–1.5 mm long. South-West India . . . . . **37. S. wightianus**

13. Anther acumen more than 5.5 mm long, forming more than 75% of the length of the anther. Asia 14

Anther acumen less than 4.5 mm long, forming less than 60% of the length of the anther. Asia or Africa 16

14. Corolla puberulous outside; anther acumen 5.5–7.5 mm long. Indonesia . . . . . **29. S. puberulus**

Corolla glabrous outside, or puberulous near the mouth only; anther acumen 8.5–19 mm long 15

15. Bracts and sepals erect or suberect; corolla lobes including the tails 43–255 × 4.5 –13 mm; anthers pubescent near the apex; style 9–15 mm long. Thailand to Indonesia . . . . . **7. S. caudatus**

Bracts and sepals erect or recurved; corolla lobes including the tails 18–55 × 3–6 mm; anthers pubescent from base to apex; style 6–8.5 mm long. India to Malaysia . . . . . **35. S. wallichii**

16. Leaves ternate, or on the same plant both opposite and ternate, occasionally also quaternate 17

Leaves opposite 19

17. Corolla tube more than 17.5 mm long and at the mouth more than 15 mm wide; filaments more than 3 mm long, with ridges tapering towards the base. West and Central Africa . . . . . **30. S. sarmentosus**
Corolla tube less than 16 mm long and at the mouth less than 12 mm wide; filaments less than 2 mm long, with ridges with an obtuse base . . . 18
18. Petiolar colleters situated on the margin of petiole and stem; anthers and ovary glabrous; pedicel 2–7 mm long. China, Viêt-nam . . . . . **10. S. divaricatus**
Petiolar colleters situated on the adaxial side of the basal part of the petiole; anthers pubescent, ovary puberulous; pedicel 6–21 mm long. Zimbabwe, S. Africa . . . . . **32. S. speciosus**
19. Corolla glabrous outside 20
Corolla puberulous or sparsely pubescent outside, at least near the mouth 24
20. Corolla lobes in their lower part 6–18 mm wide; tube at the mouth (8–)10–30 mm wide; corona lobes 5–22 × 1.7–5 mm; filaments inserted at 6–13.5 mm from the base of the tube 21
Corolla lobes in their lower part 3–7 mm wide; tube at the mouth 5–13 mm wide; corona lobes 2–7.5 × 1–2 mm; filaments inserted at 3.5–8 mm from the base of the tube 22
21. Ovary puberulous in the upper half; corolla lobes minutely puberulous inside; sepals 1.5–4(–8) × as long as wide. West and Central Africa . . . . . **30. S. sarmentosus**
Ovary glabrous; corolla lobes glabrous inside; sepals (1.5–)3–8 × as long as wide. East and Southern Central Africa . . . . . **27. S. petersianus**
22. Secondary leaf veins at an angle of 75–80° with the midrib; filaments inserted at 7–8 mm from the base of the tube, with ridges with an obtuse base. Eastern Zaïre, Rwanda . . . . . **4. S. bequaertii**
Secondary leaf veins at an angle of 35–60° with the midrib; filaments inserted at 3.5–6 mm from the base of the tube, with ridges that taper towards the base 23
23. Older branches with corky protuberances; anther acumen 1.8–3.8 mm long; petiole 1–6 mm long; mature leaves less than 2 cm wide. Moçambique, S. Africa . . . . . **13. S. gerrardii**
Older branches without protuberances; anther acumen up to 1.1 mm long; petiole 5–15 mm long; mature leaves more than 2 cm wide. Cameroun to Zaïre . . . . . **8. S. congoensis**
24. (19.) Leaves and flowers often situated on short shoots; leaves obtuse or mucronate, with very inconspicuous secondary venation; anthers exserted, with 2–3.8 mm long filaments. Somalia, Kenya **22. S. mirabilis**
Leaves and flowers never situated on short shoots; leaves acuminate or – if rounded – with conspicuous secondary venation; anthers included or – if exserted – with filaments less than 1.8 mm long 25
25. Corolla tube at the mouth 15–30 mm wide; corona lobes 5–17 mm long, narrowly triangular; older branches with corky protuberances. West and

Central Africa . . . . . **30. S. sarmentosus**

Corolla tube at the mouth less than 14 mm wide, or – if up to 17 mm wide – with corona lobes less than 3 mm long and lingulate; older branches without protuberances 26

26. Corolla tube widening in the lower 33% of its length; bracts less than 6 mm long; anthers glabrous 27

Corolla tube widening above 40% of its length, or – if widening between 33 and 40% – then with bracts more than 6 mm long and puberulous or pubescent anthers 28

27. Shrub or liana, more than 1 m high; tertiary venation of leaves conspicuous; anthers 6–9.5 mm long. Zaïre to Namibia . . . . . **1. S. amboensis**

Shrublet, less than 30 cm high; tertiary venation of leaves inconspicuous; anthers 4.2–4.4 mm long. Zaïre and Angola . . . . **34. S. vanderijstii**

28. Anthers at least partly exserted 29

Anthers included 32

29. Corolla lobes including tails more than 120 mm long, only rarely shorter; sepals unequal, the outer much wider than the inner; anthers and ovary densely pubescent. West and Central Africa . . . . . **28. S. preussii**

Corolla lobes including the tails less than 100 mm long; sepals subequal or equal; anthers and ovary glabrous 30

30. Leaf base cuneate or decurrent into the petiole, leaf acumen less than 8 mm long; anthers only exserted by their acumen, which is 2–4.5 mm long; filament ridges obtuse at base. China, Viêt-nam . . **10. S. divaricatus**

Leaf base cuneate or rounded, leaf acumen 5–22 mm long; anthers nearly completely exserted, with an acumen less than 0.4 mm long; filament ridges tapering towards the base. Africa 31

31. Leaves with (6–)7–13 pairs of secondary veins; corolla lobes including the tails 11–40 mm long; upper, wider part of corolla tube 2.5–3.5 mm long. Nigeria to Zaïre . . . . . **6. S. bullenianus**

Leaves with 4–6 pairs of secondary veins; corolla lobes including the tails 40–74 mm long; upper, wider part of corolla tube 4–6 mm long. Gabon to Angola . . . . . **25. S. parviflorus**

32. Branchlets puberulous; anthers puberulous around the insertion on the filaments only. Moçambique, S. Africa . . . . . **21. S. luteolus**

Branchlets glabrous, rarely scabrous or sparsely pubescent; anthers glabrous or puberulous to pubescent for more than half their length . 33

33. Anthers puberulous or pubescent, with an acumen of more than 0.5 mm long; outer sepals much wider than the inner, or sepals undulate . . 34

Anthers glabrous, with an acumen of less than 0.2 mm long; outer and inner sepals nearly equal, never undulate 36

34. Corolla lobes including the tails more than 120 mm long, only rarely shorter; anther acumen 0.5–2 mm long, pubescent as the rest of the anther; corolla tube widening at 40–60% of its length. West and Central Africa . . . . . **28. S. preussii**

Corolla lobes including the tails less than 100 mm long; anther acumen more

than 2 mm long, puberulous when the anther is puberulous or glabrous when the anther is pubescent; corolla tube widening at 33–50% of its length 35

35. Sepals undulate; leaves with 4–6 pairs of secondary veins; anthers puberulous. West Africa . . . . . **3. S. barteri**
Sepals straight; leaves with 5–8 pairs of secondary veins; anthers pubescent, with a glabrous acumen. Kenya, Tanzania . **38. S. zimmermannianus**

36. Leaf base cuneate or decurrent into the petiole; anther acumen 2–4.5 mm long; filament ridges obtuse at base. China, Viêt-nam **10. S. divaricatus**
Leaf base rounded, rarely cuneate; anther acumen less than 0.4 mm long; filament ridges tapering towards the base 37

37. Corolla lobes including the tails more than 70 mm long; petiole 3–7 mm long; ovary hispid. Zaïre . . . . . **2. S. arnoldianus**
Corolla lobes including the tails less than 75 mm long; petiole 1–3 mm long; ovary glabrous. Gabon to Angola . . . . . **25. S. parviflorus**

38. (10). Corolla tube glabrous outside; corona lobes 6–15 mm long and acute; anther acumen 1–4 mm long. East Africa . . . . . **27. S. petersianus**
Corolla tube at least near the mouth with indumentum; corona lobes less than 7.5 mm long and obtuse or – if acute – the anthers with an acumen of less than 0.5 mm long 39

39. Corolla tube widening in the lower 36% of its length; anthers glabrous; leaves soft to the touch beneath 40
Corolla tube widening either above 45% of its length, or, – if widening between 40 and 45% – then anthers pubescent and leaves rough to the touch 41

40. Leaves with 7–11 pairs of secondary veins; bracts 5–19 mm long; anthers 5–6.5 mm long and with an acumen of less than 0.3 mm. Cameroun to Zaïre . . . . . **23. S. mortehanii**
Leaves with 3–8 pairs of secondary veins; bracts 2–6 mm long; anthers 6–9.5 mm long and with an acumen of (0.5)1.6–4.2 mm. Zaïre to Namibia . . . . . **1. S. amboensis**

41. Leaves glabrous, sparsely puberulous, sparsely hispid, or scabrid . . . 42
Leaves densely puberulous, densely pubescent, densely hispid, or tomentose, at least beneath 45

42. Anthers included, and puberulous or pubescent at least for 1 mm above the filaments 43
Anthers at least 1 mm exserted, and glabrous 44

43. Leaves glabrous or puberulous and soft to the touch, and mucronate or acuminate for less than 3 mm; anthers puberulous around the insertion on the filaments only. Moçambique, S. Africa . . . . . **21. S. luteolus**
Leaves scabrous, rough to the touch, and with a 3–12 mm long (or rarely shorter) acumen; anthers densely pubescent for the whole length. Nigeria to Gabon . . . . . **14. S. gracilis**

44. Petiole 0–2(–3) mm long; mature leaves up to 3.6 × 1 cm, with an obtuse or mucronate apex and 3–5 secondary veins; peduncle absent. Somalia,

Kenya . . . . . **22. S. mirabilis**

Petiole 2–7 mm long; mature leaves more than 5 × 2 cm, with a 7–22 mm long acumen and 6–13 secondary veins; peduncule (0–)5–48 mm long. Nigeria to Zaïre . . . . . **6. S. bullenianus**

45. (40) Branchlets and leaves hispid, with 1–2 mm long stiff hairs 46

Branchlets and leaves puberulous or pubescent, with supple hairs which are less than 1 mm long 48

46. Upper, wider part of corolla tube 2.5–3.5 mm long; anthers exserted; ovary glabrous. Nigeria to Zaïre . . . . . **6. S. bullenianus**

Upper, wider part of corolla tube 5.5–12 mm long; anthers included; ovary hispid 47

47. Sepals 9–20(–27) × 1.5–3.5 mm, about equal and 4–12 × as long as wide; corolla tube 0.8–2.2 × as long as the calyx; peduncle 2–14(–25) mm long. East and Southern Central Africa . . . . . **19. S. kombe**

Sepals 13–35 × 1.5–10 mm, unequal, the outer 2.3–4 x as long as wide and much wider than the inner; corolla tube 0.5–1.3 × as long as the calyx; peduncle 0–55 mm long. West and Central Africa **16. S. hispidus**

48. Leaves medium green beneath, indumentum puberulous; filaments curved, 0.9–1.1 mm high; anthers puberulous around the insertion on the filaments only; inner petiolar colleters 2–4. Moçambique, S. Africa . . . . . **21. S. luteolus**

Leaves pale yellow-green or silvery beneath by the tomentum or tomentellum; filaments straight, 1–6.2 mm long; anthers glabrous; inner petiolar colleters 4–16 49

49. Mature leaves more than 10 cm long, with an acute or acuminate apex, rarely obtuse; calyx 10–25 mm long; corolla tube 17–26 mm long . 58

Mature leaves less than 7.5 cm long, with an obtuse, acute, or emarginate apex; calyx 4.5–12.5 mm long; tube 10–20 mm long 50

50. Corolla lobes 55–115 mm long; filaments 1–2.3 mm long; bracts 2–5 × 1–2 mm; petiole 1–3 mm long. Southern Central Africa . . . . . **24. S. nicholsonii**

Corolla lobes 22–57 mm long; filaments 2.3–4.5 mm long; bracts 4 –16 × 2.5–7 mm; petiole 2–7.5 mm long. Tanzania, Northern Moçambique . . . . . **18. S. hypoleucos**

51. (9) Corolla tube widening below the middle; ovary glabrous or puberulous; anther acumen (0.5–)1–4 mm long 52

Corolla tube widening at or above the middle; ovary pubescent or hispid; anther acumen 0.1–1 mm long 55

52. Corolla tube at the mouth 6–13 mm wide; corona lobes 1.3–7.5 mm long, obtuse or acute 53

Corolla tube at the mouth 10–30 mm wide; corona lobes 5–22 mm long, acute 54

53. Corolla glabrous outside; older branches with corky protuberances. Moçambique, S. Africa . . . . . **13. S. gerrardii**

Corolla puberulous outside, at least near the mouth; older branches without

protuberances. Zaïre to Namibia . . . . . **1. S. amboensis**

54. Corolla lobes glabrous on both sides; ovary glabrous. East and Southern Central Africa . . . . . **27. S. petersianus**

    Corolla lobes puberulous near the mouth on both sides; ovary puberulous in the upper part. West and Central Africa . . . . . **30. S. sarmentosus**

55. Inflorescence with a single flower; filaments inserted at 4–6 mm from the base of the tube; anthers 3–4 mm long; inner petiolar colleters 0–2(–5). Somalia and Kenya . . . . . **22. S. mirabilis**

    Inflorescence single– to many–flowered; filaments inserted at 6.2–14 mm from the base of the tube; anthers 4–7 mm long; inner petiolar colleters 4–16 56

56. Sepals 4.5–12.5 mm long; anthers 4–5.3 mm long; corolla tube 10–22 mm long; corolla lobes less than 60 mm, or – if 60–115 mm long – then style 6–10 mm long 57

    Sepals 8–25 mm long; anthers 5–7 mm long; corolla tube 17–26 mm long; corolla lobes 94–200 mm long, style 11–18.5 mm long 58

57. Corolla lobes 22–57 mm long; filaments 2.3–4.5 mm long; bracts 4–16 × 2.5–7 mm; sepals 2–9 mm wide; Tanzania, Northern Moçambique . . . . . **18. S. hypoleucos**

    Corolla lobes 55–115 mm long; filaments 1–2.3 mm long; bracts 2–5 × 1–2 mm; sepals 1.3–3 mm wide. Southern Central Africa . . . . . **24. S. nicholsonii**

58. Bracts 4–15 × 3.5–10 mm; corona lobes 2.5–6.5 mm long, subulate; calyx mostly eglandulose, rarely with 10 colleters; petiole 1–10 mm long; branches often semi-succulent. East and Central Africa . **11. S. eminii**

    Bracts 5–12 × 1.5–4 mm; corona lobes 1.5–4.7 mm long, subulate or lingulate; calyx with 5 colleters, distributed over the inner sepals only; petiole 1–5 mm long; branches never semi-succulent 59

59. Pedicels 3–15 mm long; style 17–18.5 mm long; corona lobes 2–4.7 mm long. Western Zaïre, Angola . . . . . **20. S. ledienii**

    Pedicels 3–6 mm long; style 13–16 mm long; corona lobes 1.5–3 mm long. Zambia, South-East Zaïre . . . . . **17. S. holosericeus**

Note: it is difficult to distinguish *S. eminii, S. holosericeus,* and *S. ledienii* when fruits and seeds are not present.

KEY FOR SPECIMENS WITH LEAVES AND MATURE FRUITS

Note: identification of fruiting specimens without leaves, or of seed samples is impossible; leaves are indispensable for naming. A few species, however, can be recognized from fruits alone (e.g. *S. eminii, S. bullenianus*); also, it is possible to identify species with seeds that are glabrous or nearly so from their seeds.

Fruits and seeds are still unknown for *S. perakensis, S. puberulus,* and *S. wightianus*. Of *S. mortehanii,* the seed grains are known, but not the coma. Material with fruits and/or seeds is scarce for the following species: *S. barteri, S. bequaertii, S. bullenianus, S. caudatus, S. gracilis, S. ledienii, S. luteolus, S. parviflorus, S. preussii, S. sarmentosus* var. *glabriflorus, S. singaporianus, S. vanderijstii, S. wallichii,* and *S. zimmermannianus*; of all these species, less than 5 collections with fruits and/or seeds are known.

With these restrictions, the following key is proposed; for seed terminology, see Fig. 5 (p. 20).

1. Follicles shaggy with pubescent protuberances. East and Central Africa . . . . . **11. S. eminii**
   Follicles glabrous or with indumentum, but without or nearly without protuberances 2
2. Seeds with a coma which is inserted on the grain as well as on the beak; follicles supple, pendulous. Nigeria to Zaïre . . . . . **6. S. bullenianus**
   Seeds with a coma which is inserted only on the beak; follicles rigid, divergent from each other 3
3. Branchlets and leaves densely scabrid; follicles 23–50 cm long, less than 7 mm thick at the base. West Africa . . . . . **14. S. gracilis**
   Branchlets and leaves glabrous or with various indumentum, but not scabrid, or – if scabrid – then with follicles 13–29 cm long and more than 8 mm thick at the base 4
4. Seed grains glabrous or microscopically puberulous 5
   Seed grains densely puberulous or pubescent 9
5. Seed beak glabrous for 1.5–2 mm; leaves with inconspicuous tertiary venation. Eastern Zaïre, Rwanda . . . . . **4. S. bequaertii**
   Seed beak glabrous for more than 5 mm, or – if less – then leaves beneath with conspicuous tertiary venation 6
6. Older branches with thick corky bark; follicles densely lenticellate; seed beak bearing a coma for 23–47 mm. West and Central Africa **15. S. gratus**
   Older branches without corky bark; follicles sparsely lenticellate, or – if densely lenticellate – then with seed beak bearing a coma for 14–32 mm (Asiatic species) 7
7. Follicles divergent at an angle of 200–250°; seed beak glabrous for 1–5(–7) mm; coma reflexed or suberect, 35–55 mm long. China, Viêt-nam . . . . . **10. S. divaricatus**

Follicles divergent at an angle of 150–200°; seed beak glabrous for 5–15 mm; coma suberect, 50–90 mm long 8

8. Follicles sparsely to densely lenticellate; seed grain glabrous or microscopically puberulous, 10–25 mm long; seed beak bearing a coma for 18–32 mm. Thailand to Indonesia . . . . . **7. S. caudatus**

Follicles densely lenticellate; seed grain glabrous, 10–18 mm long; seed beak bearing a coma for 14–26 mm. India to Malaysia . . . **35. S. wallichii**

9. Follicles rounded at the apex or tapering into a narrow, obtuse tip . . 10

Follicles with a knob at the apex 34

10. Follicles not lenticellate 11

Follicles sparsely or densely lenticellate 15

11. Seed beak glabrous for more than 20 mm 12

Seed beak glabrous for 0–12 mm 13

12. Older branches with corky protuberances; follicles tapering towards the apex; coma (38–)60–90 mm long. East and Southern Central Africa . . . . . **27. S. petersianus**

Older branches without protuberances; follicles broad at the apex, not tapering; coma 35–70 mm long. Zaïre to Namibia . . . . **1. S. amboensis**

13. Seed beak glabrous for 3–12 mm; coma more than 58 mm long. Malaysia, Singapore . . . . . **31. S. singaporianus**

Seed beak glabrous for 0–2 mm; coma less than 52 mm long 14

14. Leaves ternate or quaternate. South-East Africa . . . . **32. S. speciosus**

Leaves opposite. Angola, Zaïre . . . . . **34. S. vanderijstii**

15. Seed beak glabrous for less than 9 mm 16

Seed beak glabrous for more than 10 mm 21

16. Leaves with (10–)12–20 pairs of secondary veins. Madagascar . . . . . **5. S. boivinii**

Leaves with 3–9(–11) pairs of secondary veins. Continental Africa . . 17

17. Follicles with a broad, obtuse apex, and more than 30 mm in diameter. Cameroun to Zaïre . . . . . **8. S. congoensis**

Follicles tapering towards a narrow, obtuse tip, and less than 28 mm in diameter 18

18. Leaves chartaceous, with secondary veins at an angle of 75–80° with the midrib. Eastern Zaïre, Rwanda . . . . . **4. S. bequaertii**

Leaves coriaceous, with secondary veins at an angle of 35–55° with the midrib 19

19. Follicles 12.5–17.5 cm long; seed beak glabrous for 0–2(–6) mm. Guinée . . . . . **30. S. sarmentosus var. glabriflorus**

Follicles 18–46.5 cm long; seed beak glabrous for 1.5–9 mm 20

20. Fruit wall thin, rather brittle; seed grain 15–24 mm long; coma reflexed or suberect and 22–42 mm long. Nigeria to Gabon . . **33. S. thollonii**

Fruit wall thick, woody; seed grain 11.5–18 mm long; coma reflexed or suberect and 48–60 mm long. South-East Zaïre, Zambia . . . . . **12. S. gardeniiflorus**

21. (15) Branchlets sparsely or densely puberulous 22

Branchlets glabrous 28
22. Leaves with conspicuous tertiary venation 23
Leaves with inconspicuous tertiary venation 26
23. Older branches with corky protuberances 24
Older branches without protuberances 25
24. Follicles with a broad, obtuse apex. West and Central Africa . . . . . **30. S. sarmentosus**
Follicles tapering towards a narrow tip. East Africa . . **27. S. petersianus**
25. Follicles rather densely lenticellate; leaves yellowish-green beneath. Southern Central and East Africa . . . . . **36. S. welwitschii**
Follicles sparsely lenticellate; leaves pale green beneath. Zaïre to Namibia . . . . . **1. S. amboensis**
26. Leaves densely puberulous above, tomentose beneath. Southern Central Africa . . . . . **24. S. nicholsonii**
Leaves glabrous or sparsely puberulous 27
27. Petiole 1–5 mm long; seed grains 2.5–4 mm wide; seed beak bearing a coma for 22–55 mm. Southern Central and East Africa . **36. S. welwitschii**
Petiole 0–2(–3mm) long; seed grains 2–2.5 mm wide; seed beak bearing a coma for 42–120 mm. Somalia, Kenya . . . . . **22. S. mirabilis**
28. Leaves with conspicuous tertiary venation 29
Leaves with inconspicuous tertiary venation 32
29. Older branches with corky protuberances 30
Older branches without protuberances 31

30. It is almost impossible to distinguish fruiting specimens of *S. courmontii, S. petersianus,* and *S. sarmentosus* var. *sarmentosus*. The latter is geographically seperated from the former two; these two can to some extent be distinguished by the density of the lenticels on the branches (very dense in *S. petersianus,* sparse to dense in *S. courmontii*) and on the follicles (very dense in *S. courmontii,* sparse to dense in *S. petersianus*).
31. Follicles with a broad, obtuse apex; seed beak glabrous for 22–50 mm and bearing a coma for 22–50 mm. Zaïre to Namibia . . **1. S. amboensis**
Follicles rather long-tapering into a narrow, obtuse apex; seed beak glabrous for 10–17 mm and bearing a coma for 14–20 mm. Zaïre . . . . . **2. S. arnoldianus**
32. Older branches with corky protuberances; mature leaves up to 6 × 2 cm; seed beak glabrous for 18–40 mm and bearing a coma for 25–65 mm. Moçambique, S. Africa . . . . . **13. S. gerrardii**
Older leaves without protuberances; mature leaves up to 17.5 – 7.5 cm; seed beak glabrous for 10–15 mm and bearing a coma for 10–28 mm . . 33
33. Leaves with an acumen of 0–13 mm; exocarp thin (1–2 mm) and brittle; seed grain 15–24 mm long. Nigeria to Gabon . . . . . **33. S. thollonii**
Leaves with an acumen of 0–3 mm; exocarp thick (2 mm or more) and woody; seed grain 11.5–18 mm long; coma reflexed or 48–60 mm long. South-East Zaïre, Zambia . . . . . **12. S. gardeniiflorus**
34. (9) Leaves glabrous 35

Leaves with indumentum 43
35. Seed beak glabrous for more than 18 mm 36
Seed beak glabrous for less than 15 mm 38
36. Branchlets glabrous; older branches with corky protuberances. East and Southern Central Africa . . . . . **27. S. petersianus**
Branchlets puberulous; older branches without protuberances 37
37. Leaves membranaceous or papyraceous, with conspicuous tertiary venation; seed beak bearing a coma for 30–45 mm. Moçambique, S. Africa . . . . . **21. S. luteolus**
Leaves coriaceous, with inconspicuous tertiary venation; seed beak bearing a coma for 42–120 mm. Somalia, Kenya . . . . . **22. S. mirabilis**
38. Follicles more than 32 cm long. Kenya, Tanzania . . . . . **38. S. zimmermannianus**
Follicles less than 29 cm long 39
39. Seed beak glabrous for less than 2 mm 40
Seed beak glabrous for more than 3 mm 41
40. Follicles not lenticellate; seed beak bearing a coma for 7–15 mm; petiolar colleters inserted on the petiole. Zimbabwe, S. Africa **32. S. speciosus**
Follicles sparsely to rather densely lenticellate; seed beak bearing a coma for 15–20 mm; petiolar colleters inserted on the margin of the stem and the petiole. Eastern Zaïre, Rwanda . . . . . **4. S. bequaertii**
41. Follicles sparsely lenticellate, lenticels small and orbicular; petiole 1–3 mm long. Gabon to Angola . . . . . **25. S. parviflorus**
Follicles rather densely lenticellate, lenticels elongate; petiole 1–9 mm long 42
42. Exocarp thin and brittle; seed beak glabrous for 8–15 mm and bearing a coma for 15–30 mm. West Africa . . . . . **3. S. barteri**
Exocarp rather thick and woody; seed beak glabrous for 3–8 mm and bearing a coma for 30–50 mm. West and Central Africa . . **28. S. preussii**
43. (34) Branchlets puberulous or pubescent 44
Branchlets hispid 53
44. Leaves with conspicuous tertiary venation on at least one side 45
Leaves with inconspicuous tertiary venation 49
45. Leaves tomentellous beneath 46
Leaves puberulous beneath 48
46. Petiole 2–8 mm long; follicles without protuberances, and with orbicular lenticels. Cameroun to North-West Zaïre . . . . . **23. S. mortehanii**
Petiole 0.5–5 mm long; follicles with sparse protuberances, and with rather elongate lenticels 47
47. Follicles divergent at an angle of 170–180°; seed beak glabrous for 37–64 mm and bearing a coma for 45–75 mm; coma 45–75 mm long. South-East Zaïre, Zambia . . . . . **17. S. holosericeus**
Follicles divergent at an angle of 180–200°; seed beak glabrous for 30–47 mm and bearing a coma for 25–30 mm; coma 35–55 mm long. West Zaïre and North Angola . . . . . **20. S. ledienii**

48. Older branches with corky protuberances; branches densely lenticellate; petiole (2–)3–13 mm long; follicles 2–3.5 cm in diameter. East Africa . . . . . **27. S. petersianus**

Older branches without protuberances; branches sparsely to rather densely lenticellate; petiole 1–5 mm long; follicles 1–1.5 cm in diameter. Moçambique, S. Africa . . . . . **21. S. luteolus**

49. Leaves beneath with sparse indumentum 50

Leaves beneath tomentose or tomentellous 51

50. Petiole 2–14 mm long; seed beak glabrous for 3–8 mm and bearing a coma for 30–50 mm; mature leaves up to 18.5 × 7.5 cm, with an acuminate apex. West and Central Africa . . . . . **28. S. preussii**

Petiole 0–2(–3) mm long; seed beak glabrous for 18–35 mm and bearing a coma for 42–120 mm; mature leaves up to 3.6 × 1 cm, with an obtuse apex. Somalia, Kenya . . . . . **22. S. mirabilis**

51. Mature leaves up to 16 × 9 cm, with 7–12 pairs of secondary veins; follicles 22–38 cm long. Western Zaïre, Angola . . . . . **20. S. ledienii**

Mature leaves up to 8 × 5(–8) cm, with 4–9 pairs of secondary veins; follicles 12.5 –28 cm long 52

52. Petiole 1–3 mm long; seed grains lanate or pubescent, 12–22 mm long; seed beak glabrous for 13–44 mm and bearing a coma for 20–65 mm. Southern Central Africa . . . . . **24. S. nicholsonii**

Petiole 2–7.5 mm long; seed grains pubescent, 8–12.5 mm long; seed beak glabrous for 15–30 mm and bearing a coma for 12–33 mm. Tanzania and North Moçambique . . . . . **18. S. hypoleucos**

53. (43) Divergence of follicles 180°; seed grains 2.5–4.5 mm wide; seed beak glabrous for 20–57 mm. East and Southern Central Africa **19. S. kombe**

Divergence of follicles 200–260°; seed grains 2–3 mm wide; seed beak glabrous for 8–34 mm. West and Central Africa . . . . . **16. S. hispidus**

SPECIES DESCRIPTIONS OF STROPHANTHUS

1. S. amboensis (Schinz) Engl. & Pax 1892: 376; Franchet 1893b: 289, pl. 14; Stapf 1902: 185; Gilg 1903: 33; Hess 1952: 91; Codd 1963: 293; Merxmuller 1967: 7. **Fig. 6; Map 4**

Basionym: *S. petersianus* var. *amboensis* Schinz 1888: 259.

Type: Namibia, Amboland, Cunene R., *Schinz* 222 (Z, holotype; isotypes: K, ZT).

Heterotypic synonyms: *S. intermedius* Pax 1892: 375; Franchet 1893: 287; Stapf 1902: 185; Gilg 1903: 31, fig. 3; Staner & Michotte 1934: 54; Hess 1952: 89; Watt & Breyer-Brandwijk 1962: fig. 103, syn. nov. Type: Angola, Cuanza Sul: Golungo Alto, near the Capopa Spring, *Welwitsch* 5999a (holotype des-

FIG. 6. *Strophanthus amboensis* (Schinz) Engl. & Pax: 1. flowering branches, $\frac{2}{3}\times$; 2. opened flower, 2 ×; 3. young fruit, 2 ×; 4. follicle, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$. (1–2. *Hess & Speiser 24 July 1950*; 3. *Compère 926*; 4–5. *Brass & Woodward 20930*).

troyed in B; lectotype: G; isotypes: BM, BR, C, K, LD, LE, LISU, MO, NY, P, PRE).

S. schuchardtii Pax 1892: 371 (as *schuchardti*); Franchet 1893b: 276; Stapf 1902: 184; Gilg 1903: 40, pl. 1; Hess 1952: 85, syn. nov. Type: Angola, Huila: between Ferrão de Sola and Nene, *Welwitsch* 5992 (holotype destroyed in B; lectotype: LISU; isotypes: BM, G, K, LISU, P).

S. demeusei Dewèvre 1894: 431; Stapf 1902: 184; Gilg 1903: 32, fig. 4. Type: Zaïre, Bas-Zaïre: Buana, *Demeuse* 518 (BR, holotype; istotype: K).

S. gossweileri Hess 1952: 94, syn. nov. Type: Angola, Huila: near Humpata, alt. 1950 m, *Hess* 19 Sept. 1950 (ZT, holotype).

S. hirsutus Hess 1952: 88, syn. nov. Type: Angola, Huila: Quilengues, *Hess* 27 Sept. 1950 (ZT, holotype; isotype: BR).

S. longicalyx Hess 1952: 92, syn. nov. Type: Angola, Huila: 30 km S of Quilengues, *Hess* 22 Sept. 1950 (ZT, holotype; isotype: NY).

S. paxii Hess 1952: 86, syn. nov. Type: Angola, Benguela: 40 km S of Ganda, *Hess* 30 Aug. 1950 (ZT, holotype; isotype: ZT).

S. gossweileri × *schuchardtii* Hess 1952: 98, syn. nov. Type: Angola, Huila: Humpata, *Hess* 19 Sept. 1950 (ZT, holotype; isotype: NY).

S. hirsutus × *intermedius* Hess 1952: 97, syn. nov. Type: Angola, Huila: Quilengues, *Hess* 509 (ZT, holotype; isotype: NY).

S. intermedius × *paxii* Hess 1952: 96, syn. nov. Type: Angola, Benguela: 40 km S of Ganda, *Hess* 30 Aug. 1950 (ZT, holotype).

Sarmentose *shrub*, 1–4 m high, or *liana*, up to 20 m high, deciduous, flowers appearing before or with the leaves; latex clear or white. *Trunk* up to 20 cm in diameter, bark pale grey; branches pale brown or purple-brown, sparsely or densely lenticellate; branchlets glabrous, puberulous, or densely short-pubescent. *Leaves:* petiole 2–19 mm long, with 2 outer and 2–14 inner axillary colleters; blade ovate or broadly ovate, 0.8–3.3 × as long as wide, in mature leaves 2–12.5 × 1.2–6.5 cm, cuneate, rounded, or subcordate at the base, rounded or acuminate at the apex (acumen 2–15 mm long), sometimes slightly undulate at the margin, papyraceous or thinly coriaceous, glabrous, puberulous, or densely short-pubescent, with translucent dots; 3–8 pairs of slightly curved secondary veins at an angle of 40–60° with the midrib; tertiary venation conspicuous. *Inflorescence* on long or short branches or in the forks, 1–12-flowered (1–5 flowers open at a time), sessile or pedunculate, lax or congested, glabrous, puberulous, or densely short-pubescent in all parts; peduncle – if present – up to 10 mm long; branches 0–20(–30) mm long; pedicels 3–17(–27) mm long; bracts deciduous, ovate, narrowly ovate, or narrowly triangular, 2–6 x 0.6–1.5 mm, acute, subscarious. *Calyx:* sepals subequal or with the inner longer than the outer, ovate or obovate, 1.5–4(–5.5) x as long as wide, 3–11 x 1.2 –3.2 mm, obtuse or acute, glabrous, puberulous, or densely short-pubescent; with 2–4 colleters per sepal. *Corolla:* tube 2–6.5 × as long as the calyx, orange-yellow and turning purple via dark red on both sides, white-streaked inside, (13–)15–27 mm long, widening at 16–33% of its length into a cylindrical or slightly infundi-

amboensis). HESS called these *S. gossweileri* and *S. paxii.*

S. amboensis s.l. is closely related to *S. vanderijstii,* and *Young* 901 resembles both; but I prefer to treat *S. vanderijstii* as specifically different, because of its peculiar habit, its narrow leaves, and the very short beak of the seed.

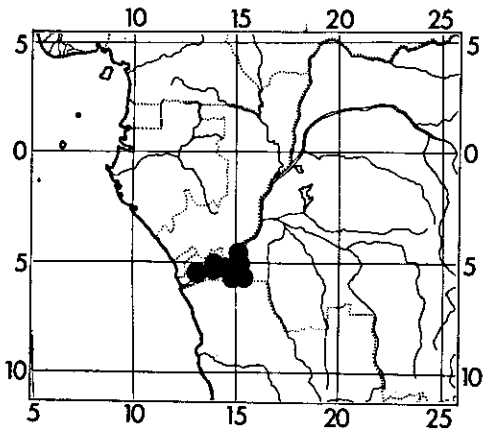
2. S. arnoldianus De Wild. & Th. Dur. 1899: 206; Stapf 1902: 179; Gilg 1903: 26, pl. 5; De Wildeman 1907: pl. 145; Staner & Michotte 1934: 44.

Fig. 7; Map 5

Type: Zaïre, Bas-Zaïre: Kitobola, *Kindt* anno 1899 (BR, holotype).

Liana, 3–5 m high, evergreen. *Trunk* bark grey; branches red-brown or dark brown, sparsely or densely lenticellate; branchlets glabrous. *Leaves:* petiole 3–7 mm long, with 2 outer and 10–12 inner axillary colleters; blade shiny and (when dry) reddish-brown above, elliptic, ovate, or rarely obovate, 1–2.2(–2.5) × as long as wide, 1.4–15.5 × 1–7.8 cm, rounded, rarely cuneate or subcordate at the base, acuminate at the apex (acumen 2–12 mm long), slightly undulate at the margin, papyraceous, glabrous on both sides, with or without translucent dots; 5–7(–9) pairs of slightly curved secondary veins at an angle of 35–45° with the midrib; tertiary venation conspicuous beneath. *Inflorescence* on short branches or in the forks, 3–8-flowered (1–2 flowers open at a time), pedunculate or rarely sessile, congested, glabrous in all parts or rarely with some hairs; peduncle (0–)5–16 mm long, lenticellate; branches 5–30 mm long; pedicels 11–33 mm long; bracts deciduous, linear or narrowly elliptic, 6–17 × 1–2 mm, acute, sepal-like. *Calyx:* sepals subequal, the outer slightly larger than the inner, narrowly ovate or linear, 5–10 × as long as wide, 9–21 × 1.2–3.8 mm, acute, glabrous; with 5–10 forked colleters, concentrated mainly on the inner sepals. *Corolla:* tube 0.9–1.6 × as long as the calyx, white and turning yellow outside, yellow and red-spotted inside, 10–19 mm long, widening at 45–66% of its length into a cup-shaped upper part, at the mouth 6–14 mm wide, puberulous on both sides; corona lobes yellow and red-spotted, lingulate, 2–3 × 2–2.2 mm, rounded at the apex, undulate at the margin, fleshy, puberulous; corolla lobes white on both sides, turning pale yellow, with yellow tails; lobes ovate, 6–10 × 3–6.5 mm, gradually narrowing into the 1 mm wide pendulous tails; lobes including the tails (70–)108–160 mm long, puberulous on both sides, except for the tails. *Stamens* included for 0.5–1.3 mm; filaments inserted at 9–10 mm from the base of the tube, curved, 1 mm high, pubescent inside, with up to 2 mm long ridges; anthers 3.6–4 × 0.8–1 mm, glabrous; tails 0.4–0.5 mm long; acumen 0.1–0.2 mm long. *Pistil:* ovary 1.3–1.5 mm high, densely hispid with long erect hairs; style 9–10.5 mm long; clavuncula 1.2–1.5 mm high; stigma minute, less than 0.4 mm high. *Fruit:* follicles divergent at an angle of 180–190°, tapering into a narrow apex with an obtuse tip, 16–36 cm long and 1.2–2 cm in diameter; exocarp pale brown or red-brown, thick and hard, sulcate, in young fruits densely pubescent, later glabrescent, densely lenticellate; lenticels often elongate. *Seeds:* grain 9.5–14 × 3–4 × 1.3 mm, densely pubescent; beak glabrous for 10–17 mm and bearing a coma for 14–20 mm; coma erect or slightly reflexed, 50–63 mm long.

FIG. 7. *Strophanthus arnoldianus* De Wild. & Th. Durand: 1. flowering branch, $\frac{2}{3}\times$; 2. section of flower, 2 ×; 3. calyx colleter, 6 ×; 4. follicle, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$. (1. *Hess 8 Nov 1950*; 2–3. *Staner 1615*; 4. *Flamigni 189*; 5. *Peynaert 72*).



MAP 5. *Strophanthus arnoldianus* De Wild. & Th. Dur.

Distribution: Western Zaïre.

Ecology: forest and riverine forest; twice reported from woodland; alt. 400–500 m.

Flowering towards the end of the dry and the beginning of the rainy season; mature fruits towards the end of the rainy season.

Specimens examined:

ZAÏRE, BAS-ZAÏRE: Luki, *Wagemans* 1603 (BR); Lukula, *Chevalier* 28418 (P); Gombe, *Jans* 283 (BR); Zongo, Inkisi Falls, *Callens* 2801 (BM); Kwilu Valley, *Mission Cabra-Michel* 66 (BR); ibid., *Devred* 934 (BR, K); Boko (Kifulama?), *Callens* 3668 (NY); Boko, near Kisantu, *Hess & Speiser* 7 Nov. 1950 (ZT); ibid., *Hess* 8 Nov. 1950 (Z); Kisantu, *Krukoff* 231 (NY); M'vuazi, Lumuemo, *Devred* 1267 (BR, K); Kitobola, *Flamigni* 189 (BR); ibid., *Kindt* anno 1899 (BR; type); ibid., Zundu Forest, *Peynaert* 72 (BR); Kinanga, on Kitobola-Kimpese Road, *Compère* 865 (BR, K, NY).

Cultivated: ZAÏRE: Eala, *Chevalier* 28039 (P), *Corbisier Baland* 1857 (BR, NY, PRE), 2005 (BR), *Van Helmont* 1 (BR), *Laurent* 1107 (BR), *Léonard* 1094 (B, BR, K, M, P), *Peynaert* 392 (BR), *Poucet* 500 (BR, K), *Staner* 1615 (BR, FHO, K, P). Kisantu, *Brass & Woodward* 20924 (K, NY), 20947 (NY); ibid., *Callens* 2114 (NY), 4768 (BR).

Notes: a fruit and a seed of another genus (probably *Periploca*) have been erroneously mounted on the same sheet as the holotype, a flowering branch. GILG (1903) has a drawing of the true fruit of the isotype at B. This sheet has been destroyed.

3. S. barteri Franch. 1893a: 301, 1893b: 179, pl. 11; Stapf 1902: 177; Gilg 1903: 25; Hutchinson & Dalziel 1931: 49; Huber 1963: 70; Hall & Swaine 1981: 295.

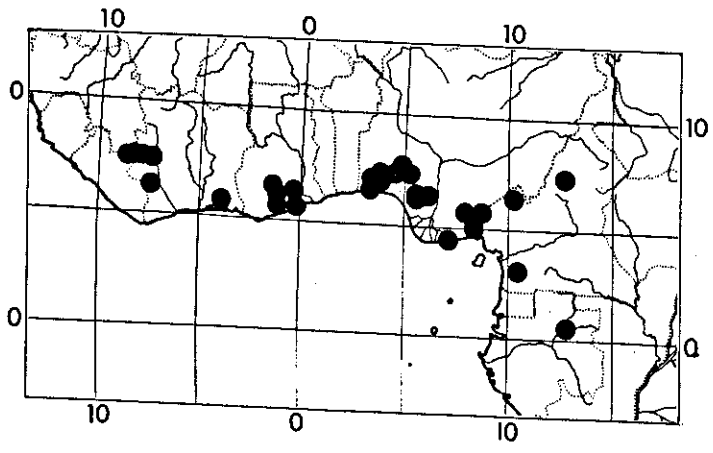
Fig. 8; Map 6

Type: Nigeria, Ogun: Abeokuta, *Barter* 3346 (P, lectotype; isotype: K).

Liana, 1–5 m high, evergreen; latex clear. *Branches* pale brown or chocolate-brown, sparsely lenticellate; branchlets glabrous, rarely puberulous or scabrid. *Leaves:* petiole 1–7 mm long, with 2 outer and 2–4 inner axillary colleters; blade medium or dark green above, paler beneath, ovate or elliptic, (1–)1.5–3 × as long as wide, 1.5–11.5 × 1.2–4.5 cm, rounded or cuneate at the base, acuminate at the apex (acumen 2–10 mm long), papyraceous or thinly coriaceous, slightly bullate, glabrous on both sides, with minute translucent dots; 4–6 pairs of curved secondary veins at an angle of 45–70° with the midrib; tertiary venation

FIG. 8. *Strophanthus barteri* Franch.: 1. flowering branch, $\frac{2}{3}\times$; 2. section of flower, 2 ×; 3. fruit, $\frac{2}{3}\times$; 4. seed, $\frac{2}{3}\times$. (1. *Dalziel 1106*; 2. *Beentje 351*; 3–4. *Krukoff 023*).

inconspicuous. *Inflorescence* on long or short branches or in the forks, 2–12-flowered (1–2 flowers open at a time), pedunculate or rarely sessile, lax, occasionally with reduced branches, puberulous in all parts; peduncle (0–)13–55 mm long, lenticellate; branches 10–50 mm long; pedicels 2.5–13 mm long; bracts pale green with some purple, ovate or elliptic, 6–14 × 2–6 mm, acute or obtuse at the apex, undulate at the margin, sepal-like. *Calyx:* sepals unequal, with the outer shorter and wider than the inner, reddish- or purplish-green, ovate, narrowly ovate, or linear, 2.5–12 × as long as wide, 7–16 × 1–6 mm, acute or obtuse at the apex, undulate at the margin, puberulous; with (1–)2 colleters per sepal. *Corolla:* tube 0.8–1.6 × as long as the calyx, white and turning yellow with a pink tinge at the base and faintly pink-streaked outside, yellow with 10–15 red-purple lines inside, 10–20 mm long, widening at 37–50% of its length into a cup-shaped upper part, at the mouth 6–14 mm wide, puberulous on both sides; corona lobes yellow, with purple margins, lingulate, 1.2–4 × 1.5–2 mm, acute or obtuse, fleshy, puberulous; corolla lobes white, with red lines on both sides, the white turning yellow; lobes ovate, 4–6 × 3–5.5 mm, abruptly narrowing into the 0.5 mm wide pendulous tails; lobes including the tails 38–100 mm long, puberulous on both sides except for the apex. *Stamens* included for 0.5–3.5 mm; filaments inserted at 4.5–9 mm from the base of the tube, curved, 0.6–1.2 mm high, puberulous outside and pubescent inside, with inconspicuous ridges; anthers 5.5–7.5 × 0.7–1 mm, densely pubescent except for the acumen; tails 0.4–0.8 mm long; acumen 2–3.8 mm long. *Pistil:* ovary 0.8–1.2 × 1.4–2.2 mm, densely long-pubescent in the upper part; style 4.5–8.5 mm long; clavuncula 1.2–1.8 × 1–1.3 mm; stigma minute. *Fruit:* follicles divergent at an unknown angle, tapering into a narrow apex and ending in a small knob, 15–27 cm long and 0.9–1 cm in diameter; exocarp thin and brittle, slightly sulcate, glabrous, rather densely lenticellate; lenticels elongate. *Seeds:* grain 10–17 × 2.2–5 mm, puberulous or short-pubescent; beak glabrous for 8–15 mm and bearing a coma for 15–30 mm; coma 25–70 mm long.



MAP 6. *Strophanthus barteri* Franch.

Distribution: Liberia to Gabon.
Ecology: primary and secondary forest; alt. 0–900 m.
Flowering all year, but especially towards the beginning of the rainy season.

Specimens examined:

LIBERIA: Mts. Nimba, *Schnell* 5249 (K, P).

CÔTE D'IVOIRE: between Danané and Mt. Kouan, *Chevalier* 21252 (P); km 25 on Man-Danané Road, *Beentje* 182 (WAG), 351 (UCJ, WAG); Man, *Aké Assi* 1519 (UCJ); between Man and Zagoué, *Chevalier* 21556 (P); Sangouiné Forest, *Aké Assi* 10053 (G, WAG); between Sangouiné and Podiagouiné, *Aké Assi* 8836 (WAG); between Divo and Lakota, *Aké Assi* 10036 (WAG); Cechi, between Dimbokro and Agboville, *Guillaumet* 1889 (ABI).

GHANA: Tano Suhien Res., *Morton* A 3635 (GC, K, WAG); km 15 on Kumasi-Accra Road, *Bally* B 115 (K); Lake Bosumtwe, *Adams* 2488 (B, BR, K, P); Banka, *Vigne* 1871 (K); Asuboni R. bank, near Ankoma, *Enti* GC 37527 (GC, K); Begoro, *Adams* 240 (GC); Achimota, *Akpabla* 22 May 1953 (GC); Dawa, *Darko* 579 (K, MO); ibid., *Box* 3443 (GC); sin. loc., *Farmar* 383 (BM, K); sin. loc., *Vigne* 1083 (K); localities not found: Techiman-Wenchi, *Morton* GC 8593 (GC, K, WAG); Otroppe E. P., *Vigne* 4380 (K, P).

NIGERIA, OYO: Ibadan, *Akpabla* 1122 (K); ibid., *Katz & Schmutz* 65 (BM), 76 (K), 81 (BM); ibid., *Katz* H 98 (K); ibid., *Keay* FHI 122483 (K, NY); ibid., *Latilo* FHI 21007 (BR, K, P); ibid., *van Meer* 689 (WAG); ibid., *Meikle* 985 (K, P), 1129 (K), 1297 (B, BR, K, P); ibid., *Onyeachusim* FHI 47227 (GC, K); Gambari, *Onochie* FHI 21700 (FHO, K); Ile Ife, *Evrard* 6947 (BR). OGUN: Abeokuta, *Barter* 3346 (K, P; type); ibid., *Harrison* 28 (P; paratype). LAGOS: Lagos, *Dalziel* 1106 (C, E, K, M, MO, PRE). ONDO: Igbara Odo, *Gledhill* 894 (K). BENDEL: Benin City, *Onochie* FHI 27693 (GC); Uhi For. Res., *Eimunjeze et al.* FHI 69931 (K). RIVERS: Bonny, *Kalbreyer* 70 (K). IMO: Ebom, *Jones 1432 (FHO)*. CROSS RIVER: 15 km SE of Ikom, *van Meer* 1710 (WAG); Calabar, *Baldwin* 13786 (K). Sin. loc., *Krukoff* 023 (NY).

CAMEROUN: Bamenda, Fang, *Maitland* 1891 (K); Bipindi, *Zenker* 4850 (BM, BR, G, GOET, HBG, K, L, LE, M, MO, S, W).

GABON: Ipasca Station, *Florence* 723 (P).

Cultivated: U.S.A.: Coconut Grove (Fla), *Margraff* PI 186628 (NY).

Notes: *S. barteri* is closely allied to *S. preussii*, and is most easily distinguished by the undulate bracts and sepals, which are also less wide than those of *S. preussii*. Moreover, the corolla lobes of *S. barteri* are shorter than those of *S. preussii*; and the exocarp of *S. barteri* is thinner than that of *S. preussii*.

4. S. bequaertii Staner & Michotte 1934: 53.

Type: Zaïre, Kivu: Masisi, *Bequaert* 6376 (BR, holotype; isotype: BR).

Fig. 9; Map 7

Liana, up to 10 m high, presumably evergreen; latex white. *Trunk* up to 7 cm in diameter; branches dark grey-brown, densely lenticellate; branchlets dark red-brown, glabrous. *Leaves:* petiole 4–12 mm long, with 2 outer and 0–2 inner axillary colleters; blade medium or dark green above, much paler beneath, elliptic, narrowly elliptic, or slightly obovate, rarely slightly ovate, 2–3.8 × as long as wide, 4–11.5 × 1.5–4.5 cm, cuneate at the base or decurrent into the petiole, acuminate at the apex (acumen 3–12 mm long), chartaceous or thinly coriaceous, glabrous on both sides, with or without translucent dots; 7–9(–11) pairs of slightly curved secondary veins at an angle of 75–80° with the midrib; tertiary venation inconspicuous. *Inflorescence* on long or short branches, 1–6-flowered (1 flower open at a time), pedunculate, lax, glabrous in all parts; peduncle 2–12 mm long, lenticellate; branches 5–30 mm long; pedicels 4–11 mm long; bracts narrowly ovate or linear, 2.5–10 × 0.5–1.5 mm, subscarious and not very sepal–

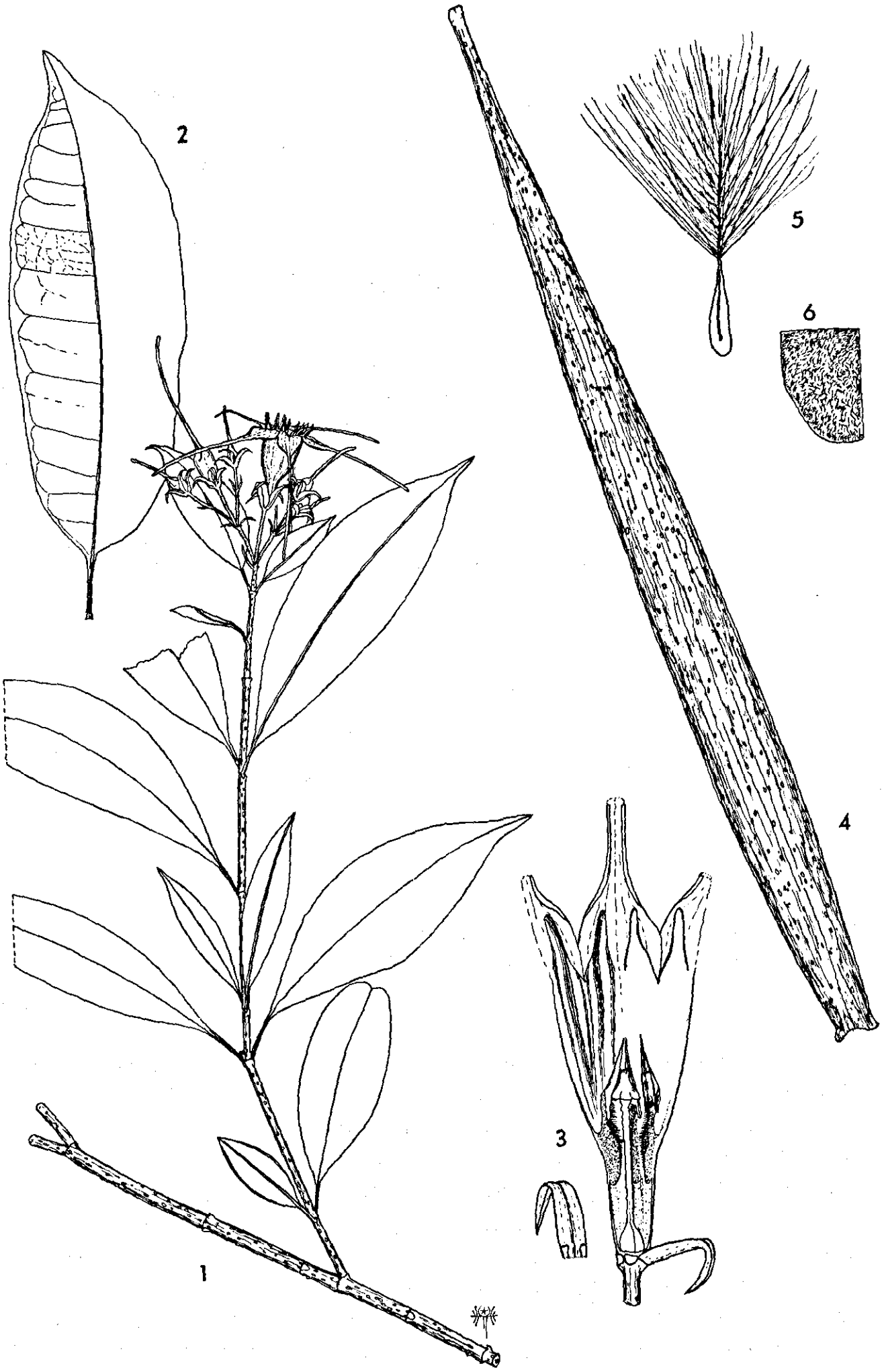
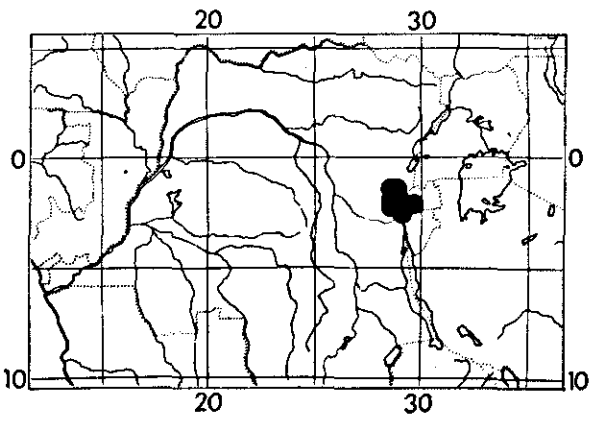


FIG. 9. *Strophanthus bequaertii* Staner & Michotte: 1. flowering branch, $\frac{2}{3}\times$; 2. leaf, $\frac{2}{3}\times$; 3. section of flower, 2 ×; 4. follicle, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$; 6. testa detail, 6 ×. (1. *Pierlot 2878*; 2. *Bridson 362*; 3. *Pierlot 1460*; 4. *Pierlot 2878*; 5–6. *Léonard 3121*).

like. *Calyx:* sepals equal, erect or spreading, ovate or narrowly ovate, 2.5–4 × as long as wide, 5–12 × 1.5–3 mm, acute, glabrous; with one obtuse or lobed colleter per sepal. *Corolla:* tube 2–3 × as long as the calyx, white and turning yellow on both sides, violet-tinged outside and violet-streaked inside, 15–25 mm long, widening at 30–45% of its length into a cylindrical or slightly infundibuliform upper part, at the mouth 7–12 mm wide, glabrous on both sides except for the inner side near the mouth, which is puberulous; corona lobes yellow, violet-streaked, subulate, 4–6.5 × 1.5–2 mm, acute or obtuse at the tip, fleshy, sparsely puberulous or pubescent; corolla lobes yellow, turning reddish-yellow; lobes ovate, 5–7 × 3.5–7 mm, abruptly narrowing into the 0.5–1 mm wide spreading tails; lobes including the tails 24–68 mm long, glabrous on both sides. *Stamens* included for 4–7.5 mm; filaments inserted at 7–8 mm from the base of the tube, straight, with an abaxial swelling, 2–3 mm long, pubescent inside, with 3–3.5 mm long pubescent ridges, ridges with a short obtuse spur at the base; anthers 6–9.5 × 1–1.7 mm, glabrous; tails 0.7–0.9 mm long; acumen 1 mm long. *Pistil:* ovary 1–1.3 mm high, glabrous; style 7–8.5 mm long; clavuncula 2.4–2.5 mm high; stigma up to 0.7 mm long. *Fruit:* follicles divergent at an unknown angle, tapering into a narrow apex and ending in an obtuse tip or in a small knob, 18–21 cm long and 1.4 cm in diameter; exocarp dark brown, thick and hard, slightly sulcate, glabrous, rather densely lenticellate. *Seeds:* grain 15–17 × 3.5–4.5 × 1 mm, densely and microscopically puberulous; beak glabrous for 1.5–2 mm and bearing a coma for 15–20 mm; coma 40–45 mm long.



MAP 7. *Strophanthus bequaertii* Staner & Michotte

Distribution: Eastern Zaïre and Rwanda.
Ecology: montane forest; alt. 1400–2000 m.
Flowering from January to March, mature fruits from February to June.

Specimens examined:

ZAÏRE, KIVU: between Masisi and Walikale, *Lebrun* 5141 (BR); Masisi, *Bequaert* 6376 (BR, NY; type); Mahanga, *Léonard* 2493 (BR, WAG); Keco, *Léonard* 3121 (BR, WAG); Kalimbi, Terr. Kalehe, *Léonard* 3563 (BR, WAG); Bitale, km 48 on Kavumu-Walikale Road, *Pierlot* 2878 (BR); Mikonzi, km 42 on Kavumu-Walikale Road, *Pierlot* 1460 (BR).

RWANDA: Cyangugu Préf., Bururi, plain N of Uwinka, *Bridson* 362 (K, WAG); Rangiro, Bururi Forest, *Troupin* 16274 (BR, K, WAG).

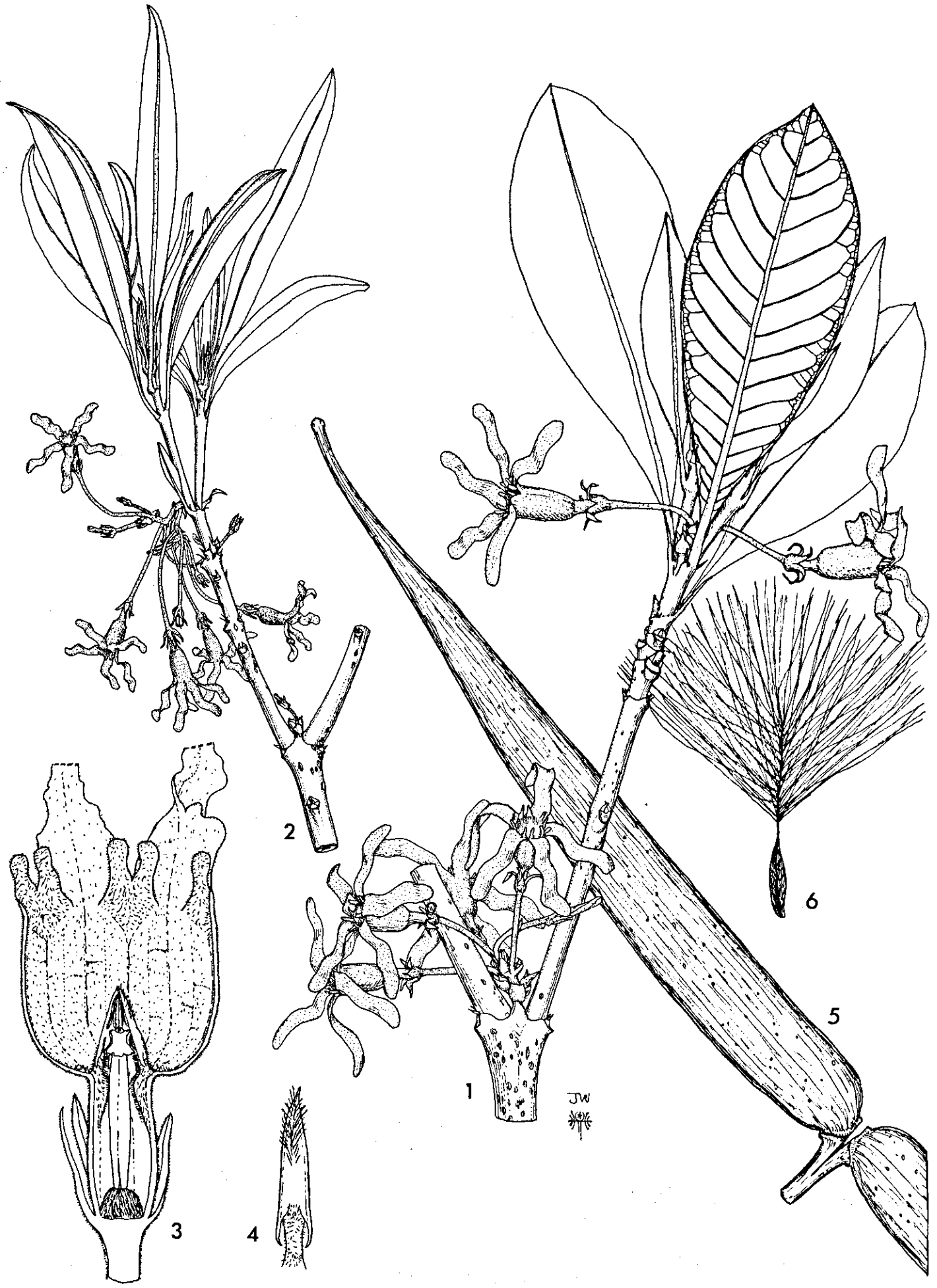


FIG. 10. *Strophanthus boivinii* Baill.: 1. flowering branch, $\frac{2}{3}\times$; 2. flowering branch, $\frac{2}{3}\times$; 3. section of flower, 3 ×; 4. abaxial side of stamen, 6 ×; 5. fruit, $\frac{2}{3}$; 6. seed, $\frac{2}{3}\times$. (1. *Kaudern Nov. 1911*; 2. *Capuron & Chauvet SF 20794*; 3–4. *Capuron SF 28946*; 5. *Boiteau 2018*; 6. *Decary 8037*).

5. S. boivinii Baill. 1888: 757; Franchet 1893b: 252, pl. 1; Gilg 1903: 10; Jumelle & Perrier de la Bâthie 1910: 89; Chatterjee 1950: t. 3483. **Fig. 10; Map 8**

Type: Madagascar, bays of Rigny and Diégo-Suarez, *Boivin* 2462 (P, lectotype; isotypes: NY, P; designated by Pichon 1949: 64).

Homotypic synonym: *Roupellina boivinii* (Baill.) Pichon 1949: 64, pl. 4, and 1950: 62; Markgraf 1976: 244; Boiteau 1979: fig. 44.

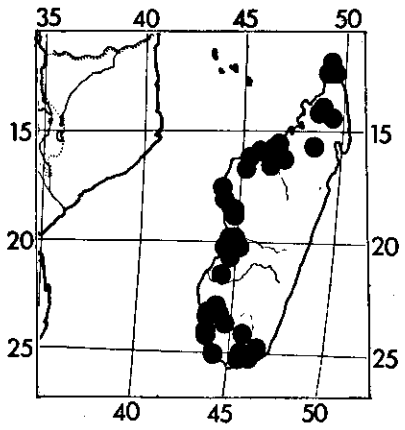
Heterotypic synonyms: *S. grevei* Baill. 1888: 757; Franchet 1893b: 254; Gilg 1903: 10. Type: Madagascar, Morondava, *Grévé* 6 (P, lectotype).

S. boivinii var. *grandiflorus* Pichon 1948b: 211, 1949: 67; Markgraf 1976: 247, syn. nov. Type: Madagascar, upper Mandrare R., between Vavara Hill and Manambolo Valley, *Humbert* 6753 (P, holotype).

S. boivinii var. *angustifolius* Perrier de la Bâthie ex Pichon 1948b: 211, 1949: 67 (as *angustifolia*); Markgraf 1976: 247, syn. nov. Type: Madagascar, bank of Lake Tsimanampetsotsa, *Perrier de la Bâthie* 19038 (P, holotype; isotypes: NY, P).

Shrub, 2–5 m high, or *tree* up to 12 (or perhaps even 28) m high, dichotomously branched and without lateral branches, deciduous, flowers appearing before or with the leaves; latex white. *Trunk* up to 40 cm in diameter, with a pale grey, flaking bark; branches pale reddish- or grey-brown, sparsely or densely lenticellate; branchlets glabrous or puberulous. *Leaves:* petiole 4–15(–20) mm long, with 2 outer and 2–6 inner axillary colleters; blade elliptic, narrowly elliptic, or slightly obovate, 2–7 × as long as wide, 2–21 × 1.3–6(–8) cm, cuneate at the base or decurrent into the petiole, acute, acuminate, or rarely rounded at the apex (acumen up to 10 mm long), undulate or slightly recurved at the margin, papyraceous or chartaceous, glabrous or sparsely to densely puberulous, especially so beneath; (10–)12–20 pairs of nearly straight secondary veins at an angle of 55–70° with the midrib; tertiary venation conspicuous. *Inflorescence* in the forks, (1–)4–24-flowered (1–18 flowers open at a time), erect or drooping, pedunculate, congested, sparsely to densely puberulous in all parts; peduncle 1–7 mm long; branches 2–10(–25) mm long; pedicels (7–)12–35 mm long; bracts whitish, ovate, 1.5–4 × 1–4 mm, acute, scarious, and not sepal-like. *Calyx:* sepals erects, spreading, or recurved, ovate or narrowly ovate, 1.5–3.5 × as long as wide, 1.5–8 × 1–2.5 mm, acute, sparsely to densely puberulous; eglandulose or with 5–7 colleters in total. *Corolla:* tube 1.6–4(–5.5) × as long as the calyx, yellow at the base and orange, turning reddish, in the upper part on both sides, 8–22 mm long, widening at 25–45% of its length into a cylindrical or cup-shaped upper part, at the mouth 3–10 mm wide, puberulous on both sides; corona lobes presumably yellow, squamose or lingulate, (0.4–)1–3 × 1–1.2 mm, obtuse, fleshy, puberulous; corolla lobes orange and turning reddish, with yellow margins, narrowly oblong and sometimes slightly narrowing towards the rounded apex, 2.8–6 × as long as wide, 7–32 × 1.5–6(–8) mm, undulate or crisped at the margin, puberulous on both sides. *Stamens* included for 1–10 mm; filaments inserted at 3–6 mm from the base of the tube, straight, 0.4–1.3 mm long, pubescent all over or inside only, with 0.6–3 mm long puberu-

lous ridges; anthers 2.5–3.4 × 0.5–0.9 mm, pubescent; tails 0.2–0.6 mm long; acumen up to 0.5 mm long. *Pistil:* ovary 0.7–2 × 0.6–1.1 mm, densely pubescent; style (2.6–)3.8–5.1 mm long; clavuncula 0.7–1.2 × 0.6–0.9 mm; stigma up to 0.3 mm long. *Fruit:* follicles divergent at an angle of 160–220°, tapering into a narrow apex, often curved inwards at the tip, 11–24 cm long and 1.3–2.7 cm in diameter; exocarp thick and hard, slightly sulcate, in young fruits puberulous, later glabrescent, sparsely to densely lenticellate. *Seeds:* grain 11–16 × 3–5 × 1 mm, densely pubescent; beak glabrous for 1.5–5 mm and bearing a coma for 9-20 mm; coma erect or spreading, 30–45 mm long.



MAP 8. *Strophanthus boivinii* Baill.

Distribution: Madagascar.

Ecology: dry forest and thorny thickets; alt. 0–800 m.

Flowering towards the end of the dry and the beginning of the rainy season; mature fruits in the dry season.

A selection of the ca. 125 specimens examined:

MADAGASCAR: Cap d'Ambre, *Bosser* 20196 (P); Mt. d'Ambre Circular Road, *Morat* 1426 (P); Diego Suarez, Mt. des Francais, *Humbert* 3954 (G, P); Orengea For., E of Diego Suarez, *Capuron* SF 11336 (P); Ankiakabe-Andapa, *Serv. For.* 11148 (P); Majunga, Mitsingo, *Kaudern* Oct. 1911 (S); between Majunga and Antsahalambé, *Grandidier* s.n. (P; paratype); Berivotra, *Descoings* 3507 (P); Analalava Distr., Ambondro Forest, *Capuron* SF 18827 (P); Soalala Distr., Namoroka, *Decary* 15844 (P); Ambongo, Andranomavo, *Perrier de la Bâthie* 975a (P); ibid., Rakotovao Cons. Res. 5635 (P); Soalala Distr., Andranomatavy, *Randrianasolo in herb. Saboureau* 2191 (P); Soalala-Mangobory, *Serv. For.* 4330 (P); Mandritsava Distr., Kalandy, Matsamena, *Serv. For.* 25997 (P); between Manaratsandry and Hitsingo, 6 km from Amfijoroa, *Boiteau* 1066 (P); Ankarafantsika, *Serv. For.* 4 (P); Ambalo-Boeni Distr., Tsaramandroso, *Ramamomossa* 2544 (P); Tambohorano, *Decary* 8037 (P); Maintirano, *Decary* 15567 (P); Antsalova Distr., Antsinger, *Serv. For.* 11244 (P); Antsalova Distr., Berongony, *Serv. for.* 11234 (P); Marofandelia For., N of Morondava, *Humbert 11428* (P); Morondava, *Grévé* 22 (P; paratype of *S. grevei*), 75 (NY, P); Mahabo, Dabara, *Dequaire* 27288 (P); Ankiranja, 30–35 km from Manja on Bevoay Road, *Capuron* SF 28946 (P); Tulear area, Ankazoabo, *Decary* 16298 (P); Ampotaka, *Boiteau* 4221 (P); 'La Table', Tulear, *Keraudren* 578 (P); Sakaravy, *Poisson* 60 (P); Betioky Distr., Sakoa R. Valley, *Decary* 15971 (P); near Lake Tsimanampetsotsa, *Humbert* 20236 (P); ibid., *Leandri & Saboureau* 4044 (P); Delta of Ilinta R., *Humbert & Swingle* 5365 (P, US); Hazoara Forest, near Imongy, *Cours* 5274 (P); Piropiso Rock, near Ampandrandava, *Seyrig* 332 (P); N of Ambovombe, Mahatomotsy, *Decary* 9509 (BM, C, G, K, P, S); Ambovombe, *Bosser* 444 (P); Lake Alaotra (Cult?), *herb. stat. Agric.* 27358 (P).

MAURITIUS, naturalized: Old Calebasse Railway Halt, *Duljeat 16 June 1955* (MAU).

REUNION, naturalized: St. Leu, Oratoire, *Cadet* 1817 (P).

Cultivated: MAURITIUS: sin. loc., *Fl. Mauritius* 1879 (MAU); RÉUNION: La Galette, St. Leu, *Fl. Mauritius* 1878 (MAU); ALGERIA: Alger, *Decaisne* anno 1872 (P); INDIA: Bombay, *Chatterjee* s.n. (K); Madras, *Gamble* 16032 (K); VIÊT-NAM: Saigon, *Hiêp* 765 (P); INDONESIA: Bogor, *Woerjantoro* 1 (BR, L).

Notes: according to FRANCHET (1893b) and GILG (1903), *S. boivinii* has succulent branches, but this could not be observed from the herbarium specimens.

I see no reason to place this species in a separate genus *Roupellina,* as it differs only in the shape of the corolla lobes from other *Strophanthus* species.

In the Southwest of Madagascar, plants of this species grow on limestone, and show leaves which are much narrower (up to 7 × as long as wide) than plants from other regions (leaves 2–3 × as long as wide). I considere this to be an ecological adaptation, and therefore the var. *angustifolius* is reduced into synonymy, as is Pichons other variety, var. *grandiflorus*; this is merely a local extreme.

One of the paratypes of *S. grevei, Grévé* 63, seems to have been lost.

6. S. bullenianus Mast. 1870: 1471, fig. 257; Reber 1887: 297; Franchet 1893b: 274; Stapf 1902: 175; Gilg 1903: 38, pl. 3; Hutchinson & Dalziel 1931: 49; Krukoff & Letouzey 1950: 132; Monachino 1950: 366; Huber 1963: 70.

Fig. 11; Map 9

Type: Nigeria, Cross River: Old Calabar R., *Mann* 2247 (K, lectotype; isotype: K; designated by Monachino).

Heterotypic synonyms: *S. erythroleucos* Gilg 1902a: 160; Stapf 1902: 178; Gilg 1903: 27, pl. 6; Krukoff & Letouzey 1950: 136, syn. nov. Type: Cameroun, Grand Batanga, *Dinklage* 841 (HBG, lectotype; isotype: HBG).

S. schlechteri K. Schum. & Gilg 1902a: 158; Gilg 1903: 38, pl. 3. Type: Cameroun, between Mafura and Mundane, *Schlechter* 12919 (holotype destroyed in B). Neotype: Cameroun, Bakaka For., 3 km E of Eboné, *Leeuwenberg* 8646 (WAG,neotype; isoneotype: WAG).

S. wildemanianus Gilg 1902a: 159; Stapf 1902: 179; Gilg 1903: 26, pl. 5; Staner & Michotte 1934: 48, syn. nov. Type: Zaïre, Bas-Zaïre: Kimuenza, *Gillet* 2083 (BR, holotype).

Liana, 2–12 m high, presumably evergreen; latex clear or white. *Branches* dark purplish-brown, sparsely lenticellate; branchlets reddish, glabrous or sparsely to densely hispid. *Leaves:* petiole 2–7 mm long, with 2 outer and 2–4 inner axillary colleters; blade in young leaves sometimes purplish, in mature leaves shiny and dark green above, dull and paler beneath, elliptic, ovate, or slightly obovate, 1.5–3 × as long as wide, 3–16 × 1.3–7.5 cm, cuneate, rounded, or subcordate at the base, acuminate at the apex (acumen slender, 7–22 mm long), slightly undulate at the margin, membranaceous or chartaceous, glabrous or sparsely hispid above and glabrous or densely hispid beneath, especially on the midrib and the veins, with translucent dots; (6–)7–10(–13) pairs of slightly curved secondary veins at an angle of 50–70° with the midrib, anastomizing

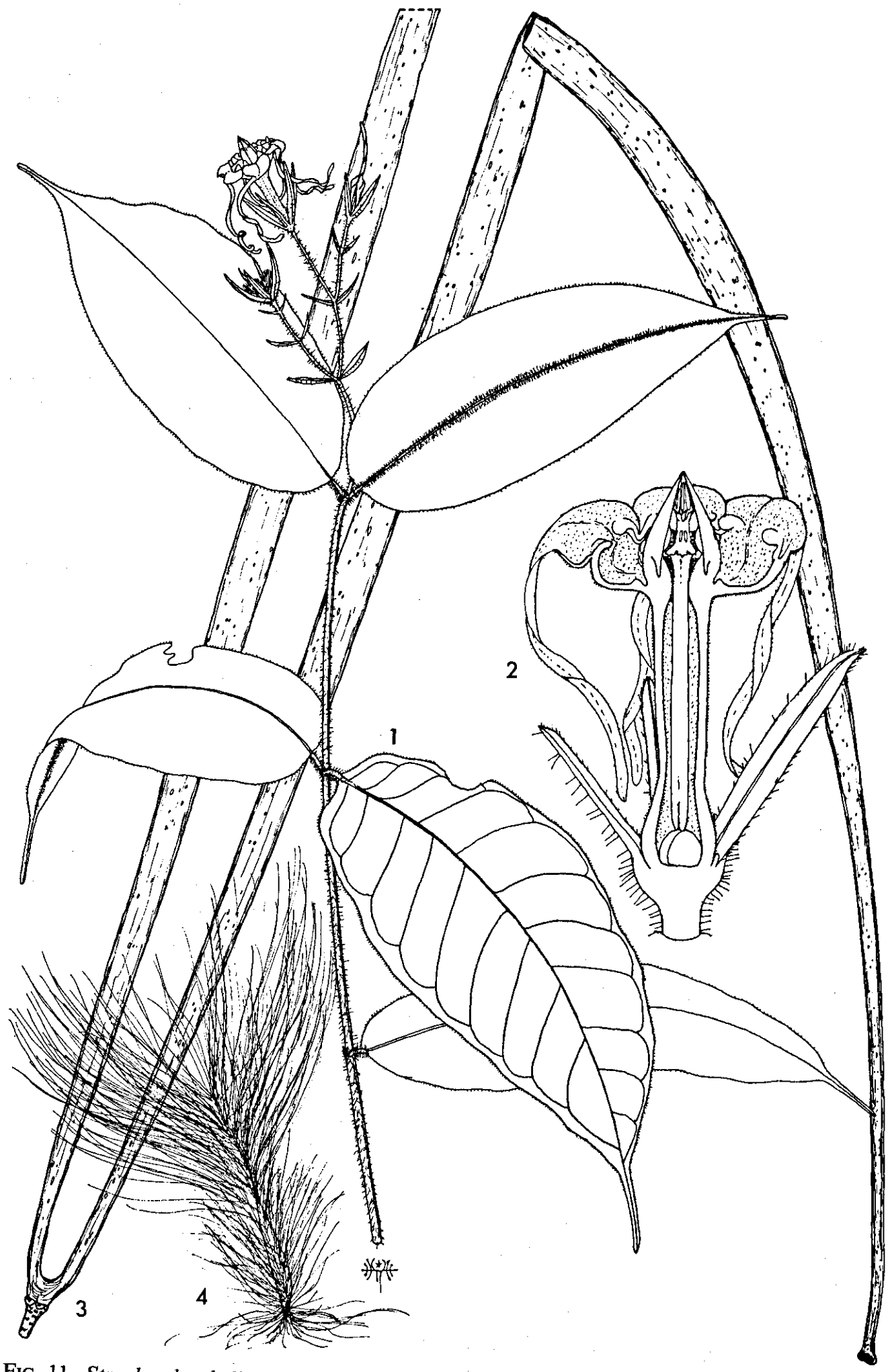
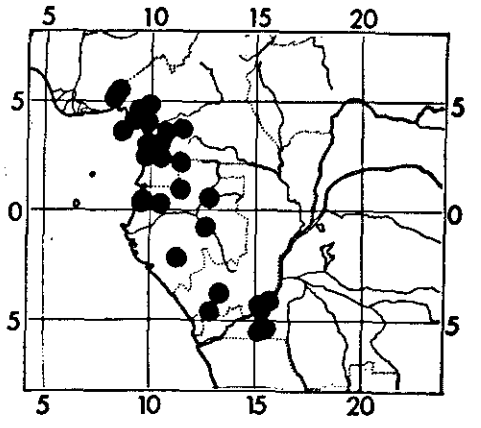


FIG. 11. *Strophanthus bullenianus* Mast.: 1. flowering branch, $\frac{2}{3}\times$; 2. section of flower, 3 ×; 3. fruit, one follicle bent double, $\frac{2}{3}\times$; 4. seed, $\frac{2}{3}\times$. (1. *Soyaux 55*; 2. *Leeuwenberg 8646*; 3. *Brass & Woodward 20834*; 4. *Breyne 3439*).

or looping near the margin; tertiary venation sometimes conspicuous. *Inflorescence* on long or short branches or in the forks, 1–10-flowered (1–5 flowers open at a time), pedunculate or rarely sessile, lax, glabrous or sparsely to densely lenticellate in all parts; peduncle – if present – 5–48 mm long; branches 5–70 mm long; pedicels 6–21 mm long; bracts erect or spreading, green and slightly reddish near the base, linear, narrowly elliptic, or narrowly obovate, 4–11 × 0.5–1.2(–2) mm, obtuse or acute, sepal-like. *Calyx:* sepals subequal, the outer somewhat wider and occasionally longer than the inner, green and slightly reddish at the base or entirely greenish-violet, narrowly elliptic or narrowly ovate, 5–17 × as long as wide, 5–12 × 0.5–1.8 mm, obtuse or acute, glabrous or hispid on the midrib and margins; with 1 colleter per sepal, rarely 0 or 2–3. *Corolla:* tube 0.9–1.6 × as long as the calyx, creamy on both sides, turning reddish outside, red- or purple-spotted inside, 9–15 mm long, widening at 63–90% of its length into a shallowly cup-shaped upper part, at the mouth 6–12 mm wide, puberulous on both sides; corona lobes red, turning purple, lingulate, 0.5–2.5 × 1–2 mm, rounded, fleshy, minutely puberulous; corolla lobes yellow on both sides, sometimes with red on the right margin outside, red-spotted inside; lobes ovate, 3–7 × 3.5–7 mm, rather abruptly narrowing into the 0.5–1 mm wide spreading tails; lobes including the tails 11–40 mm long, puberulous on both sides. *Stamens* nearly completely exserted; filaments inserted at 8.5–11.5 mm from the base of the tube, straight or slightly curved, with a small abaxial swelling near the base, 0.9–1.3 mm long, pubescent inside, with 6–15 mm long puberulous ridges; anthers 3.8–4.5 × 0.9–1.2 mm, glabrous; tails 0.3–0.7 mm long; acumen 0.1–0.3 mm long. *Pistil:* ovary 0.7–1.3 × 0.7–1.3 mm, glabrous; style 8.4–12 mm long; clavuncula 1.5–2 mm high; stigma minute. *Fruit:* follicles pendulous, at the base divergent at an angle of 25–60°, tapering into a narrow base and a narrow apex and ending at the apex in a small knob, 33–58 cm long and 1–1.5 cm in diameter; exocarp reddish-brown, thin and brittle, slightly sulcate, glabrous, sparsely lenticellate. *Seeds:* grain 21–25 × 4 mm, at the base with a persistent coma, and with part of the apical coma inserted on the testa; beak bearing a coma over its whole length, 20–30 mm long; coma 50–82 mm long.



MAP 9. *Strophanthus bullenianus* Mast.

Distribution: Nigeria to Zaïre.

Ecology: primary or secondary forest or gallery forest, often at forest margins; alt. 0–500 m.

Flowers found all year round, but especially in November and December; mature fruits in the dry period.

Specimens examined:

NIGERIA, CROSS RIVER: Oban, *Talbot* 211 (BM, K); Oban-Calabar Road, *Ujor* FHI 31798 (K); Old Calabar R., *Mann* 2247 (K; type); ibid., *Thomson* 1022 (E, K; paratype).

CAMEROUN: Bakaka Forest, 3 km E of Eboné on Nkongsamba-Loum Road, *Leeuwenberg* 8646 (WAG); Kumba, *Krukoff* 064 (MO); Dibombari, *Surville* 738 (YA); Victoria Distr., *Maitland* 56 (K); Tiko, *SRF Cam.* 4141 (YA); Douala, Bois des Singes, *Krukoff & Chew* 200 (NY, YA); Wouri R., 9 km S of Douala, *Brass & Woodward* 20834 (NY); Eséka, *Bamps* 1410 (BR, YA); Yaoundé, *SRF Cam.* 15499 (YA); 19½ km from Kribi on Ebolowa Road, *Bos* 4029 (WAG); 13 km N of Kribi, *Bos* 3260 (WAG, YA); 14 km E of Kribi, *Bos* 4960 (WAG); Grand Batanga, *Dinklage* 841 (HBG; type of *S. erythroleucos*), 1401 (HBG; paratype of *S. erythroleucos*); Bipindi, *Zenker* 52 (BM, MO), 3639 (BM, WU); km 6 on Campo-Kribi Road, *J. de Wilde* 7807a (WAG); Nsebito, on Meyo Centre-Nyabesan Road, *Letouzey* 15282 (P, WAG); sin. loc., *Krukoff* s.n. (MO).

EQUATORIAL GUINEA, FERNANDO PÓO: sin. loc., *Mann* 1444 (A, K, P; paratype).

GABON: Bitam, near Akamsi, *Krukoff & Letouzey* 137 (MO); Essoun-Alem, *Le Testu* 8 Jan. 1934 (BM); Ipasca Station, 10 km S of Makokou, *Florence* 874b (P); Sibang, near Munda, *Soyaux* 55 (BP, GOET, K, LE, P, Z); Libreville, *Klaine* s.n. (P, WAG), 3418 (P), 3474 (P); Abanga, *N. Hallé* 2242 (P), 2286 (P); Lastoursville, *Le Testu* 7229 (BM, LISC, P); Lemba Forest, *Le Testu* 6500 (BM).

CONGO: Mudongo Road, 25 km W of Sibiti, *Farron* 4359 (P); Djoumouna Forest, *Bitsindou* 160 (P); ibid., *Farron* 4689 (P); ibid., *Sita* 1539 (P).

ZAÏRE, BAS-ZAÏRE: Binza, *Jans* 483 (BR); Maluku Terr., *Breyne* 2314 (BR, WAG), 3439 (BR); ibid., *Pauwels* 5918 (BR); Kinganga, *Compère* 659 (BR); Kimuenza, Gillet 2083 (BR, NY; type of *S. wildemanianus*).

ANGOLA, CABINDA: Hambe, Belize, *Gossweiler* 8216a (BM, LISJC, LISU), 8216b (LISU).

Notes: STAPF (1902), GILG (1903), and KRUKOFF & LETOUZEY (1950) stated that the fruits of S. bullenianus were in fact those of a *Pleioceras*, but MONACHINO (1950) proved that they indeed belong to *S. bullenianus*; fruit and seed however are exceptional within *Strophanthus*, as the fruits are pendulous and very long, while the seeds bear the coma not only on the beak, but also on the grain itself. MONACHINO (1950) based a new section on these characters (section *Synclinocarpus*), but I do not consider these differences to be important enough to maintain this section.

S. erythroleucos and *S. wildemanianus* were seen as completely glabrous species, as opposed to *S. bullenianus* which was seen as having densely hispid leaves. The type specimens of both of the first names turned out to bear some hairs on the leaves and the inflorescence, while several other specimens were intermediate between these two and the type of *S. bullenianus* as for their indumentum. As they do not differ in any other respect, *S. erythroleucos* and *S. wildemanianus* are reduced into synonymy.

7. S. caudatus (L.) Kurz 1877a: 257; Franchet 1893b: 263; Gilg 1903: 13; Bakhuizen van den Brink jr. 1948: 44; Backer & Bakhuizen van den Brink jr. 1965: 240.

Fig. 12; Map 10

Basionym: *Echites caudata* L. 1767: 52; Burman f. 1768: 68, pl. 24; Willdenow 1797: 1240.

Type: Indonesia, Java, *Kleinhof* 23 (K-LINN, holotype; isotypes: G, G-DC).

Homotypic synonyms: *Nerium caudatum* (L.) Lam. 1789: 458; *S. dichotomus* var. *marckii* A.DC. 1844: 417; *S. caudatus* f. *marckii* (A.DC.) Franch. 1893b: 265.

S. dichotomus DC. 1802: 123; A. P. De Candolle & Desfontaines 1802: 411; A. P. De Candolle 1804: 7, t. 3; Blume 1826: 1044; G. Don 1837: 85; A. De Candolle 1844: 417; Miquel 1856: 441; van Nooten 1863: pl. 25; Hooker f. 1882: 655; Reber 1887: 293; King & Gamble 1908: 468; Ridley 1923: 354, fig. 106.

S. dichotomus var. *rotundatus* Pers. 1805: 269; G. Don 1837: 85; Reber 1887: 293.

Heterotypic synonyms: *Nerium scandens* Lour. (non L.) 1790: 143. Type: Viêt-nam, 'in dumetis Cochinchinae', *Loureiro* s.n. (BM, holotype). Homotypic synonyms: *S. scandens* (Lour.) Roem. & Schult. 1819: 412; Griffith 1854: 743; *S. dichotomus* var. *loureiri* A. DC. 1844: 417; Reber 1887: 294.

S. terminalis Blume 1823: 56. Type: Indonesia, Java, *Blume* s.n. (L, holotype; isotypes: NY, P). Homotypic synonym: *S. caudatus* forma *undulata* Franch. 1893b: 265; Gilg 1903: 14, syn. nov.

S. griffithii Wight 1848: t. 1300; Walpers 1852: 40; Miquel 1856: 442; Kurz 1877a: 191. Type: Malaysia, Malacca Peninsula, sin. loc., *Griffith* s.n. (K, holotype; isotype: BM, K, P, TCD).

S. longicaudatus Wight 1848: t. 1299; Walpers 1852: 40; Miquel 1856: 191; Kurz 1877a: 191; Franchet 1893b: 266; Gilg 1903: 14, syn. nov. Type: Malaysia, Malacca Peninsula, sin. loc., *Wight* s.n. (K, holotype).

S. cumingii A. DC. 1844: 418; Miquel 1856: 442; Reber 1887: 297; Franchet 1893b: 269; Gilg 1903: 16; Merrill 1912: 374, syn. nov. Type: Philippines, Luzon: Manilla, *Cuming* 1218 (P, holotype; isotypes: L, NY).

S. horsfieldianus Miq. 1856: 442; Reber 1887: 296. Type: Indonesia, Java, *Horsfield* s.n. (L, holotype; isotypes: BM, K, U).

S. dichotomus var. *luzoniensis* Vidal y Soler 1883: 1181, pl. 67, syn. nov. Type: icon. cit. (lectotype).

S. caudatus forma *macrophylla* Franch. 1893b: 265; Gilg 1903: 14; Pitard 1933: 1199, syn. nov. Type: Viêt-nam, Tonkin, between Yen Caa and the Black R., *Balansa* 2127 (P, holotype; isotypes: G, K, P). Homotypic synonym: *S. macrophyllus* (Franch.) Pierre 1905: 491.

S. caudatus forma *javanensis* Franch. 1893b: 264; Gilg 1903: 13, syn. nov. Type: Indonesia, Java: Pintjong Tanduk, *Zollinger* 1637 (P, holotype; isotypes: BM, FI, FI-W, G, K, LE, NY, P, W, Z).

S. caudatus forma *billardieri* Franch. 1893b: 265; Gilg 1903: 14, syn. nov. Type: Indonesia, Bouton Isl., *Webb in herb. Labillardière* 17 Oct. 1793 (P, holotype; isotypes: BM, FI-W, G, K, P, TCD).

S. caudatus forma *lanceolata* Franch. 1893b: 26; Gilg 1903: 14, syn. nov. Type: Viêt-nam, Haiphong, *Balansa* 599 (P, holotype, not seen, probably lost). Neotype: Viêt-nam, Vinh-Yen Prov.: Lang Luc, *Eberhardt* 4920 (P, neotype; isoneotype: A, NY).

S. pierrei Heim 1894: 1151; Gilg 1903: 12. Type: Viêt-nam, Bien Hoa, Thudau-

FIG. 12. *Strophanthus caudatus* (L.) Kurz: 1. flowering branches, $\frac{2}{3}$ ×; 2. section of flower, 2 ×; 3. stamen with the acumen and part of the filament ridge removed, adaxial side, 6 ×; 4. stamen with part of the filament ridge removed, abaxial side, 6 ×; 5. fruit, $\frac{2}{3}$ ×; 6. seed, $\frac{2}{3}$ ×. (1. *Kaudern 468*; 2–4. *Edano 6191*; 5–6. *Kjellberg 2019*).

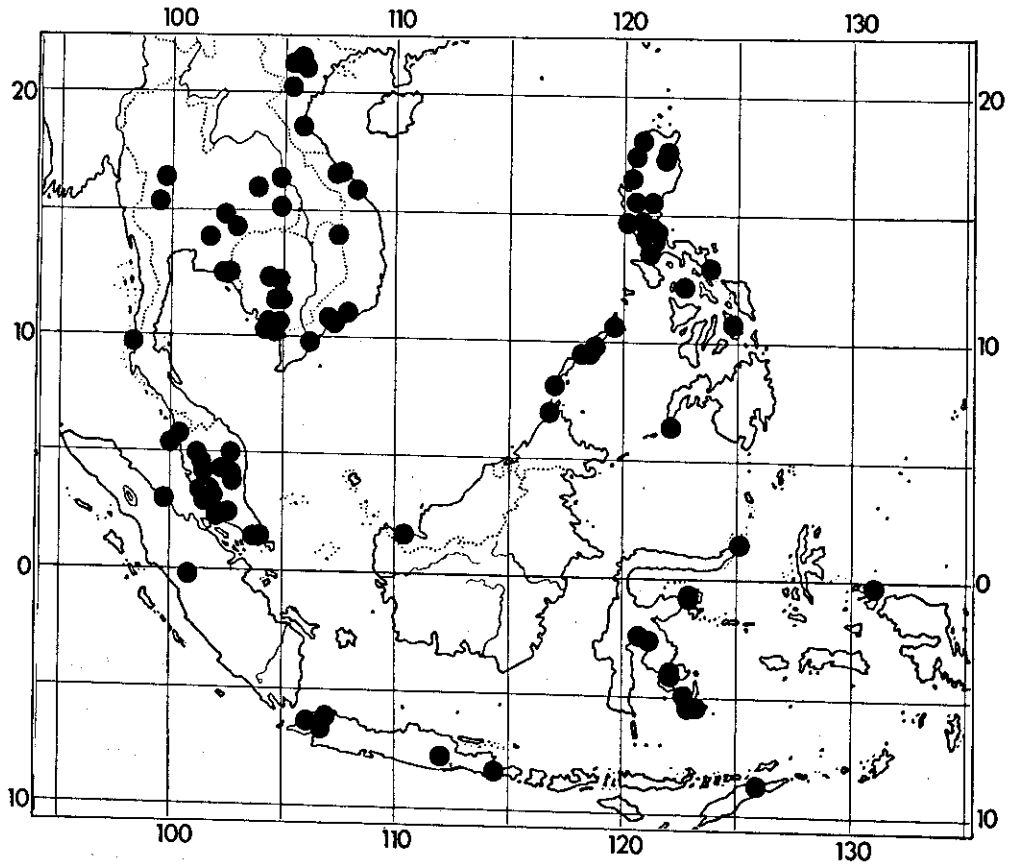
mot, *Pierre* 4411 (P, holotype; isotypes: A, C, CAL, MO, NY, P). Homotypic synonyms: *S. giganteus* Pierre 1905: 491; *S. caudatus* var. *giganteus* (Pierre) Pitard 1933: 1200, syn. nov.

S. erectus Merrill 1908: 261, syn. nov. Type: Philippines, Palawan: Puerto Princesa, *Merrill* 695 (NY, holotype; isotype: K).

S. letei Merrill 1926: 47, syn. nov. Type: Philippines, Luzon: San Fernando, *Lete* 263 (K, holotype).

Sarmentose *shrub,* 1–3 m high, or *liana*, up to 12 m high; latex clear or white. *Trunk* up to 15 cm in diameter, bark pale brown; branches dark brown, sparsely to densely lenticellate; branchlets glabrous. *Leaves:* petiole 3–13(–18) mm long, with 2 outer and 4–12 inner axillary colleters; blade shiny and light or dark green above, dull and paler green beneath, elliptic, obovate, or less often ovate, (1–)1.3–3.1 × as long as wide, 5–15(–24) × 2.5–9(–11) cm, cuneate at the base, acuminate or less often rounded or emarginate at the apex (acumen up to 13 mm long), sometimes with slightly revolute margins, thinly coriaceous, coriaceous, or rarely papyraceous, glabrous on both sides, with translucent dots; 5–13 pairs of curved secondary veins at an angle of 45–70° with the midrib; tertiary venation sometimes conspicuous. *Inflorescence* on long or short branches or in the forks, 2–16-flowered (1–5 flowers open at a time), peduncu-late or rarely sessile, rather congested, glabrous or microscopically puberulous in all parts; peduncle (0–)2–42 mm long, lenticellate; branches 5–85 mm long; pedicels 3–11 mm long; bracts deciduous, pale green, linear or narrowly triangular, 2–12(–17) × 1–2.5 mm, acute, sepal-like. *Calyx:* sepals subequal, the inner slightly longer than the outer, pale green and occasionally with purple margins, ovate or narrowly triangular, 1–6.5 × as long as wide, 3–19 × 1.5–6 mm, acute, subscarious, glabrous, minutely puberulous, or ciliate; with 1–8 colleters per sepal. *Corolla:* tube 1.5–4.2 × as long as the calyx, white, turning red via yellow, on both sides, red- or purple-streaked inside, 12–25.5 mm long and widening at 45–66% of its length into a cup-shaped upper part, at the mouth 7.5–15 (–22) mm wide, glabrous or with only the upper part puberulous on both sides; corona lobes red and turning purple, lingulate or subulate, 3–10 × 1.5–4 mm, obtuse or acute at the tip, sometimes with ragged margins, fleshy, glabrous or puberulous; corolla lobes white, turning red via yellow on both sides, tails yellow and turning purple via red; lobes broadly ovate, 6–15 × 4.5–13 mm, rather abruptly narrowing into the 1.5–3.2 mm wide pendulous tails; lobes including the tails 43–255 mm long, glabrous on both sides or puberulous near the base. *Stamens* 5–14 mm exserted; filaments inserted at 8–13.5 mm from the base of the tube, straight or slightly curved, with an abaxial swelling near the base, 1.4–3 mm long, glabrous or puberulous except for the inner side of the apex, which is pubescent, with 3.5–7 mm long ridges, ending at the base in an obtuse spur, glabrous or puberulous; anthers 13.5–25 × 0.8–1.6 mm, glabrous except for the scabrous or pubescent apex; tails 0.3–0.8(–1.8) mm long; acumen 10.5–19 mm long, minutely serrate. *Pistil:* ovary 1.3–2.5 × 2–3.1 mm, glabrous or microscopically puberulous; style 9–15 mm long; clavuncula 1.4–2.2 × 1.1–1.7

mm; stigma 0.3–0.7 mm long. *Fruit:* follicles divergent at an angle of (150–)180–200°, tapering into a broad or narrow obtuse apex, (10–)13–30 cm long and 2–4.8 cm in diameter; exocarp thick and hard, sulcate, glabrous, sparsely to densely lenticellate. *Seeds:* grain 10–25 × 3–4 mm, glabrous or sparsely and microscopically puberulous; beak glabrous for 5–14 mm and bearing a coma for 18–32 mm; coma 50–90 mm long.



MAP 10. *Strophanthus caudatus* (L.) Kurz

Distribution: South-East Asia.

Ecology: primary or secondary forest, often in forest margins; alt. 0–900 m.

Flowers were found on Java from February to April, and from July to December.

Local names: *Yang nawng* (Thailand, Keai language). *Voi* or *(Dai) voi bong do* (Viêt-namese). *Damrey* (Cambodian). *Abu(h)ab-bagin* (Philippines). *Kikija* (Indonesia, Javanese).

Local uses: arrow poison (Thailand).

A selection of the ca. 220 specimens examined:

BURMA: S Tenasserim, Victoria Isl., *Parkinson* 2048 (K).

THAILAND: Mukdahan, *Lakschnakara* 923 (E, K, TCD); Roi Et, *Wassarak* 16 (K); Ubol Ratchathani, *Yasothorn* 9000 (K); between Khao Yai and Khao Ngi Yai, E of Sangkhla, *van Beusekom & Phengkhlai* 377 (AAU, C, E, K, L, P); Ban Chum Ceng, Korat, *Nai Noc* 223 (BM, L); Dongbang, *Kerr* 21820 (BM, K, P); Chantaburi, *Kerr* 17935 (BM, E, K, L, P).

LAOS: sin. loc., *Spire* 130 (P).

CAMBODIA: Camp Rolland, région des trois frontières, *Vidal* 5099 (P); Kompong Chhnang, *Chevalier* 31952 (P); Kompong Speu prov., Chambak, *Poilane* 15507 (P); Phú Qúôc, Poilane 902 (P).

VIÊT-NAM: Vinh-Yen Prov., Lang Luc, *Eberhardt* 4920 (A, NY, P); Co-ba For. Res. near Vinh, *Fleury in Chevalier* 32418 (P); Quangtri Prov., Colonial Road Nr. 9, km 24, *Poilane* 13380 (P); Bien Hoa, *Thorel* 734 (A, B, K, P); Delta of Mekong R., *Harmand* 802 (P).

MALAYSIA, MALACCA PENINSULA: Perak, Larut, *Kings Coll.* 3896 (K); Dipong, *Scortechini* 1819 (K); Sungei Chenana, *Alvins* 973 (SING); Selangor, Bukit Tanggol, Ulu Langat, *Gadok anak Umbai* KL 1988 (NY); Mt. Ophir, *Lobb* 106 (K, W). SARAWAK: Kudat, *Ismail* 3813 (A, UC); Kuching, *Beccari* 2716 (FI-W).

PHILIPPINES, LUZON: Penablanca, Lagum, *Adduru* 271 (A, K, MO, P); Rizal Prov., *Loher* 14285 (M, UC); Cavite Prov., *Ramos & Deroy* Bs 22589 (BM, K, L, NY); Irosin, Mt. Bulusan, *Elmer* 15637 (BM, BP, C, FI, G, HBG, K, L, MO, NY, P, S, U, UC, W, Z).SIBUYAN: Mt. Giting-giting, *Elmer* 12302 (A, BM, BP, E, FI, G, HBG, L, LE, MO, NY, P, U, W, Z). LEYTE: sin. loc., *Wenzel* 228 (MO). PALAWAN: Puerto Princesa, Mt. Pulgur, *Elmer* 13081 (A, BM, BP, CAL, E, FI, G, HBG, K, L, MO, NY, P, U, W, Z); Lake Maguao, *Merrill* 9570 (BM, K, L, NY, P).

SINGAPORE: Changi Road, *Ridley* 3994 (BM).

INDONESIA, SUMATRA: Asahan, Hoeta Padang, Krukoff 4432 (A, BR, G, L, MO, NY); Taram near Kepala Bandar, *Meyer* 7157 (L). JAVA: Laladon, near Tjiomas, *Bakhuizen van den Brink jr.* 5387 (K, L, P, W); Rogodjampi Prov., Pintjong Tanduk, *Zollinger* 1637 (BM, FI, FI-W, G, K, LE, NY, P, W, Z; type of *S. caudatus* forma *javanensis*). SULAWESI: Minahassa, Mt. Batu Angus Res., *Alston* 16062 (BM); Loewock, *Kaudern* 468 (L, S); Malili, *Kjellberg* 2019 (S); 5 km S of Polipolia, Opa swamp, *Prawiroatmodjo et al.* 1833 (L); Fretum Bouton Isl., *Webb in herb. Labillardière* 17 Oct. 1793 (BM, FI-W, G, K, P, TCD; type of *S. caudatus* forma *billardieri*). WAIGEO: *Labillardière* anno 1793 (FI-W).

TIMOR: sin. loc., *Cardoso* s.n. (LISJC).

Notes: LINNAEUS (1767) first published the name *Echites caudata*; he cites as a reference BURMAN F. (1768), which had not yet been published, as J. BURMAN had sent him proof illustrations of some 'Indian' plants to be included in his son's publication (BURMAN F.). LINNAEUS replies in a letter dated 12 Feb. 1765 that one of these illustrations, bearing the name *Convulvulus filamentosus*, is already known to him and is in fact a species of *Echites,* by him (LINNAEUS) named *E. caudata.* The illustration referred to was later published in BURMAN F. (1768) under the name *Echites caudata.* (See also STEARN 1962: viii.)

Several names, which are reduced here into synonymy, are based on regional characteristics differing slightly from the type of *S. caudatus,* which is from Java:
– in the Philippines the leaves are relatively thin, and the corolla is less fleshy than in specimens from other parts of the distribution area. Philippine specimens of *S. caudatus* were named *S. cumingii, S. dichotomus* var. *luzoniensis, S. erectus,* and *S. letei*;
– In Viêt-nam, Cambodia, and Central Thailand the tails of the corolla are shorter than in other parts of the distribution area. Short-tailed specimens from this area were previously called *S. caudatus* forma *macrophylla* and *S. caudatus* var. *giganteus.*

The types of *S. longicaudatus* and of various formae described by FRANCHET (1893b) closely resemble the type of *S. caudatus.*

8. S. congoensis Franch. 1893a: 318, 1893b: 288, pl. 13; Stapf 1902: 185; Gilg 1903: 32; Staner & Michotte 1934: 55; Krukoff & Letouzey 1950: 137.

Fig. 13; Map 11

Type: Gabon or Congo, *Thollon* s.n. (P, holotype; isotype: P).

Heterotypic synonym: *S. intermedius* var. *bieleri* De Wild. 1907: 547. Type: Zaïre, Equateur: upper Lopori R., *Bieler* anno 1904 (BR, holotype; isotype: BR).

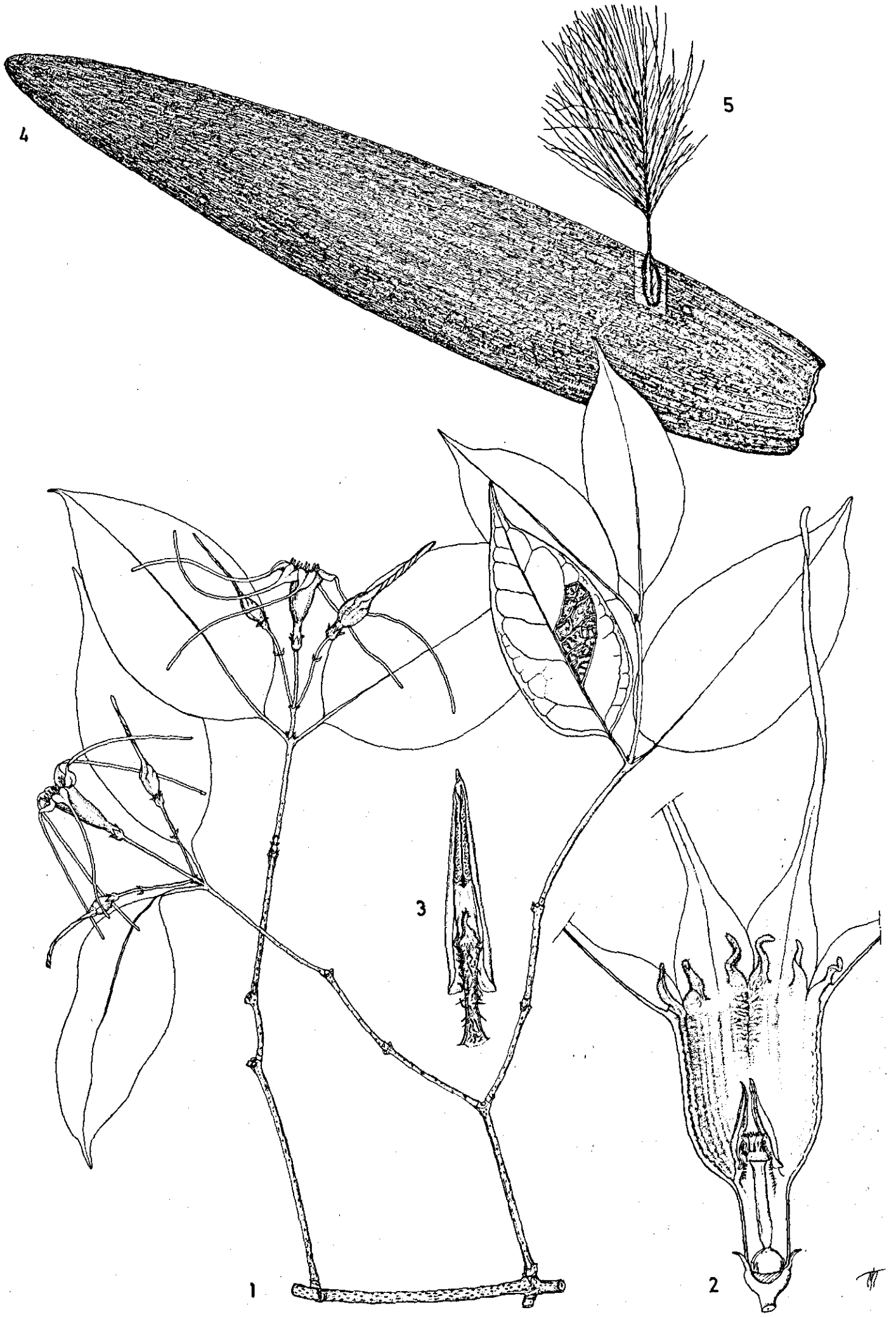
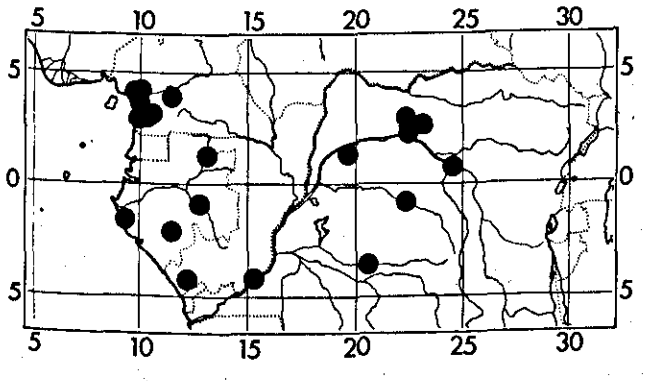


FIG. 13. *Strophanthus congoensis* Franch.: 1. flowering branches, $\frac{2}{3}\times$; 2. section of flower, 2 ×; 3. adaxial side of stamen, 6 ×; 4. follicle, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$. (1–3. *Bos 6633*; 4. *Brass & Woodward 20882*; 5. *Krukoff & Letouzey 184*).

Liana, 5–30 m high, deciduous; latex white. *Trunk* up to 11 cm in diameter; branches brown or grey-brown, sparsely to rather densely lenticellate; branchlets glabrous. *Leaves:* petiole 5–12(–15) mm long, with 2 outer and 2 inner axillary colleters; blade ovate or elliptic, 1.3–3.2 × as long as wide, 3.3–11 × 1.3–5 cm, rounded or cuneate at the base, obtuse or acuminate at the apex (acumen 2–12 mm long), papyraceous or chartaceous, glabrous on both sides, with minute translucent dots; 3–5(–6) pairs of curved secondary veins at an angle of 45–60° with the midrib; tertiary venation sometimes conspicuous. *Inflorescence* on long or short branches or in the forks, 1–18-flowered (1–2 flowers open at a time), sessile or pedunculate, rather congested, glabrous in all parts; peduncle – if present – up to 13 mm long, lenticellate; branches 5–25 mm long; pedicels 2–12(–15) mm long; bracts deciduous, ovate, 1.5–5 × 1–1.5 mm, acute, sepal-like. *Calyx:* sepals erect or spreading, (sub-)equal, ovate, 0.8–2.4 × as long as wide, 1.4–5(–6.2) × 1.5–2.6 mm, acute, scarious, glabrous; with 2–4 colleters per sepal. *Corolla:* tube (2.2–)3.4–11 × as long as the calyx, white on both sides, turning reddish-white outside, red- or purple-streaked inside, 11–19 mm long, widening at 20–33% of its length into a cup-shaded upper part, at the mouth 5–12 mm wide, glabrous outside and puberulous inside; corona lobes presumably red or purple, subulate, 3–7.5 × 1.7–2 mm, acute, fleshy, puberulous; corolla lobes white and turning reddish-white on both sides, tails yellow; lobes ovate, 3–8 × 3–7 mm, rather abruptly narrowing into the 1 mm wide spreading or recurved tails; lobes including the tails 17–50 mm long, glabrous on both sides or puberulous inside near the base. *Stamens* included for 3.4–8.5 mm; filaments inserted at 3.5–6 mm from the base of the tube, straight, 1.4–2.5 mm long, pubescent inside, with 2.5–4 mm long ridges; anthers 4.2–5.2 × 0.8–1.5 mm, glabrous; tails 0.3–0.8 mm long; acumen 0–0.3(–1.1) mm long. *Pistil:* ovary 1.1–1.5 × 1–1.5 mm, glabrous; style 4.3–7 mm long; clavuncula 1–2 × 1.1–1.3 mm; stigma minute. *Fruit:* follicles divergent at an angle of 155° (observed only once), tapering into an obtuse apex, 12.5–23 cm long and 2.3–4 cm in diameter; exocarp thick and hard, slightly sulcate, glabrous, rather densely lenticellate. *Seeds:* grain 11–17 × 4 mm, densely pubescent; beak glabrous for 2–9 mm and bearing a coma for 15–40 mm; coma erect or spreading, rarely recurved, 30–80 mm long.



MAP 11. *Strophanthus congoensis* Franch.

Distribution: Cameroun to Zaïre.

Ecology: primary, secondary, or semi-deciduous forest, also in riverine forest; alt. 0–1000 m.

Flowers from November to March; mature fruits from December to March.

Local names: *Libobo* (Zaïre, Turumbu language, also used for other *Strophanthus* species).

Specimens examined:

CAMEROUN: Douala, Bois des Singes, *Krukoff & Letouzey* 237 (NY); Douala, *Speiser* P 28 (NY), P 29 (NY), P 31 (NY); Koupé on Douala-Bonepoupa Road, *Krukoff & Letouzey* 247 (NY, P, YA), 248 (NY, P, YA); Douala-Yansoki, 5 km from the airport, *Krukoff & Letouzey* 249 (NY, P, YA); Edéa, near Nyong R., *Krukoff & Letouzey* 166 (NY); 4 km N of Kribi, *Bos* 6633 (WAG, YA); Ndoua, *Krukoff & Letouzey* 176 (NY, P), 184 (NY, P); ibid., *Brass & Woodward* 20887 (NY), 20895 (NY); Mboltsia Hill, 23 km NW of Bipindi, *Villiers* 1111 (P); Bipindi, *Krukoff* s.n. (K); ibid., *Zenker* 4174 (BM, BP, BR, E, G, GOET, HBG, K, L, LE, LISC, M, MO, P, PRE, S, UC, W, WU, Z); 5 km SW of Bipindi, *Brass & Woodward* 20882 (K, NY); summit of Mt. Akouandé, *Bos* 6883 (WAG); sin. loc., *Krukoff & Letouzey* 212 (NY, YA), 213 (MO, NY, US).

GABON: Bélinga, *N. Hallé* 3524 (P); Lastoursville, *Le Testu* 7120 (BM, BR, EA, LISC, MO, P); Omboué, *Walker* 29 (P); upper Ngounyé R., Boutombi, *Le Testu* 13 Nov. 1925 (BM).

CONGO: Kakamoeka-Sounda Road, *Farron* 4932 (P); Brazzaville, near Mikatou, *Sita* 1225 (P); Brazzaville, Mayama Road, *Sita* 1960 (P).

ZAÏRE, EQUATEUR: Dundusana, *Mortehan* 1085 (BR); Mobwasa, *Vermoesen* 315 (BR); Bumba, on the Zaïre R., *Goossens* 3039 (BR); upper Lopori R., *Bieler* 20 (BR, type of *S. intermedius* var. *bieleri*); Yalisenga, *Evrard* 6208 (BR, K). HAUTE ZAÏRE: 5 km N of Yangambi, *Brass & Woodward* 20954 (NY); Yangambi, Lusambila R., *Germain* 5415 (BR, M); ibid., *Louis* 14355 (BR), 11187 (B, BM, BR, C, FHO, K, LISJC, M, MO, P). BANDUNDU: Bumbuli, Lake Léopold II, *Lebrun* 6331 (BR). BAS-ZAÏRE: Kisantu, *Callens* 4470 (K, MO, NY; probably cultivated).

Sin. loc.: *Krukoff & Letouzey* 203L (P, YA), 204 (P, YA), 219 (P); *Thollon* s.n. (P; type).

Notes: the locality of the type is not clear. The sheet label has 'Gabon' printed on it, after which 'Congo' is written in ink.

9. S. courmontii Sacl. ex Franch. 1893a: 300 (as *courmonti*); Franchet 1893b: 286, pl. 10; Stapf 1902: 182; Gilg 1903: 22; Braun 1910: 292; Verdcourt & Trump 1969: 136. **Fig. 14; Map 12**

Type: Tanzania, T6, Nguvu Mts., *Sacleux* 2032 (P, holotype).

Heterotypic synonyms: *S. courmontii* var. *fallax* Holmes 1901: 487. Type: Malawi, *Buchanan* 1219 (K, holotype; isotypes: BM, E).

S. courmontii var. *kirkii* Holmes 1901: 488. Type: Tanzania, T8: Yao Forest, *Bishop Steere* s.n. (K, holotype).

Liana, 5–22 m high, or less often a sarmentose *shrub*, 0.60–4 m high, deciduous, with the flowers appearing after the leaves; latex white. *Trunk* up to 10 cm in diameter, with corky ridges up to 5 cm long and 1.8 cm high; branches dark grey or reddish-brown, with corky laterally compressed protuberances at the nodes, later growing into ridges, densely or less often sparsely lenticellate; branchlets glabrous. *Leaves:* petiole 3–11 mm long, with 2 outer and 2–8 inner axillary colleters; blade dark green above, much paler beneath, elliptic, ovate, or rarely obovate, 1–3.1 × as long as wide, 2.5–13.5 × 2.5–6.5 cm, rounded or cuneate at the base, mucronate or acuminate at the apex (acumen up to 10

FIG. 14. *Strophanthus courmontii* Sacl. ex Franch.: 1. flowering branch, $\frac{2}{3}\times$; 2. leaf, $\frac{2}{3}\times$; 3. older branch, $\frac{2}{3}\times$; 4. section of flower, 1 $\times$; 5. fruit, one follicle removed, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1–2. *Helg Jan. 1953*; 3. *Harris 2485*; 4. *Haerdi 215/0*; 5. *Pedro 3319*; 6. *Topham s.n.*).

mm long), papyraceous or thinly coriaceous, glabrous on both sides, with some translucent dots; 3–7(–8) pairs of slightly curved secondary veins at an angle of 35–60° with the midrib; tertiary venation conspicuous beneath. *Inflorescence* on long or short branches or in the forks, 1–3-flowered (1 or rarely 2 flowers open at a time), sessile or pedunculate, glabrous or sparsely puberulous in all parts; peduncle – if present – up to 4 mm long, lenticellate; branches 0–7 mm long; pedicels 1–7.5 mm long; bracts sometimes deciduous, ovate or narrowly ovate, 1.5–4 × 0.8–1.2 mm, acute, not sepal-like. *Flowers* fragrant. *Calyx:* sepals (sub-)equal, the outer sometimes shorter and wider than the inner, pale green and often with a pink apex and margins, ovate or narrowly ovate, 2–6 × as long as wide, 3.5–10 × 1.5–3.5 mm, acute or apiculate, glabrous, ciliate, or rarely puberulous; with 2–3 colleters per sepal, colleters rarely forked. *Corolla:* tube 3–7.5 × as long as the calyx, white and turning yellow near the base outside, red and turning purple near the apex outside, white and turning yellow inside and there purple-streaked, (22–)25–43 mm long, widening at 15–33(–40)% of its length into a cup-shaped upper part, at the mouth 17–35 mm wide, glabrous or less often puberulous outside, puberulous inside; corona lobes yellow, turning purple via red, subulate but with a wide base, 2–6 × 1.2–3.2 mm, obtuse at the tip, fleshy, puberulous; corolla lobes white and turning yellow on both sides, with a violet band on the right margin, 2–3.5 × as long as wide, ovate and gradually narrowing into the acute apex, (20–)25–57 × 10–27 mm, glabrous or less often puberulous on both sides, but always puberulous inside at the base. *Stamens* included for 5–16 mm; filaments inserted at 6–12 mm from the base of the tube, straight or nearly so, 3.5–6 mm long, pubescent inside, with 4–7 mm long puberulous or pubescent ridges; anthers 6.5–9 × (1.3–)1.6–2.2 mm, glabrous; tails 0.7–1.2 mm long; acumen 0.8–2 mm long. *Pistil:* ovary 1.3–2.2 × 2–3.8 mm, glabrous; style 8.8–15.5 mm long; clavuncula 2.2–3 × 1.9–3 mm; stigma minute. *Fruit:* follicles divergent at an angle of 160–200°, tapering into a broad or narrow obtuse apex, 12–26 cm long and 3–4.5 cm in diameter; exocarp grey-black or purplish-black, thick and hard, smooth or slightly sulcate, glabrous, very densely lenticellate. *Seeds:* grain 10–15 × 2.2–4 × 1 mm, densely pubescent; beak glabrous for 15–52 mm and bearing a coma for 17–35 mm; coma 36–70 mm long.

Distribution: East Africa.

Ecology: gallery forest or riverine thickets, less often in forest not directly associated with rivers; alt. 0–1400 m.

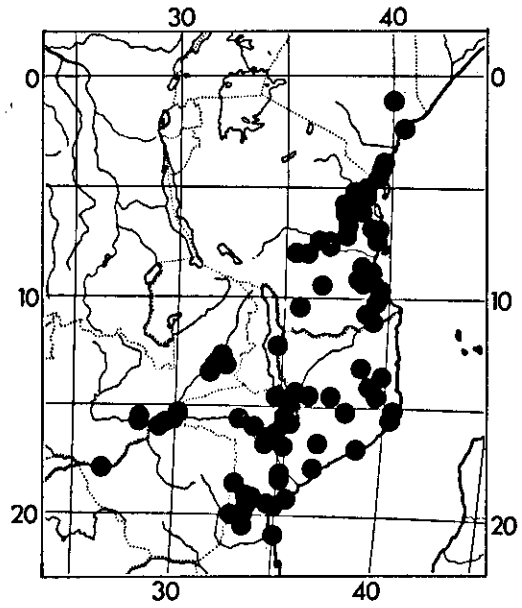
Flowering towards the end of the dry season, and to a lesser extent during the rainy season; mature fruits towards the end of the rainy season.

Local names: *Kia ya mamba* (Kiswahili, meaning 'crocodiles tail').

A selection of the ca. 150 specimens examined:

KENYA, K7: Garissa Distr., Bura, *Greenway* 9246 (FI, K, PRE); Lamu Distr., Otwani Forest, *Rawlins* 254 (K); Coast Distr., Rabai, *Joane* 10528 (EA); Kwale, *Graham* 1568 (BR, FHO, K); 6 km from Ramisi R. on Ramisi-Mrima Hill Road, *Faden* 74/301 (BR, K, MO, PRE, WAG).

TANZANIA, T3: Mtotohovu, *Grote* Feb. 1915 (B); Eastern Usambara Mts., Sigi R., *Brass & Wood-*



MAP 12. *Strophanthus courmontii* Sacl. ex Franch.

ward 20961 (K, NY); ibid., *Peter* 58211 (B, WAG); Panusi, *Greenway* 6676 (K, PRE). T6: Pori, Mogo, *Peter* 44805 (B, WAG); Mia Leni R., 13 km S of Dar es Salaam, *Brass & Woodward* 20971 (NY); Korogwe, Mswahe, *Achibold* 1462 (WAG); Liwali R. bank, Turiani, *Milne-Redhead & Taylor* 7100 (B, BR, K); ibid., *Semsei* 1439 (B, BM, BR, FHO, K); Selous Game Res., Luanyando R., *Rees* T176 (EA); Ulanga Distr., *Haerdi* 215/0 (BR, G, P, WAG). T7: Iringa, Lukosi R., *Burtt* 6071 (BM, BR, FHO, FI, K, LISJC, P, PRE, S); Uhehe, Ruaha R., *Goetze* 453 (BR, K); Bundali Mts., Kyimbila, *Stolz* 125 (A, BM, G, HBG, K, L, M, MO, S, US, W, Z). T8: Kingapura, *Vollesen* MRC 2954 (WAG); Namgaru R., *Busse* 2952 (BM, BR, G, HBG, P); Lindi Distr., Lake Lutamba shore, *Eggeling* 6756 (FHO, K, PRE); Lupaso, *Helg* Jan. 1953 (NY, PRE); Lukuleli Valley, 80 km SW of Lindi, *Schlieben* 5506 (B, BM, BR, G, HBG, M, P, S, Z).

MOÇAMBIQUE, NIASSA: Tapala-Riano Mt., *Pedro & Pedrogao* 5540 (EA); Amarambe, between Lurio and Mepanhira, *Pedro & Pedrogao* 5567 (NY, PRE); Malema R., Malema, *Pedro & Pedrogao* 3319 (PRE). TETE: Mecangadzi R., Cabora Bassa, *Correia et al.* 3768 (B); Inhacoro Forest, *Surcouf* 172 (P). MOÇAMBIQUE: Muite, Mocaburi Road, *Torre* 1052 (COI, LISC); Ribaué area, *Andrada* 1407 (BM, COI, LISC); Nampula, Monapo R., *Torre* 926 (COI, LISC, PRE). ZAMBEZIA: between Moenha and Maganja da Costa, *Torre* 4647 (BM, LISC); Quelimane, *Stuhlmann* 823 (HBG); ibid., Namagoa Plantations, *Faulkner* SRGH 11733 (BR, K, LISJC, NY, S, SRGH); Morrumbala, *Waller: Zambesi Expedition* ca. 1865 (K). MANICA E SOFALA: Inhamitanga, *Simão* 611 (LISC); Pungoué Valley, Nyantinga R. bank, *Vasse* 276 (P); Chiniziua R., near sawmills, *Gomes e Sousa* 4431 (COI, G, K, LISC, PRE, W); Sambanke, between Matarara de Lucite and Dombe, *Gomes Pedro* 4700 (K, LISJC, PRE); Machanga, *Fidalgo de Carvalho* 932 (LISC). INHAMBANE: Cubine, *Le Testu* 545 (BM, BR, P).

MALAWI: Likoma Isl., Lake Nyassa, *Bellingham* Aug. 1887 (BM); Nankumba Fort Johnston, *Jackson* 1380 (B, BM, BR, FHO, K); Mlanje Distr., Yuchila For. Res., *Bain* 1 (K, NY); Lengwe Nat. Park, Makanga East, *Hall-Martin* 1050 (K, PRE).

ZAMBIA: Luangwa Valley S., near Big Lagoon Camp, *Astle* 5372 (K, SRGH); Lutembwe R. Gorge, E of Machinje Hills, *Robson & Angus* 93 (BM, BR, K, LISC, PRE, SRGH); Kafue Stn., *Rogers* 8411 (BOL, K); Feira, *Fanshawe* 10465 (K, SRGH).

ZIMBABWE: Zambesi R. bank, W of Mana Pools Game Res., *West* 4575 (K, SRGH); Batoka Country Highlands, Manyorene Hill, *Kirk* Nov. 1860 (K); Melsetter Distr., Lusitu R. Valley, below Glencoe For. Res., *Goldsmith* 85/66 (BR, K, L, LISC, M, MO, PRE, SRGH).

Cultivated: UGANDA, Kampala, *Snowden* 1883 (K); U.S.A., Miami (Fla), *Perdue & Blum* 28 Aug 1961 (NY).

Notes: when they are not bearing flowers, plants of *S. courmontii* closely resemble those of *S. petersianus*. The two species can be distinguished by the density of lenticels on the stem and on the fruit, while the base of the leaf may also be different.

FIG. 15. *Strophanthus divaricatus* (Lour.) Hook. & Arn.: 1. flowering branches, $\frac{2}{3}\times$; 2. opened corolla, 4 ×; 3. calyx and gynoecium, one stamen attached, 4 ×; 4. leaf scar on stem, 8 ×; 5. fruit, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1. *Robert 7*; 2. *Pirey 42*; 3. *Fischer 1839*; 4. *Robert 7*; 5–6. *Lau 358*).

10. S. divaricatus (Lour.) Hook & Arn. 1837: 199 (excluding the synonym *Nerium chinensis* Hunter ex Roxb.); Franchet 1893b: 266; Gilg 1903: 15; Merrill 1935: 314; Anonym. 1974: 442; Herklots 1976: 47, fig. 52; Tsiang 1977: 152, pl. 51. **Fig. 15; Map 13**

Basionym: *Pergularia divaricata* Lour. 1790: 163.

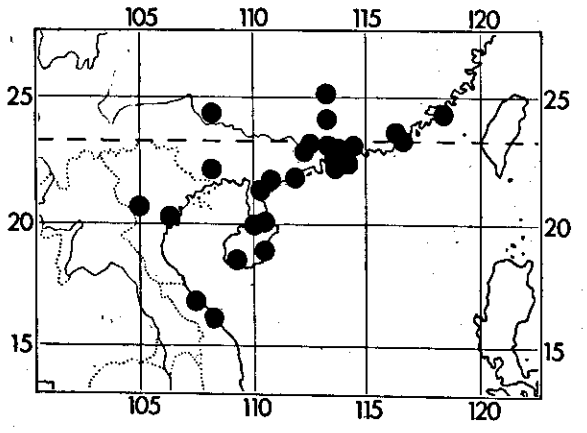
Type: China, 'habitat inculta apud Sinas', *Loureiro* s.n. (P, holotype).

Homotypic synonyms: *Emiricia divaricata* (Lour.) Roem. & Schult. 1819: 401; *Periploca divaricata* (Lour.) Spreng. 1825: 836; *Vallaris divaricata* (Lour.) G. Don 1837: 79; *Streptocaulon divaricata* (Lour.) G. Don 1837: 162.

Heterotypic synonyms: *S. dichotomus* var. *chinensis* Ker 1820: t. 469. Type: Macao, *Bladh* s.n. (BM, lectotype; isotypes: S, UPS). Homotypic synonym: *S. divergens* R. Graham 1827: 177; A. DC. 1844: 417; Bentham 1861: 220; Pitard 1933: 1197.

Sarmentose *shrub,* 0.50–4.50 m high, or *liana*, up to 4.50 m high; latex clear or yellowish. *Trunk* up to 4 cm in diameter; branches dark grey, rather densely lenticellate; branchlets reddish-brown, glabrous. *Leaves* opposite or ternate; petiole 2–11 mm long, with 2 outer and 2–6 inner axillary colleters; blade dark green above, paler beneath, elliptic or slightly obovate, (1.5–)2–3.3(–3.7) × as long as wide, 3.5–9 × 1–4 cm, cuneate at the base or decurrent into the petiole, rounded, acute, or acuminate at the apex (acumen up to 8 mm long), often slightly undulate at the margin, papyraceous, glabrous; 4–9 pairs of straight or slightly curved secondary veins at an angle of 60–70° with the midrib; tertiary venation conspicuous beneath. *Inflorescence* on long or short branches or in the forks, 1–15-flowered (1–3 flowers open at a time), sessile or peduncu-late, lax, glabrous in all parts; peduncle – if present – up to 29 mm long, lenticellate; branches 2–30 mm long; pedicels 2–7 mm long; bracts deciduous, linear or narrowly ovate, 3–13 × 0.5–1.5 mm, acute, subscarious. *Flowers* sometimes fragrant. *Calyx:* sepals subequal, the outer slightly shorter and wider than the inner, narrowly triangular, 3.3–8 × as long as wide, 4–11 × 1.2–2 mm, acute, subscarious, glabrous; with 0–5 entire or lobed colleters per sepal. *Corolla:* tube 1.1–2.8 × as long as the calyx, white and turning yellow on both sides, red-spotted inside, 9–16 mm long, widening at 45–66% of its length into a cup-shaped or infundibuliform upper part, at the mouth 5–11.5 mm wide, densely and minutely puberulous on both sides or glabrous inside; corona lobes white or greenish-yellow, triangular or subulate, 0.9–3 mm high, obtuse at the tip, fleshy, minutely papillose; corolla lobes white and turning yellow on both sides, with a red spot inside near the base, tails yellow; lobes ovate, 3–7 × 3–5.2 mm, rather abruptly narrowing into the 1 mm wide spreading or pendulous tails; lobes including the tails 35–100 mm long, glabrous on both sides except for the base, which is puberulous on both sides. *Stamens* from 2.5 mm exserted to 1.2 mm included; filaments inserted at 5.8–7.5 mm from the base of the tube, straight or nearly so, with a small abaxial swelling near the base, densely pubescent, with 3–5 mm long puberulous or pubescent ridges, which are fleshy and obtuse at the base; anthers 4.3–8 × 0.4–0.9 mm, glabrous except for the minute-

ly puberulous acumen; tails 0.3–0.6 mm long; acumen 2–4.5 mm long. *Pistil:* ovary 1–1.8 × 1.3–2.4 mm, glabrous; style 5.3–8 mm long; clavuncula 0.6–1.4 × 1.3 mm; stigma up to 0.5 mm long. *Fruit:* follicles divergent at an angle of 200–250°, tapering into a rather narrow apex with an obtuse tip, sometimes curved inwards at the tip, 9–15 cm long and 1.7–3 cm in diameter; exocarp thick and hard, slightly sulcate, glabrous, densely lenticellate. *Seeds:* grain 13–18 × 3–3.5 × 1 mm, densely and microscopically puberulous; beak glabrous for 1–7 mm and bearing a coma for 11–27 mm; coma erect or reflexed, 35–55 mm long.



MAP 13. *Strophanthus divaricatus* (Lour.) Hook. & Arn.

Distribution: South-East China and Viêt-nam.

Ecology: primary and secondary forest and thickets; alt. 0–900 m.

Flowers are found in Guangdong Province (China), Hong Kong, and Macao, from November to May, with a distinct peak in April and May; mature fruits are found from July to February.

Local names: *Yeung kok shue* or *Yeung kok ngau* (Cantonese).

A selection of the ca. 150 specimens examined:

CHINA, FUJIAN: Xiamen (Amoy) Isl., Nanputo Hill, *H. H. Chung* 1471 (K, UC, W); Xiamen interior, *Swinhoe* June 1870 (K); small island near Xiamen, *Price* 1286 (K); Chinmen Tao (Little Quemoy), *Chuang* 4569 (A, UC); sin. loc., *H. H. Chung* 5990 (NY). GUANGDONG: Lok Chong, *C. L. Tso* 20263 (K, NY); Ying Tak Distr., Wan Tong Shan, *T. M. Tsui* 408 (K, NY); ibid., *Tsang & Wong* 14641 (UC); Shantou (Swatow), *Dalziel* 11 May 1900 (E); Wu King Fu, 96 km W from Shantou, Dalziel May 1899 (E), April 1901 (E); Wai Yeung Distr., Pak-wan Cheung, *T. M. Tsui* 132 (A, K, MO, NY); Honan Tao, *Levine* 665 (MO); Whampoa, *Hance* or *Hillebrand in herb. Hance* 884 (BM, FI, G, NY, P, W; fruits belong to another genus); Guangzhou (Canton), *Hance & Simson* 699 (W); ibid., *Sampson* 411 (BM); ibid., *Levine* 1746 (MO); ibid., *Chen* 18 (A); Ting Woo Chan, Sin Yan Kei Hok, *S. Y. Lau* 20203 (NY); West R., Yun Fou Distr., *Wang* 357 (UC); Yeungkong, *Ferris* 11966 (MO); Mowming, Pei-yun Shan, *Y. Tsiang* 2188 (NY); Kuang Chou Wan, *Robert* 7 (P). GUANGXI: Hochih, Loo Shin, *R. C. Ching* 6358 (NY, W); SE of Shang-sze, *W. T. Tsang* 22107 (A, BM, P, S). HAINAN: Hoihow, *Hancock* 23 (LE); ibid., Li Mukiang R., *Hancock* 22 (K); Wanning, *How* 71355 (A, BM); Yaichow, *F. C. How* 70478 (NY); Ngai Distr., Naam Shan Leng, *S. K. Lau* 358 (A, B, BM, E, G, K, MO, NY, P, UC); ibid., *Tso* 23013 (K).

HONG KONG: Ma-an Shan, *Y. Tsiang* 213 (E, G, P, UC); Pagoda at East Point, *herb. de Poli* s.n. (A); Hei Ling Chau, *Hu* 7154 (K); Mt. Victoria, *Lamont* 450 (BM, L); sin. loc., *Fortune* A 120 (BM, G, GOET, K, M, MO, P, W); New Terr., Sai Tsui, *Hu* 8343 (K); Lantau Isl., Shek Pik, *K. Y. Chan* 1069 (P); Taai Yue Shan, *Tsang* 16635 (BM, MO, S, UC, W).

MACAO: *Callery* 103 (P), 130 (K, P), 187 (P); *Staunton* s.n. (FI-W, P; paratype of *S. dichotomus* var. *chinensis*); *Thunberg* anno 1789 (S).

VIÊT-NAM: Ninh-Binh, *Bon* 303 (P); Ha Son Binh Prov., Kiên Khê, *Bon* 2080 (P); Quang Tri, Sung Tran, *Pirey* 42 (A, NY, P), 95 (P); Lang-co, *Eberhardt* 2522 (P); sin. loc., *Bon* 516 (P).

Cultivated: INDIA, Calcutta, *Hooker f.* s.n. (SING); INDONESIA, Bogor, *Schuurman* 126-H (L); U.S.A., Miami (Fla), *Gillis* 11254 (S); Mayaguez (PR), *Winters* 2239 (NY); GREAT BRITAIN, Kew, *Forsberg* s.n. (S); THE NETHERLANDS, Wageningen, *Beentje* 1620 (WAG); GERMANY, Berlin, *Willdenow* s.n. (MO); BELGIUM, Brussel, *Vermoesen* s.n. (BR); FRANCE, Paris, *Wedukorff* s.n. (M); AUSTRIA, Wien, *Boos* s.n. (W); ITALY, Firenze, *Anonym.* 170 (FI).

11. S. eminii Asch. & Pax 1892: 366, t. 10 & 11; Franchet 1893b: 275; Stapf 1902: 172; Gilg 1903: 39; Busse 1907: t. 43; Braun 1910: 294; White 1962: 351; Verdcourt & Trump 1969: 37, fig. 10. **Fig. 16; Map 14**

Type: Tanzania, T5: Irangi, *Fischer* 382 (holotype destroyed in B; lectotype: K).

Heterotypic synonym: *S. wittei* Staner 1932a: 90. Type: Zaïre, Shaba: Kiamba, Luvua R. right bank, *De Witte* 280 (BR, holotype; isotypes: BR, NY). Homotypic synonym: *S. eminii* var. *wittei* (Staner) Staner & Michotte 1934: 34, syn. nov.

Shrub or small *tree*, 1–7 m high, sometimes climbing up to 10 m, deciduous, with the flowers appearing before or with the leaves; latex clear, white, or yellow. *Trunk* up to 6 cm in diameter; branches grey or brown, sometimes fleshy, with adherent or loose bark, smooth or sulcate, sparsely lenticellate; branchlets densely puberulous. *Leaves:* petiole 1–10 mm long, with 2 outer and 8–16 inner axillary colleters; blade light to dark green above, silvery-grey beneath, ovate, broadly ovate, or elliptic, 0.8–2.3 × as long as wide, 6–24 × 4–18 cm, cuneate, rounded, or rarely subcordate at the base, acute or acuminate at the apex (acumen up to 10 mm long), slightly undulate at the margin, papyraceous or chartaceous, densely pubescent or glabrescent above, tomentose beneath; 5–12 pairs of straight secondary veins, the apical at an angle of 40–55° with the midrib, the basal at more obtuse angles; tertiary venation sometimes conspicuous. *Inflorescence* on long or short leafless branches, axillary or apparently so, only rarely in the forks, 1–12-flowered (1–7 flowers open at a time), sessile or pedunculate, congested, densely pubescent in all parts; peduncle – if present – up to 4 mm long; branches 1–15 mm long; pedicels 1–8 mm long; bracts ovate or elliptic, 4–15 × 3.5–10 mm, acute, sepal-like. *Flowers* fragrant. *Calyx:* sepals subequal, the outer wider and occasionally shorter than the inner, ovate or narrowly ovate, 1.5–6 × as long as wide, (8–)11–25 × 2.5–13 mm, acute; eglandulose or rarely with 10 colleters per calyx. *Corolla:* tube 0.8–2.1 × as long as the calyx, pink-suffused white, turning red via yellow outside, white and turning yellow, red-spotted and -streaked inside, 17–26 mm long, widening at 55–80% of its length into a cup-shaped upper part, at the mouth 8–17(–21) mm wide, densely pubescent outside, glabrous or minutely puberulous inside; corona lobes red or purple, subulate, 2.5–6.5 × 1.2–2.5 mm, acute or obtuse at the tip, fleshy, minutely papillose; corolla lobes white and turning yellow inside, tails orange and turning

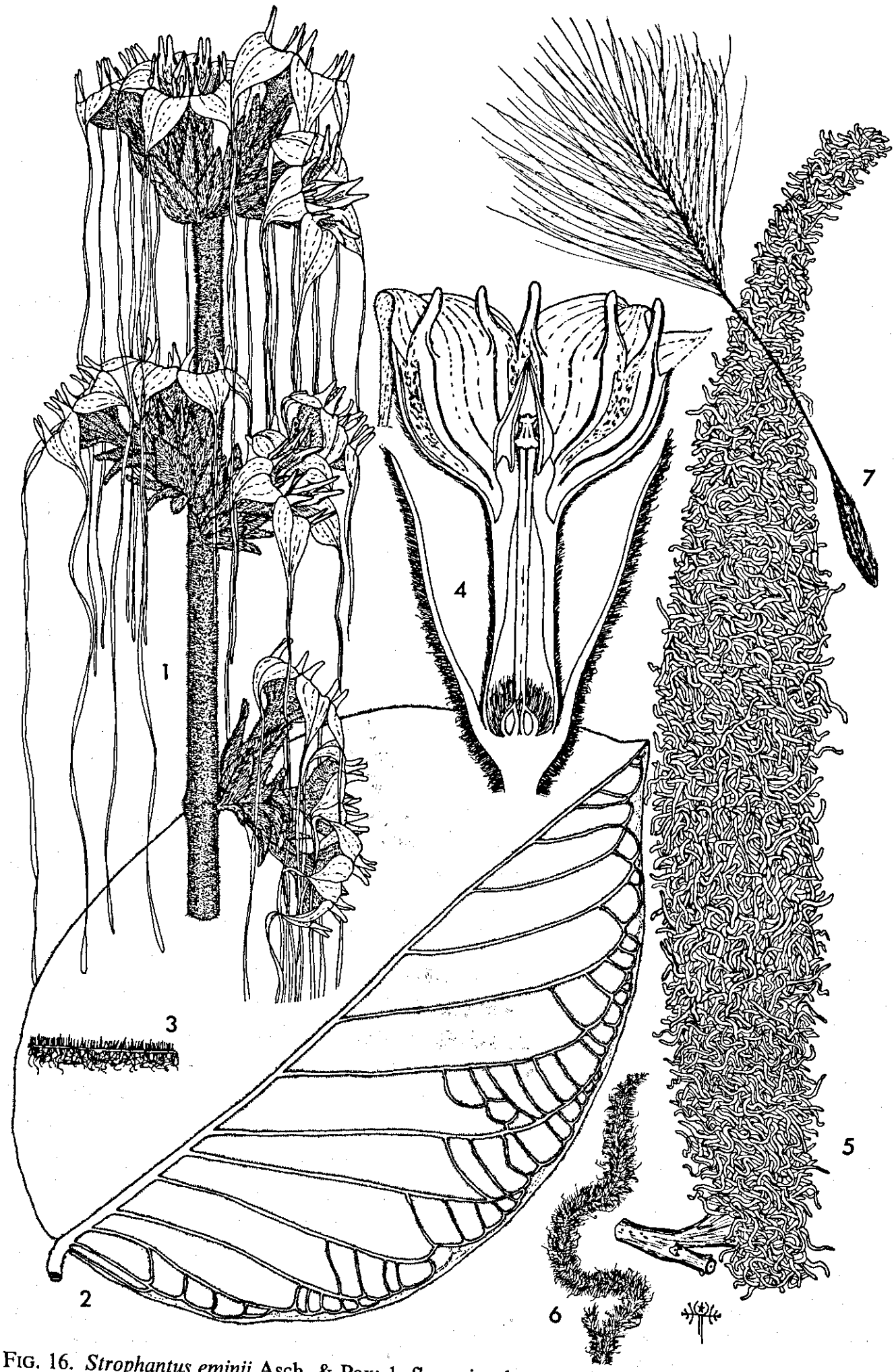
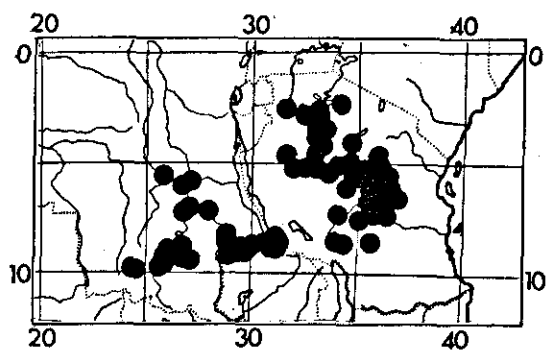


FIG. 16. *Strophantus eminii* Asch. & Pax: 1. flowering branch, $\frac{2}{3}\times$; 2. leaf, $\frac{2}{3}\times$; 3. cross section of leaf, detail, 6 ×; 4. section of flower, 2 ×; 5. fruit, one follicle removed, $\frac{2}{3}\times$; 6. follicle protuberance, 6 ×; 7. seed, $\frac{2}{3}\times$. (1. *Leach 10086*; 2–3. *Peter 34769*; 4. *Mhoro 1150*; 5–6. *De Witte 5795*; 7. *Robijns 1961*).

red; lobes ovate, 7–15 × 4.5–10 mm, gradually narrowing into the 1 mm wide pendulous tails; lobes including the tails 94–180 mm long, pubescent outside except for the apex, glabrous inside. *Stamens* from 2.8 mm exserted to 1 mm included; filaments inserted at 9.5–14 mm from the base of the tube, straight, with an abaxial swelling, 3.5–6.2 mm long, pubescent inside, glabrous or sparsely puberulous outside, with 4–8 mm long pubescent ridges; anthers 5–7 × 1.3–2 mm, glabrous; tails 0.4–1 mm long; acumen 0.1–0.4 mm long. *Pistil:* ovary superior, 1.2–2.3 × 1–2.5 mm, densely hispid with erect hairs up to 3.5 mm long; style 11–18 mm long; clavuncula 1.6–3 × 1.4–2.7 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180°, tapering into an obtuse apex or ending in a knob, (15–)20–38 cm long and 1.5–3.2 cm in diameter; exocarp pale brown, rather thick and hard, shaggy with 4–18 mm long villous protuberances, 0.5–1 mm in diameter. *Seeds:* grain 11–24 × 2.5–5 mm, densely pubescent; beak glabrous for 18–60 mm and bearing a coma for 30–50 mm; coma 60–110 mm long.



MAP 14. *Strophanthus eminii* Asch. & Pax

Distribution: South-East Zaïre, Tanzania and Northern Zambia.

Ecology: *Julbernardia-* and miombo-woodland or *Acacia-Commiphora* bush, especially in rocky places; alt. 600–1650 m.

Flowering at the end of the dry and the beginning of the rainy season; mature fruits in the dry season.

Local names: *Bulembe, Kilembi, Chilembelembe* (Zaïre: Tabwa, Muholoholo, Kibemba, and Kiluba languages; also used for other *Strophanthus* species); *Mwerewere, Mweliweli* (Tanzania: Kigogo, Kihehe, Kinyamwezi, and Kinyanyembe languages); *Msungululu* (Tanzania: Kisukuma, Nzega, and Kinyamwezi languages); *Ifeso* (Tanzania: Mrangi and Kondou languages).

Local uses: in Zaïre and Tanzania the roots are used as an emetic; the seeds are used for the preparation of arrow-poison; and the soft, pliable leaves are used as toilet-paper for babies.

A selection of the ca. 160 specimens examined:

ZAÏRE, EAST KASAI: Sentery Terr., Kuluye, *Risopoulos* 1101 (BR, WAG). SHABA: Muliangazi, lower Lukuga R., *de Saeger* 83 (BR); Manono Terr., Kiala, *Thiebaud* 482 (BR); Kiambi R. right bank, *De Witte* 280 (BR, NY; type of *S. wittei*); Pweto area, *Schmitz* 6865 (BR); Upemba Nat. Park, Munoï, *De Witte* 3883 (BR); Katoto near Bukama, *Lukuesa* 950 (BR); Kiubo, *Malaisse 9127* (BR); Sokele, Dilumbulula, *Huart* 63 (BR).

TANZANIA, T1: Biharamulo Game Res., *Rodgers* 1523 (EA); Mwanza Distr., Mbarika, *Tanner* 590 (BR, K, NY, UC, WAG); Musoma Distr., Handajega, *Greenway* 10255 (K, PRE); Shinyanga Distr., Nindo For. Res., *Carmichael* 775 (K); Iramba Distr., Isanza, *Woodburn* 38 (EA). T4: Nzega Road, *F. G. Smith* 1176 (K); Buyenze, 32 km S of Uvinza, *Procter* 449 (K); Urambo, Usopiro Rock, *Moors* K16 (K); Ngulu, E of Tura, *Peter* 34769 (B, WAG); Tabora, *Lindeman* 27 (BM, MO). T5: W side of Great Rift Valley, Saranda, *Peter* 33639 (B, WAG); Kondoa Distr., 64 km N of Dodoma, *Gillett* 17365 (BR, K); Uyanshi, Lake Tschaya, *Peter* 34100 (B); near Nsassa, *Busse* 211 (BM, G, HBG, K, L, P, W); Usagara, Kidete, *Peter* 32738 (B, WAG); Kondoa Irangi, *Peter* 44503 (B, WAG). T7: 100 km from Mbeya on Iringa Road, *Brass & Woodward* 20958 (K, NY); Ruaha Gorge, km 160 on Iringa-Morogoro Road, *Procter* 3305 (K); northern Kinga Mts., Ukinga, *Goetze* 1016 (B, BR).

ZAMBIA: 15 km S of Lake Tanganyika, *Pole Evans* 3032 (K, P, PRE, SRGH); Kalambo Falls, *Leach & Brunton* 10086 (K, MO, SRGH); Lake Mweru-Wantipa, *Verboon* 342 (FHO, K, SRGH); Mporokoso Distr., 8 km S of Chiengi, *Angus* 713 (BR, FHO, K); Mporokoso Distr., Kundabwika Falls, *Whellan* 1411 (K, PRE, SRGH); Mbala, path to Isoko Valley, *Richards* 1420 (BR, K).

Notes: two paratypes, *Stuhlmann* 263 and 354, were destroyed in B.

The type of *S. wittei* differs slightly from typical *S. eminii* in the size and shape of the calyx, but is identical in all other respects.

The roots of herb. *Brass & Woodward* 20958 are described as fleshy, thick (up to 8 cm in diameter), and moniliform.

S. eminii is closely related to *S. ledienii* and *S. holosericeus*, but the fruits are exceptional within the genus.

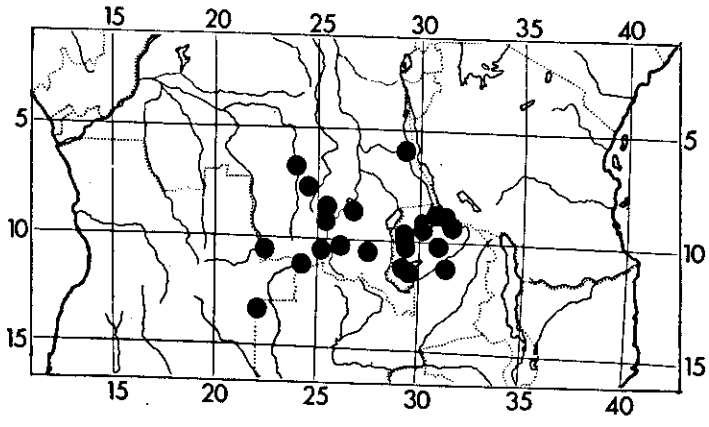
12. S. gardeniiflorus Gilg 1903: 20; Stapf 1904: 605; Staner & Michotte 1934: 30 (as *S. thollonii*); White 1962: 351. **Fig. 17; Map 15**

Type: Zaïre, Shaba: Lukafu, *Verdick* 236 (BR, lectotype).

Liana, 5–15 m high, presumably evergreen; latex clear or milky. *Trunk* up to 5 cm in diameter; branches dark grey-brown or black, sparsely to rather densely lenticellate; branchlets glabrous. *Leaves:* petiole 3–10(–13) mm long, with 2 outer and 2–6 inner axillary colleters; blade shiny and dark green above, dull and pale yellowish green beneath, elliptic or slightly obovate, 1.5–3.5(–4) × as long as wide, 2–16.5 × 1–7.5 cm, cuneate at the base, rounded or acuminate at the apex (acumen 1–3 mm long), slightly revolute at the margin, coriaceous, glabrous, with translucent dots; 5–9 pairs of curved secondary veins at an angle of 45–65° with the midrib; tertiary venation inconspicuous. *Inflorescence* on long or short branches or in the forks, 1–3-flowered (1 flower open at a time), sessile or pedunculate, glabrous in all parts; peduncle – if present – up to 8 mm long; branches up to 8 mm long; pedicels 5–10 mm long; bracts persistent or deciduous, triangular or ovate, 1–9 × 1.5–4 mm, not sepal-like. *Flowers* fragrant. *Calyx:* sepals unequal, the inner larger than the outer, ovate or nearly orbicular, 1.2–2.2 × as long as wide, 6–12.5 × 3.5–7 mm, rounded and often apiculate, glabrous; with 4–14 colleters per sepal, the inner sepals with more than the outer. *Corolla:* tube 2.5–4.6 × as long as the calyx, white and turning yellow inside and near the base outside, dark pink and turning reddish purple near the mouth outside, pink- or purple-streaked inside, 29–40 mm long, widen-

FIG. 17. *Strophanthus gardeniiflorus* Gilg: 1. flowering branch, $\frac{2}{3}$ ×; 2. leaf apex, $\frac{2}{3}$ ×; 3. bud, $\frac{2}{3}$ ×; 4. adaxial side of sepal with colleters, 2 ×; 5. section of flower, 2 ×; 6. fruit, $\frac{2}{3}$; 7. seed, $\frac{2}{3}$ ×; 8. seed grain, 2 ×. (1. *De Witte 572*; 2–3. *Burtt 6304*; 4–5. *De Witte 572*; 6–8. *Hutchinson 3938*).

ing gradually or at 40–50% of its length into a cylindrical or cup-shaped upper part, at the mouth 12.5–22 mm wide, glabrous outside, puberulous to pubescent inside; corona lobes white and turning yellow, with a pink streak in the centre, the pink turning purple, narrowly triangular and sometimes undulate, 18–28 × 2.5–3 mm, acute, somewhat fleshy, sparsely pubescent; corolla lobes white and turning yellow inside and on the left side outside, dark pink and turning reddish-purple on the right side outside, ovate, 1.7–2.4 × as long as wide, 24–46 × 11–21 mm, acute or acuminate, glabrous on both sides. *Stamens* 8–12 mm exserted; filaments inserted at 14–18 mm from the base of the tube, straight, 2.6–3.1 mm long, pubescent inside, with 6–10 mm long ridges; anthers 26.5–30 × 1.3–2.2 mm, glabrous; tails 1.2–1.8 mm long; acumen 17.5–20 mm long. *Pistil:* ovary 1.9–2.8 × 1.9–3.1 mm, glabrous; style 16–19.5 mm long; clavuncula 2.6–3.5 × 2.4–2.7 mm; stigma 0.3–0.7 mm long. *Fruit:* follicles divergent at an angle of 180°, tapering into a narrow apex, 19–25 cm long and 2.4–2.8 cm in diameter; exocarp dark or purplish-brown, thick and hard, smooth or sulcate, glabrous, sparsely to densely lenticellate. *Seeds:* grain 11.5–18 × 2–3.5 mm, densely puberulous or densely short-pubescent; beak glabrous for 4–11 mm and bearing a coma for 10–28 mm; coma erect or rarely reflexed, 48–60 mm long.



MAP 15. *Strophanthus gardeniiflorus* Gilg

Distribution: southern Zaïre and northern Zambia.

Ecology: gallery forest; alt. 1000–1500 m.

Flowering in the second half of the dry season; mature fruits in the dry season.

Local names: *(M)ulembe* (Zaïre and Zambia, Kiluba, Chibemba, and Chilunda languages; the root *lembe* is also used in names for other *Strophanthus* species).

Specimens examined:

ZAÏRE, E KASAI: Gandajika, *Liben* 3548 (BR). SHABA: Muhange, near Kalémié, *Dubois* 1318 (BR); Grelco section 1, *Quarré* 2599 (BR, FHO, K, P, PRE); 24 km S of Sungu Monga, *Pole Evans & Erens* 1886 (BR, E, K, P, PRE, S); Upemba Nat. Park, Munte R., Ribara Mt. base, *J. de Wilde* 749 (BR); Kanzenze R., 60 km NNW of Kolwezi, *Schmitz* 2989 (BR); Kanzenze, *De Witte* 572 (BR, K, NY); 52 km from Kolwezi on Dilolo Road, *Schmitz* 5610 (BR); Dilolo, *Vin* 86 (BR); Lukafu, *Verdick* 235 (BR; paratype), 236 (BR; type).

ZAMBIA: Inono R., near Mpulungu Road, *Richards* 1954 (BR, K); Lunzua Falls, SE of Mpulungu, *Bullock* 3332 (K); ibid., *Robertson* 171 (K, PRE); Mbala Distr., Kambole Escarpment, *Richards* 13218 (K, SRGH); Inona R., *Burtt* 6304 (BM, BR, K); Mporokoso, *Fanshawe* 4807 (K); 19 km N of Mbala, *Hutchinson & Gillett* 3938 (BM, K); Mbala, *Gerstner* 15 Sept. 1949 (K, PRE); Luchechi R. near Mbala, *Bullock* 1393 (B, BR, K, LISC, S); ibid., *Richards* 6194 (BR, K); Mponda R. above Issi Falls, *Richards* 20517 (BR, K, MO); Kawambwa, *Fanshawe* 3655 (K), 3585 (BR, K); km 20 on Kawambwa-Mansa Road, *Angus* 671 (BR, FHO, K, MO); Kawambwa, Mabumba Stream, *Lawton* 691 (FHO, K); Kasama Distr., Chishimba Falls, *Robinson* 3976 (K, M, SRGH); Kasama Distr., Kabwibwi area, *Humbles* 230 (FHO); Mwinilunga Distr., 6 km N of Kalene Hill Mission, *White* 3301 (BR, FHO, K, WAG); 163 km N of Mansa on Kasama Road, *Brass & Woodward* 20956 (K, NY); Mansa Distr., 1.5 km N of Samfya Mission at Lake Bangweulu, *Angus* 341 (BR, FHO, K).

ANGOLA, MOXICO: Kamwano R., *Milne Redhead* 3646 (BR, K).

Sin. loc.: *Richards* 3646 (K); *Van Meel* 1843 (BR).

Cultivated: U.S.A., Mayaguez (P.R.), *Winters* 2235 (NY).

Notes: *S. gardeniiflorus* is closely related to *S. thollonii*; many specimens were determined as *S. thollonii* in the collections seen.

The two species can be distinguished as follows:

leaf acumen up to 3 mm long; calyx up to 12 mm long; seed coma 48-60 mm long . . . . . **S. gardeniiflorus**

leaf acumen up to 13 mm long; calyx more than 13 mm long; seed coma 22–42 mm long . . . . . **S. thollonii**

13. S. gerrardii Stapf 1907: 52, 1909: 510; Codd 1963: 292.

Type; S. Africa, Natal: Durban, *Gerrard & McKen* 1795 (K, holotype; isotypes: TCD, W). **Fig. 18; Map 16**

Liana, 3–12 m high, deciduous, flowers appearing before or with the leaves; latex white. *Trunk* up to 2.5 cm in diameter; branches pale grey, in older branches with longitudinal corky ridges up to 6 cm long and 1.5 cm high, in younger branches with triangular flat protuberances at the nodes, rather densely lenticellate; branchlets reddish-brown, glabrous. *Leaves:* petiole 1–6 mm long, with 2 outer and 2 inner axillary colleters; blade ovate, narrowly ovate, or elliptic, 1.7–4(–5) × as long as wide, 3–6 × 1–2 cm, cuneate at the base, rounded or acuminate at the apex, rarely acuminate (acumen up to 3 mm long), sometimes with a revolute margin, chartaceous or thinly coriaceous, glabrous, with translucent dots; 3–6(–8) pairs of slightly curved secondary veins at an angle of 35–50° with the midrib; tertiary venation inconspicuous. *Inflorescence* on long or short branches or in the forks, 1–2(–5)-flowered (1 or rarely 2 flowers open at a time), glabrous in all parts; peduncle – if present – up to 3(–6) mm long; branches – if present – up to 3(–12) mm long; pedicels 3–10 mm long; bracts deciduous, spreading or recurved for half their length, narrowly triangular, 3–7 × 1–1.5 mm, acute, sepal-like. *Calyx:* sepals subequal, the outer slightly shorter than the inner, recurved for half their length, ovate or narrowly ovate, 2–6 × as long as wide, 3–10 × 1.5–2.5 mm, acute, often slightly carinate, glabrous; with 2 colleters per sepal, rarely none or 4. *Corolla:* tube 2–4(–5) × as long as the calyx, pink and turning purple outside, white and turning yellow

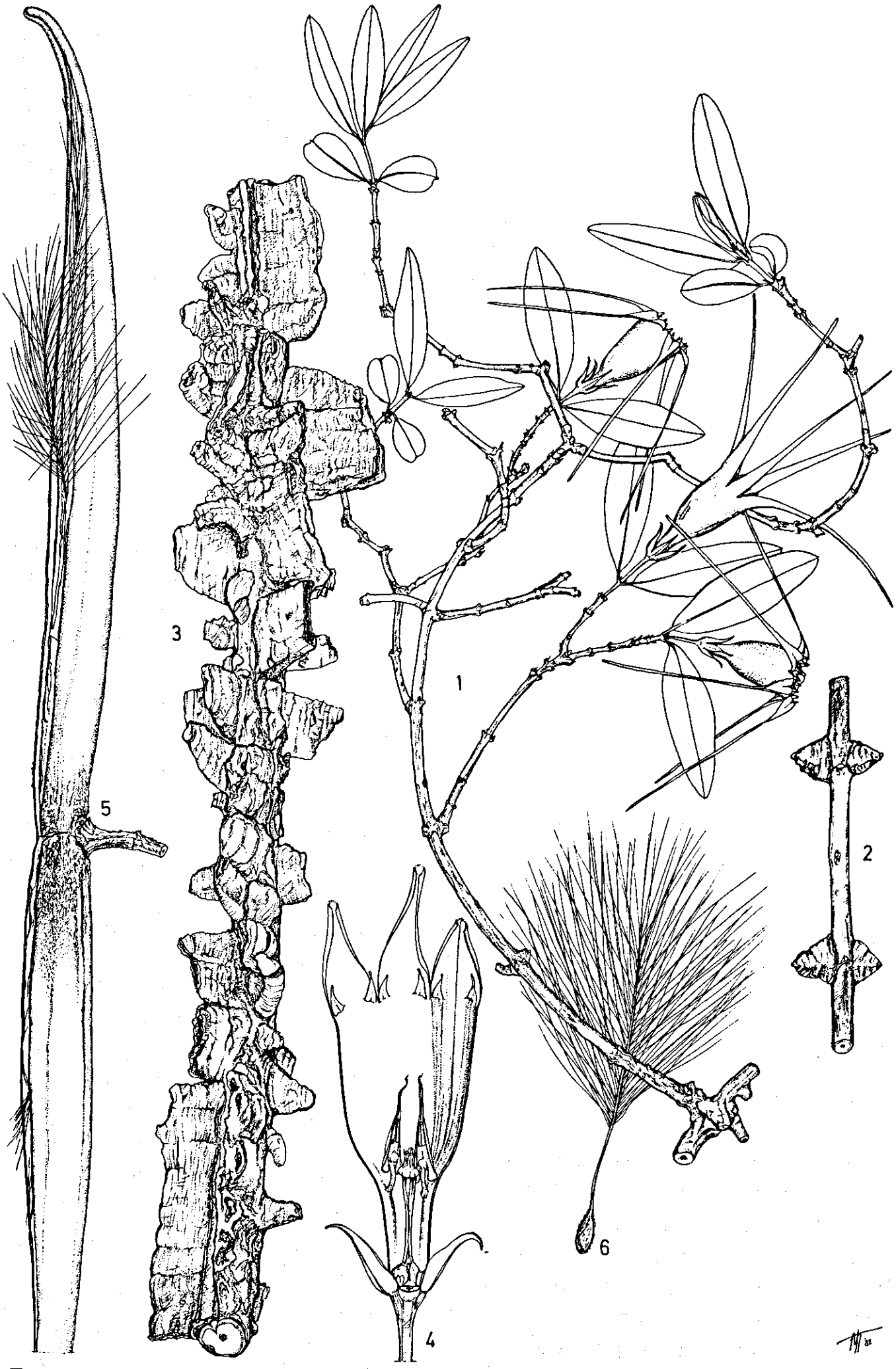
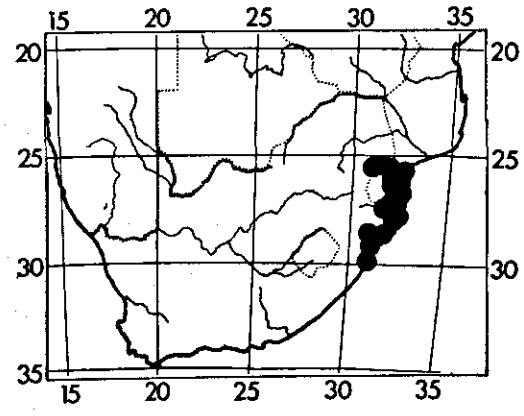


FIG. 18. *Strophanthus gerrardii* Stapf: 1. flowering branches, $\frac{2}{3}\times$; 2. young branch with corky protuberances, $\frac{2}{3}\times$; 3. older branch, $\frac{2}{3}\times$; 4. section of flower, $2\times$; 5. fruit, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1. *MacDonald 5*; 2. *Wearne 25*; 3. *Ward 6626*; 4. *Balsinhas* 1326; 5–6. *Smith 18 Oct. 1945*).

inside, and there red-streaked, 14–25 mm long, widening at 15–25% of its length into a cylindrical or slightly infundibuliform upper part, at the mouth 6–13 mm wide, glabrous outside and puberulous inside; corona lobes presumably red or purple, subulate, (1.3–)2–5 × 1–1.6 mm, acute or obtuse at the tip, fleshy, puberulous; corolla lobes reddish outside and yellow inside, tails yellow; lobes ovate, 5–10 × 3–6 mm, gradually narrowing into the 2 mm wide spreading tails; lobes including the tails 30–59 mm long, glabrous on both sides but puberulous near the base. *Stamens* included for (0.6–)2.7–6 mm; filaments inserted at 4.2–6 mm from the base of the tube, straight or slightly curved, puberulous or pubescent inside, with 2.5–4.5 mm long ridges; anthers 6.4–8.6 × 1–1.5 mm, glabrous; tails 0.3–0.9 mm long; acumen 1.8–3.8 mm long. *Pistil:* ovary 0.9–2 × 1.7–2.8 mm, glabrous; style 4.5–7 mm long, smooth or wrinkled; clavuncula 1.4–2 × 1.3–1.9 mm; stigma 0.2–0.7 mm high. *Fruit:* follicles divergent at an angle of 180–230°, tapering into a narrow obtuse apex, sometimes curved inwards at the tip, 11–24 cm long and 1.5–2 cm in diameter; exocarp brown or red-brown, thick and hard, sulcate, glabrous, very densely lenticellate. *Seeds:* grain 10–18 × 2.2–4 mm, densely pubescent; beak glabrous for 18–40 mm and bearing a coma for 25–65 mm; coma 45–85 mm long.



MAP 16. *Strophanthus gerrardii* Stapf

Distribution: Southern Moçambique, North-East S. Africa, and Swaziland.

Ecology: coastal 'sand' forest, woodland, or gallery forest, often on rocky places; alt. 0–750 m.

Flowering from May to December, leaves appearing soon after the first flowers and lasting till April; mature fruits throughout the year.

A selection of the ca. 60 specimens examined:

MOÇAMBIQUE, MAPUTO: Maputo, *Howard* 39 (BOL, LISC, PRE); 16 km S of Boane, *Leach* 11197 (BM, G, K, LISC, M, MO, P, PRE, S, SRGH); Goba, near Lebombo Spring, *Barbosa* 8656 (COI, K, LISC, PRE).

S. AFRICA, TRANSVAAL: Barberton, *Rogers* 29921 (A, S, Z); ibid., Louw's Creek, *Thorncroft* 1139 (K, PRE, W); Nelspruit Distr., near Malelane, *Codd* 6099 (K, PRE). NATAL: Mfongozi R., *Roberts* PRE 32429 (PRE); Pt. Heuner, *Gerstner* 6632 (BM, BOL, K, NY, PRE); 8 km NE of Mkuzi on Ubombo Road, *Codd* 2054 (NY, PRE); Mkuzi Game Res., *Ward* 3536 (NH, PRE); 3 km S of

Ndumu Police Sta., *Stephen* 756 (PRE); Ndumu Game Res., *Tinley* 497 (PRE); Ingwavuma Poort, *Wells* 2205 (BM, K, M, PRE); Lebombo Mts., Ubombo, 18 m S of Jozini, *de Winter & Vahrmeyer* 8479 (K, NH, PRE); km 32 on Jozini-Bazwana Road, *Strey* 5281 (K, NH, PRE, WAG, Z); 10 km S of Ubombo, *Acocks* 13116 (K, P, PRE); Lebombo Flats, *Galpin* 13341 (BOL, K, P, PRE); Magudu, *Gerstner* 6432 (K, NH); Hlabisa Distr., False Bay, *Ward* 1641 (NH, PRE); Krantzkop Distr., Mambula, *Dyer* 4346 (PRE); Fenies Isl., *MacDonald* 5 (E); Umfolozi Game Res., *Ward* 2647 (NH, PRE); Empangeni Distr., Utimona, *Gerstner* 2744 (K, NH, PRE); Mapumulo Distr., Oqaqeni, *Edwards* 1834 (PRE); Durban, *Gerrard & McKen* 1795 (K, TCD, W; type).

SWAZILAND: Lubombo Mts., Umbeluzi Gorge, *Culverwell* 944 (PRE).

Cultivated: SRI LANKA, sin. loc., *Macrae* 1795 (BM).

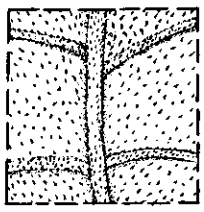
14. S. gracilis K. Schum. & Pax 1892: 370; Franchet 1893b: 277; Stapf 1902: 175; Gilg 1903: 23, pl. 4; Hutchinson & Dalziel 1931: 49; Krukoff & Letouzey 1950: 34; Huber 1963: 70. **Fig. 19; Map 17**

Type: Gabon, Munda, Sibange-Farm, *Soyaux* 312 (holotype destroyed in B; lectotype: Z; isotype: K).

Heterotypic synonyms: *S. scaber* Pax 1892: 370. Type: Nigeria, Rivers: Nun R., *Mann* 499 (holotype destroyed in B; lectotype: K; isotypes: A, LE, NY, P, S, U, W).

S. klainei De Wild. 1903: 106, pl. 29. Type: Gabon, sin. loc., *Klaine* 1124 (BR, lectotype; isotype: P).

Liana, 3–7 m high, presumably evergreen; latex clear. *Trunk* up to 1.8 cm in diameter; branches blackish-brown, sparsely lenticellate; branchlets purplish-brown, densely and shortly hispid or scabrid. *Leaves:* petiole 2–10 mm long, with 2 outer and 2–4 inner axillary colleters; blade dark green above, much paler beneath, ovate, elliptic, or narrowly elliptic, 1.6–4 × as long as wide, 2–12 × 1–5 cm, cuneate or rounded at the base, acuminate or rarely obtuse at the apex (acumen 3–12 mm long), sometimes revolute at the margin, papyraceous or thinly coriaceous, scabrid, especially on the midrib, veins, and margins, with translucent dots in the axils of the secondary veins; 3–8 pairs of curved secondary veins at an angle of 60–80° with the midrib; tertiary venation sometimes conspicuous above. *Inflorescence* on long or short branches or in the forks, 2–10(–72)-flowered (1–3 flowers open at a time), pedunculate or rarely sessile, lax, densely and shortly hispid or scabrid in all parts; peduncle – if present – 5–29 mm long, lenticellate; branches 5–30(–100) mm long; pedicels 6–20 mm long; bracts ovate, 5–14 × 1.5–9 mm, acute, sepal-like. *Calyx:* sepals sometimes spreading, unequal, the outer wider than the inner, brown or reddish-brown with green margins, ovate or narrowly ovate, 2.2–10 × as long as wide, 8.5–14 × 1–6.5 mm, acute or rarely obtuse, densely and shortly hispid or scabrid; outer sepals eglandulose, inner sepals with 1–3 colleters per sepal. *Corolla:* tube 1.1–2 × as long as the calyx, yellow and turning reddish-orange on both sides, red- or purple-streaked near the mouth, 10–22 mm long, widening at 40–60% of its length into a cup-shaped upper part, at the mouth 5–13 mm wide, minutely scabrid on both sides; corona lobes red and turning purple, with some yellow spots, lingulate, 0.9–2.3 × 1.3–2 mm, rounded, fleshy, minutely scabrid; corolla lobes yellow outside and white inside, near the base red-spotted and -streaked



2

1

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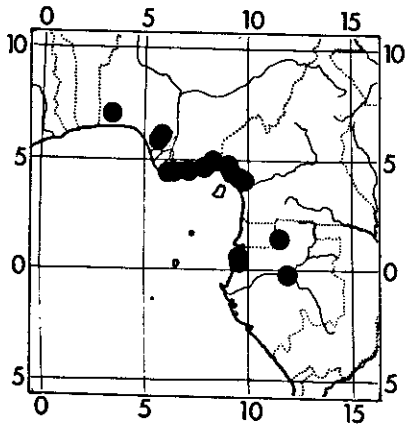
FIG. 19. *Strophanthus gracilis* K. Schum. & Pax: 1. flowering branch, $\frac{2}{3}\times$; 2. detail of lower surface of leaf, 2 ×; 3. section of flower, 2 ×; 4. stamen, abaxial side, 6 ×; 5. fruit, one follicle removed, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}$. (1. *Letouzey 15094*; 2. *Brass & Woodward 20832*; 3–4. *Krukoff & Letouzey 215*; 5. Letouzey & Bakang s.n.; 6. *Brass & Woodward 20832*).

with the red turning purple, tails yellow and turning orange; lobes ovate, 4–10 × 3.5–6 mm, abruptly narrowing into the 0.5 mm wide pendulous tails; lobes including the tails (55–)75–170 mm long, minutely scabrous on both sides and glabrescent towards the apex. *Stamens* included for 2.9–6 mm; filaments inserted at 6–9.5 mm from the base of the tube, curved, 0.7–1 mm high, with a small abaxial swelling near the base, pubescent, with 3.3–5 mm long ridges; anthers 3.8–4.3 × 0.8–1 mm, densely pubescent outside but for the acumen; tails 0.3–0.6 mm long; acumen 0.2–0.4 mm long. *Pistil:* ovary 1.1–1.6 × 1.5–1.9 mm, pubescent; style 5.5–8.5 mm long; clavuncula 1.2–1.8 × 1–1.3 mm; stigma minute. *Fruit:* Follicles divergent at an unknown angle, tapering towards the base and the apex, ending in a small or large knob, 23–50 cm long and 1.6 cm in diameter; exocarp purplish-brown, rather thin and brittle, slightly sulcate, glabrous, rather densely lenticellate; lenticels rounded or elongate. *Seeds:* grain 18–20 × 3.6–4 mm, minutely scabrid; beak glabrous for 4–4.5 mm and bearing a coma for 35–40 mm; coma 55–60 mm long.



MAP 17. *Strophanthus gracilis* K. Schum. & Pax

Distribution: Nigeria to Gabon.
Ecology: coastal and riverine forest at low altitudes.
Flowering in Cameroun in November and December.

Specimens examined:

NIGERIA, OGUN: Abeokuta, *Barter* 3346 (P). BENDEL: Sapoba, *Keay* 540 (NY); Jamieson R., Agbadi, near Sapoba, *Meikle et al.* 540 (B, BR, K, P). RIVERS: Nun R., *Barter* 2011 (P); ibid., *Mann* 499 (A, K, LE, NY, P, S, U, W; type of *S. scaber*); Brass, *Barter* 1867 (K, P); Bonny, *Kalbrayer* 70 (BM). CROSS RIVER: Eket, *Talbot* s.n. (BM); ibid., Kwa Ibo R. mouth, *Talbot* 3083 (BM, K, Z); km 47, Oron-Eket Road, *Talbot* 3026 (BM); Calabar, *Baldwin* 13755 (K), 13766 (K).

CAMEROUN: Ekundu Ndene, *Dusen* 333 (M); Ekondutiti, 50 km W of Kumba, Letouzey 15094 (P, WAG, YA); Douala, *Baldwin* 13900 (G, UPS, WAG), 14005 (K, LISC, WAG); ibid., *Hess & Speiser* 14 Dec. 1950 (ZT); ibid., *Krukoff & Letouzey* 214 (MO, NY); ibid., Tokoto Creek, *Krukoff & Letouzey* 205L (P, YA), 206L (P, YA), 208 (NY, P, YA), 215 (NY, P, YA); Douala, Bois des Singes, *Brass & Woodward* 20832 (K, NY), 20835 (NY); ibid., *Krukoff & Letouzey* 216 (NY, YA), 217 (NY), 218 (NY), 220 (NY); ibid., *Letouzey & Bakang* s.n. (NY); ibid., *Speiser* P 30 (EA); sin. loc., *Krukoff & Letouzey* 209 (MO, NY).

GABON: Woleu-Ntem, Oveng-Abé, *Le Testu* 9147 (BM); Woleu-Ntem, *Le Testu* 17 Dec. 1933 (BM); Munda, Sibange-Farm, *Soyaux* 312 (K, Z; type); 5 km N of Libereville, *Brass & Woodward*

20910 (K, NY); Libreville, *Klaine* s.n. (P), 2375 (P), 2466 (P), 2557 (P); Ogooué R., *Klaine* 412 (P); Booué Falls, *Thollon* 157 (P); sin. loc., *Klaine* 1124 (BR, P; type of *S. klainei*), 1125 (BR, P; paratype of *S. klainei*).

Notes: *S. gracilis* resembles *S. preussii*, and is most easily distinguished from this species by its scabrid indumentum.

15. S. gratus (Wall. & Hook.) Baill. 1888: 171; Franchet 1893b: 256, pl. 9; Stapf 1902: 170; Gilg 1902b, fig. 3; Gilg 1903: 17, pl. 9; Hutchinson & Dalziel 1931: 47; Staner & Michotte 1934: 29; Krukoff & Letouzey 1950: 125; Huber 1963: 70; Hall & Swaine 1981: 295. **Fig. 20; Photo 3; Map 18**

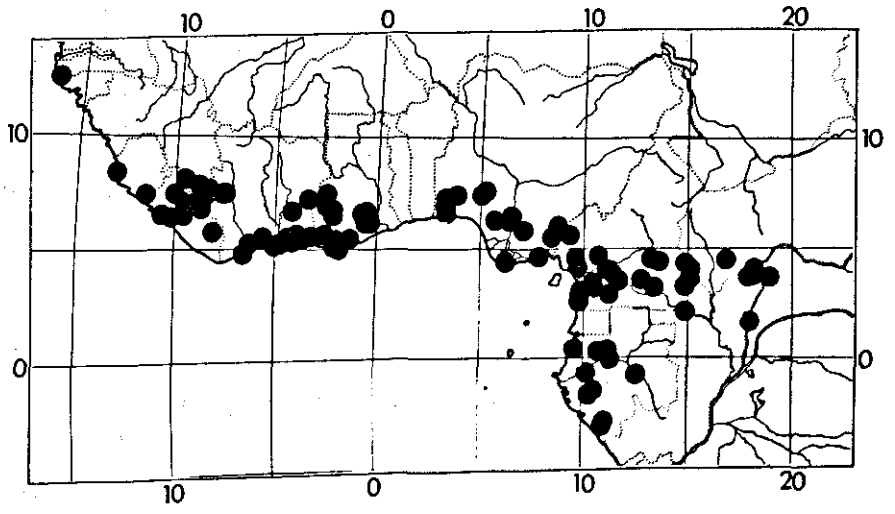
Basionym: *Roupellia grata* Wall. & Hook. 1849: t. 4466; Hooker 1849b: 449; Bakhuizen van den Brink jr. 1948: 43; Backer & Bakhuizen van den Brink jr. 1965: 240.

Type: Wallich & Hooker 1849: t. 4466 (lectotype).

Liana, 2–25 m high, or less often a *shrub*, 2–3 m high, presumably evergreen; latex clear or white. *Trunk* up to 10 cm in diameter, in older plants often with corky ridges; branches dark brown or purplish-brown, rather densely lenticellate, lenticels becoming corky with age; branchlets glabrous. *Leaves:* petiole 5–17(–32) mm long, with 2 outer and 2–6 inner axillary colleters; blade glossy and medium to dark green above, much paler beneath and there often with a reddish midrib, ovate, elliptic, or sometimes obovate, 1.2–3(–4) × as long as wide, 5–18 × 2–9 cm, rounded or cuneate at the base, acuminate at the apex (acumen 1–15 mm long), often with a somewhat revolute margin, thinly coriaceous or coriaceous, glabrous; 5–11 pairs of nearly straight or curved secondary veins at an angle of 60–85° with the midrib; tertiary venation sometimes conspicuous. *Inflorescence* on long or short branches or in the forks, (1–)3–32-flowered (1–6 flowers open at a time), sessile or pedunculate, congested, glabrous in all parts; peduncle – if present – up to 6(–15) mm long, lenticellate; branches 3–35 mm long; pedicels 4–13 mm long; bracts deciduous, ovate or triangular, 2–9 × 1–4 mm, acute, scarious. *Flowers* fragrant. *Calyx:* sepals subequal or unequal, the inner longer and often wider than the outer, pale green with the apex reddish- or purplish-green and sometimes with the margins in the same colour, obovate or broadly obovate, 1–2.2 × as long as wide, 7–18 × 3–13 mm, emarginate, rounded, or apiculate at the apex, glabrous; with 10–20 colleters in total, mainly concentrated on the inner sepals. *Corolla:* tube 1.9–4.2 × as long as the calyx, white and turning yellow near the base outside, reddish or purple near the mouth outside, white and red- or purple-streaked inside, the white turning yellow, 25–45 mm long and widening at 33–55% of its length into a cylindrical or slightly infundibuliform upper part, at the mouth 13–22 mm wide, glabrous outside, papillose or scabridulous near the mouth inside; corona lobes of a single corolla lobe more connate with each other than with those of adjacent corolla lobes, pink and turning purple, subulate or narrowly triangular, 5–15 × 1.5–4 mm, acute at the tip, sometimes undulate at the margin, fleshy, papillose or scabridulous; corolla lobes white with a stripe

FIG. 20. *Strophanthus gratus* (Wall. & Hook.) Baill.: 1. flowering branch, $\frac{2}{3}\times$; 2. detail of branch, $\frac{2}{3}\times$; 3. opened flower, $1\times$; 4. adaxial side of stamen, $2\times$; 5. follicle, with middle section removed, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$; 7. seed grain, $2\times$. (1–2. *Leeuwenberg 11579*; 3–4. *Beentje 1549*; 5–7. *Leeuwenberg 12030*).

of purple on the right side outside, turning reddish or purple all over, white and turning yellow inside, orbicular or nearly so, 0.8–1.2 × as long as wide, 14–35 × 15–32 mm, unequal-sided at the base, emarginate or rounded and apiculate at the apex, undulate along the left margin, glabrous on both sides. *Stamens* 3–15 mm exserted; filaments inserted at 14–21 mm from the base of the tube, straight or nearly so, 3.2–6.8 mm long, pubescent inside, with broad and longitudinally grooved ridges, obtuse at the base; anthers 17–23 × 1.5–3 mm, glabrous; tails 1.3–2.8 mm long; acumen 6–12 mm long. *Pistil:* ovary 2–3.2 × 2.2–3.2 mm, glabrous; style 16–22 mm long; clavuncula 2.3–3.5 × 2–3.5 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180°, tapering towards the apex and ending in a narrow obtuse tip, sometimes curved inwards, 23–41 cm long and 3–4.3 cm in diameter; exocarp dark brown to purplish-brown, thick and hard, slightly sulcate, glabrous, densely lenticellate; lenticels on the abaxial side sometimes elongate. *Seeds:* grain (9–)12–20 × 2.5–4.5 mm, glabrous, scabridulous, or microscopically puberulous; beak glabrous for 6–15 mm and bearing a coma for (10–)23–47 mm; coma spreading or reflexed, 90–130 mm wide, or erect and 83–102 mm long. *Seedling:* primary root not swollen, with spreading secondary roots; hypocotyl whitish near the base, pale green at the apex; cotyledons elliptic or obovate, 17–25 × 6.5–9.5 mm, rounded; first leaves elliptic.



MAP 18. *Strophanthus gratus* (Wall. & Hook.) Baill.

Distribution: West and Western Central Africa.

Ecology: primary and secondary forest, often at forest margins or on river banks; alt. 0–650 m.

Flowering from Ivory Coast to Cameroun with a peak in November and December, but possibly all through the year.

Local names: *Iné* or *Onayé* (Cameroun and Gabon, Fang and Bulu languages, now commonly known under these names in Cameroun).

Local uses: cultivated in Nigeria, Cameroun, and Gabon, formerly (?) used for the preparation of arrow poison; now sold for export to Europa and the U.S.A. for the extraction of Strophanthine.

PHOTO 3. *Strophanthus gratus* (Wall. & Hook.) Baill., part of stem with flowering branchlets. – Breteler 2134 (photograph F. J. BRETELER).

A selection of the ca. 300 specimens examined:

SÉNÉGAL: Basse Casamance, Emay, *Berhaut* 7250 (BR, M, P); Oussouye, *Berhaut* 5744 (BR, P).

SIERRA LEONE: near Pujehun, *Deighton* 275 (BM, K); Waterloo, York, *Smythe* 245 (K).

LIBERIA: Loffa country, between St. Paul R. and Zorzor, *Bos* 2529 (K, WAG); Nimba Mts., Lamco HQ, *Adames* 813 (K, P, UPS); Gbarnga, 2 m NE of Suakoko, *Konneh* 151 (K, MO, US); Putu Distr., Grand Gedeh County, *Bos* 2884 (K, WAG).

GUINÉE: Nzérékoré, Bossou, *Adam* 7432 (MO).

CÔTE D'IVOIRE: Man, *de Wit* 9174 (WAG); between Goumélé and Agnibilékrou, *Roberty* 13667 (G, Z); 9 km E of Divo on the road to Ndouci, *Leeuwenberg* 12155 (WAG); 1 km E of Monogaga, *Geerling & Bokdam* 2415 (BM, MO, PRE, WAG); Abouabou Forest, E of Abidjan, *Leeuwenberg* 2353 (B, BR, GC, K, L, LISC, MO, P, WAG, Z).

GHANA: km 138 on Sunyani-Berekum Road, *Adams* 5049 (GC); Asenanya R. For. Res., *Andoh* 4302 (A, BM, BR, FHO); Akwaseho, *Dalziel* 158 (C, E, K, PRE); Wassaw, 66 km from Dankwa, *Darko* 1065 (K, P); Assin Cocoa Stn., *West-Skinn* 282 (K).

NIGERIA, LAGOS: near Ibadan, *Meikle* 1159 (K, P). ONDO: Ado-Ekiti, road to Ikerre, *Latilo* FHI 71063 (K). ANAMBRA: Onitsha, *Kennedy* 2518 (FHO). RIVERS: near Brass, *Burrows* s.n. (K). CROSS RIVER: Ikom Distr., Bendiga Ajuh, *Keay* FHI 28166 (K); Eket, *Talbot* 3062 (BM, K, SAM, Z).

CAMEROUN: Mamfe, *Baldwin* 13815 (K, MO, NY, S, UC); Bipindi, *Zenker* 3391 (A, BM, BP, BR, E, FHO, G, GOET, HBG, K, L, M, MO, P, S, US, W, WU, Z); N'Kolbisson, 8 km W of

Yaoundé, *Leeuwenberg* 11579 (WAG); 17 km NW of Doumé along road to Nguélémendouka, *Breteler* 2134 (A, BR, K, LISC, M, P, WAG, YA); 18 km N of Yokadouma, *Brass & Woodward* 20854 (NY).

GABON: Sibange-Farm near Libreville, *Soyaux* 458 (HBG, UC, US); Myana, 94 km from Mitzic on road to Libreville, *Brass & Woodward* 20905 (NY); Lastoursville, *Le Testu* 7188 (BM, BR, P); between Youmbi and Boungounga, *Le Testu* 5809 (BM, BR, LISC, P); Tchibanga, *Le Testu* 1967 (BM, BR, G, LISC, P).

CONGO: Nola, *Duzilleau* s.n. (P); Dongou, road to Impfondo, *Bouquet* 2089 (P).

ZAÏRE, EQUATEUR: between Libenge and Gemena, *Lebrun* 1853 (BR, K).

RÉPUBLIQUE CENTRAFRICAINE: N'Gotto, *Eaux Forest & Chasses RCA* 2026 (P); Boukoko, *Tisserant* 476 (BM, P).

MARTINIQUE, naturalized: around St. Pierre, *Père Duss* 889 (NY).

Cultivated: KENYA, Nairobi, *Bally* 6563 (FI, K, S); TANZANIA, Amani, *Jefferey* K 724 (EA); S. AFRICA, Durban, *du Toit* 2370 (K, MO); SEYCHELLES, Mahé, *Elizabeth* 116 (EA); FRANCE, Paris, *Quesnel* anno 1847 (P); GREAT BRITAIN, Kew, *House* Aug. 1888 (K); INDIA, Madras, *Jelinek* s.n. (LE, W); Calcutta, *anonym.* 1605 (W); THAILAND, Bangkok, *Kerr* 28 Jan. 1923 (BM); VIÊT-NAM, Saigon, *Hiêp* 11 (P); SINGAPORE, *Leeuwenberg* 11891 (WAG); MALAYSIA, Sandakan, *Clemens* 9500 (A, UC); INDONESIA, Bogor, *Woerjantoro* 6 (L); NEW GUINEA, Lae, *Millar* MGF 38457 (L); U.S.A., New York, *Monachino* April 1950 (NY); JAMAICA, sin. loc., *Harris* 64 (K); HAITI, sin. loc., *Ekman* 3242 (K); TOBAGO, *Broadway* 4405 (BM, G, E, K, NY, P, U, Z); BRASIL: Para, *Baker* June 1908 (B, G, UC).

Notes: WIT (1941), TOXOPEUS (1948) and DE VISSER SMITS (1951) report on the biology of fruitsetting of cultivated *S. gratus* on Java (Indonesia). From these studies it can be deduced that the lower side of the clavuncula is the receptive zone for the pollen.

16. S. hispidus DC. 1802: 123, pl. 8; A. P. De Candolle 1804: 9; Poiret 1827: 150 (as *S. hirta*, lapsu); A. De Candolle 1844: 419; Blondel 1888a: 97; Franchet 1893b: 271; Planchon 1894: 33; Stapf 1902: 174; Gilg 1903: 35, pl. 2; Hutchinson & Dalziel 1931: 47; Krukoff & Letouzey 1950: 131; Schnell 1950: 131; Huber 1963: 70; Berhaut 1971: 435; Hall & Swaine 1981: 295.

Fig. 21; Photo 4; Map 19

Type: Sierra Leone, sin. loc., *Smeathman* s.n. (G-DC, holotype; isotypes: BM, K, P, P-JU, UPS).

Heterotypic synonyms: *S. hispidus* var. *seidenii* Lindsay ex Helbing 1887: 317. Type: the original description (lectotype).

S. bariba Boyé & Béréni 1897: 405, pl. 1; syn. nov. Type: icon. cit. (lectotype).

S. tchabé Boyé & Béréni 1897: 403, pl. 8; syn. nov. Type: icon. cit. (lectotype).

S. thierreanus K. Schum. & Gilg 1902a: 158. Type: Togo, Moba, *Thierry* s.n. (holotype destroyed in B); neotype: the original description (lectotype).

S. hispidus var. *bosere* De Wild. 1907: 546. Type: Zaïre, Equatoria, Eala, *Malchair in herb. Laurent* 1273 (BR, holotype).

S. hispidus var. *latistigmatica* Schnell 1950: 598, pl. 26; syn. nov. Type: Guinée, Labé, *Schnell* 4758 (P, holotype; isotypes: K, P).

S. hispidus var. *lobatistigmatica* Schnell 1950: 598, pl. 26; syn. nov. Type: Guinée, Labé, *Schnell* 4757 (P, holotype; isotypes: K, P).

S. hispidus var. *parvistigmatica* Schnell 1950: 599; syn. nov. Type: the original description (lectotype).

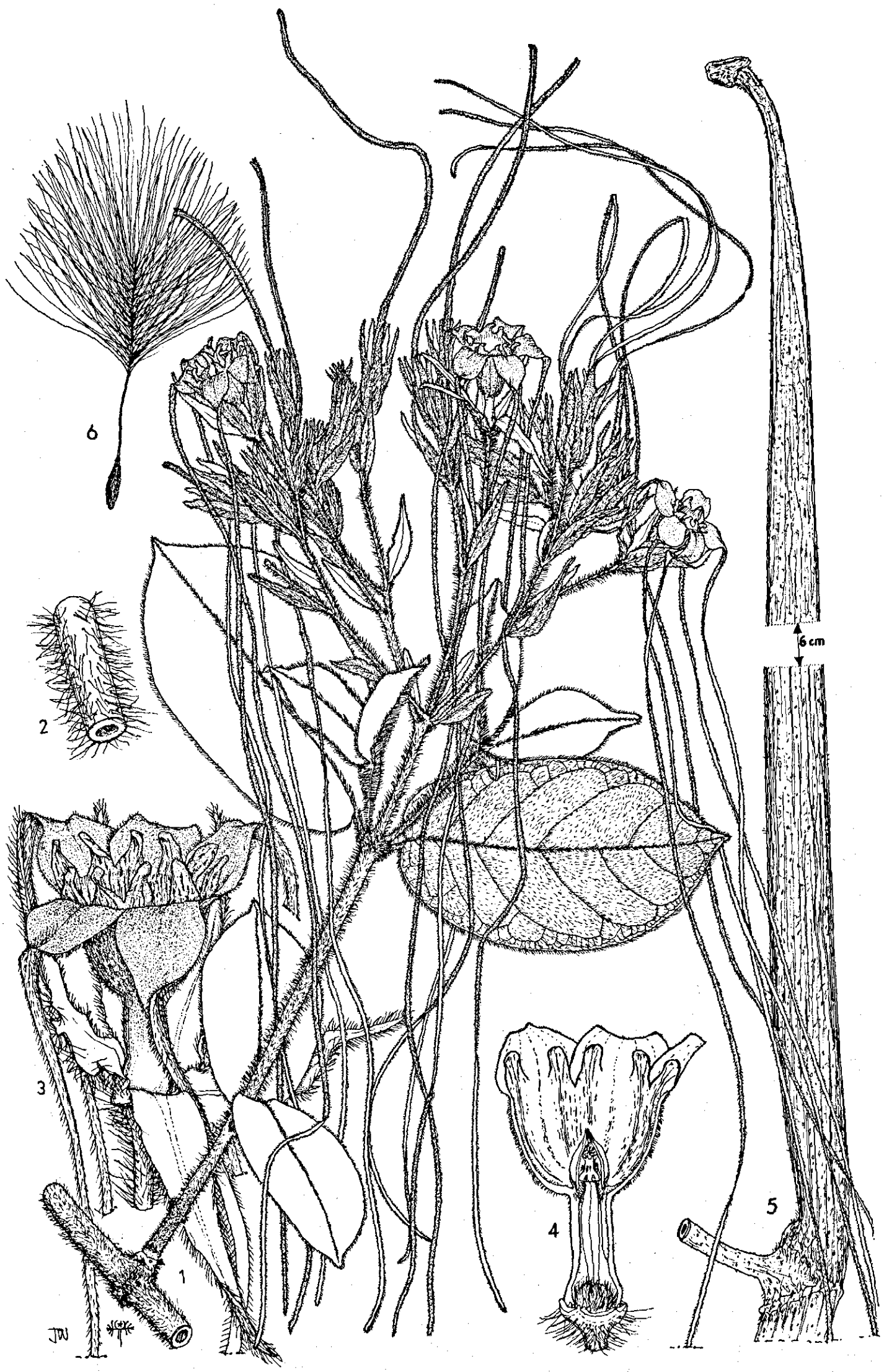


FIG. 21. *Strophanthus hispidus* DC: 1. flowering branch, $\frac{2}{3}\times$; 2. detail of branch, 2 ×; 3. flower, 2 ×; 4. section of flower, 2 ×; 5. part of fruit, follicle with middle section removed, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1–4. *Leeuwenberg 11918*; 5–6. *Leeuwenberg 2699*).

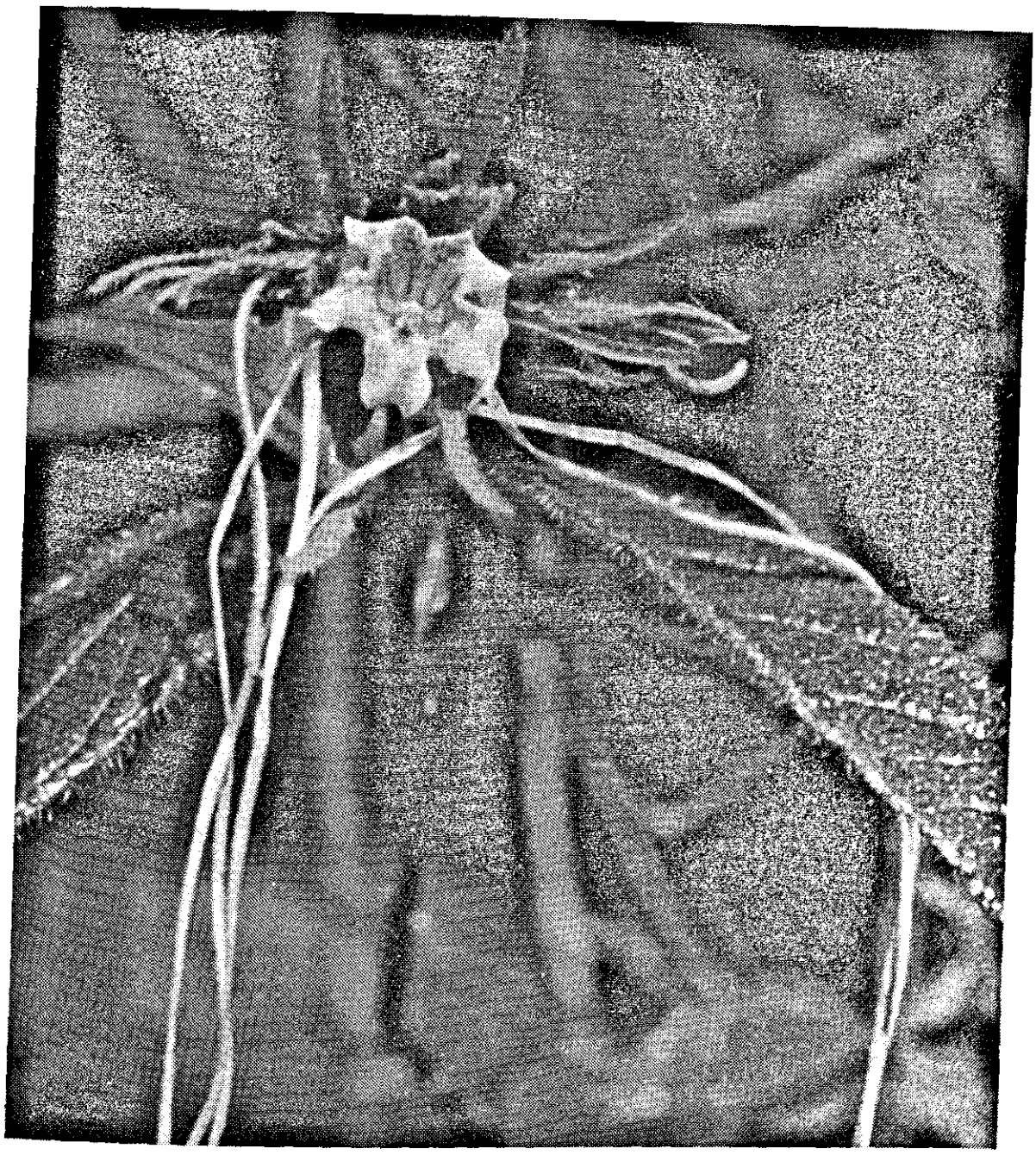


PHOTO 4. *Strophanthus hispidus* DC., flowering branchlet. – *Beentje 1357* (photograph H. J. BEENTJE).

Sarmentose *shrub*, 1.50–5 m high, or *liana*, up to 100 m long, deciduous; latex clear, reddish, or white, coagulating after exposure. *Trunk* up to 6 cm in diameter, bark dark grey; branches dark brown or blackish, sparsely or densely lenticellate; branchlets light or reddish-brown, densely hispid. *Leaves* opposite or rarely ternate; petiole 1–5 mm long, with 2 outer and 4 (rarely 6) axillary colleters; blade glossy and dark green above, dull and paler beneath, ovate, elliptic, or obovate, 1.1–3(–3.6) × as long as wide, in mature leaves up to 15 × 8(–22 × 12) cm, rounded or subcordate at the base, acuminate (or rarely acute or emarginate) at the apex (acumen 2–14 mm long), sometimes slightly undulate at the margin, papyraceous, often bullate, sparsely or densely hispid; (4–)6–11 pairs of straight or curved secondary veins at an angle of 45–60° with the midrib; tertiary venation conspicuous. *Inflorescence* on long or short branches or in the

forks, 1–72-flowered (1–3 flowers open at a time), sessile or pedunculate, lax or congested, hispid in all parts; peduncle – if present – 1–55 mm long, branches 13–80 mm long; pedicels 5–32 mm long; bracts green, with a reddish margin, narrowly ovate or elliptic, 6–30(–40) × 1–12 mm, acute, often undulate at the margin, sepal-like. *Calyx:* sepals unequal, the outer ovate and 2.3–4 × as long as wide, the inner narrowly ovate or linear and 6–14 × as long as wide, pale green with the base and midrib reddish, 13–35 × 1.5–10 mm, acute, sometimes undulate at the margin, densely hispid; with 5(–10) colleters in total, concentrated on the inner sepals. *Corolla:* tube 0.5–1.3 × as long as the calyx, white and turning orange via yellow on both sides, suffused with red near the base outside, red- or purple-spotted inside, 11–22 mm long and widening at 54–66% of its length into a cup-shaped upper part, at the mouth 7.5–17 mm wide, hispidulous on both sides except for the base; corona lobes yellow, red-, purple-, or brown-spotted, lingulate, 1–3 × 0.8–2.5 mm, rounded, fleshy, minutely papillose or scabrous; corolla lobes creamy and turning orange on both sides, red- or brown-spotted inside, tails yellow or greenish-yellow, reddish towards the apex; lobes ovate, 3–10 × 3–7.5 mm, rather abruptly narrowing into the 1 mm wide pendulous tails; lobes including the tails 150–225 mm long, puberulous on both sides. *Stamens* included for 0–4 mm; filaments inserted at 7–13 mm from the base of the tube, curved, with a small abaxial swelling at the base, 0.5–1.5 mm high, with ridges reaching the base of the tube; anthers 3.6–5 × 0.9–1.4 mm, glabrous; tails 0.4–0.8 mm long; acumen 0.1–0.3 mm long. *Pistil:* ovary 1–2.5 × 1.4–3 mm, densely hispid with long erect hairs; style 7–12 mm long; clavuncula 1.3–2.1 × 0.9–2 mm; stigma minute. *Fruit:* follicles divergent at an angle of 200–260°, long-tapering towards the narrow apex and ending in a large knob, 24–48 cm long and 1.3–1.8 cm in diameter; exocarp dark brown, thick and hard, sulcate, hispid or glabrescent, densely lenticellate. *Seeds:* grain 10–18 × 2–3 mm, densely pubescent; beak glabrous for 8–34 mm and bearing a coma for (15–)20–43 mm; coma erect or spreading, 42–85 mm long.

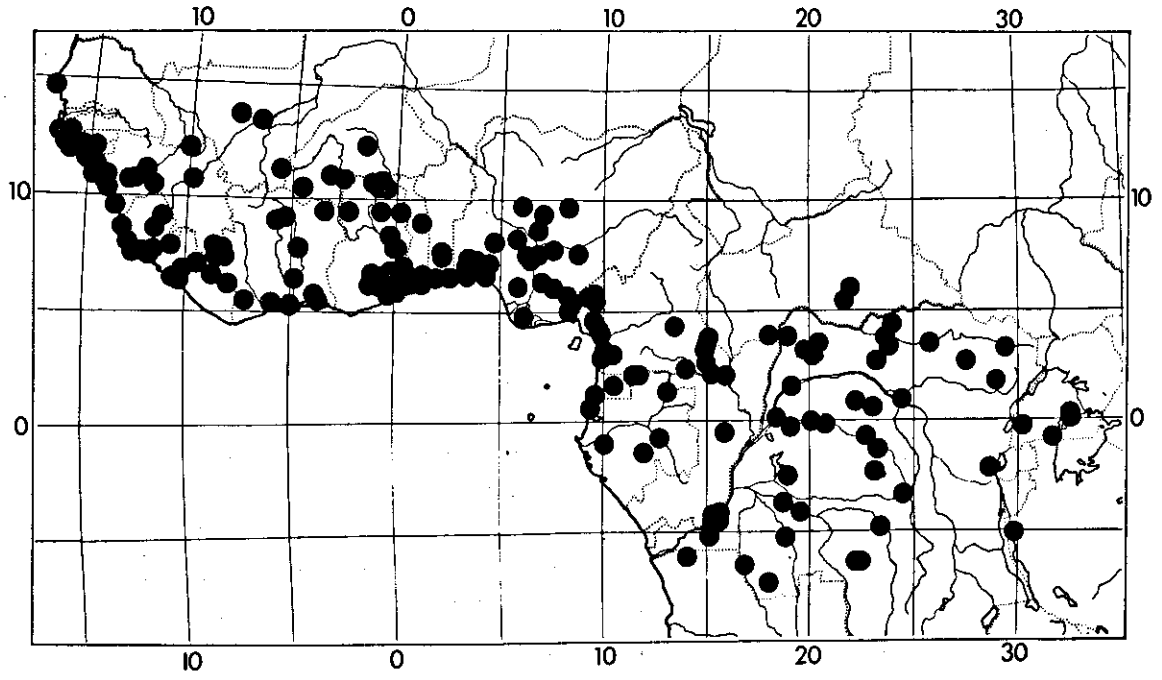
Distribution: West and Central Africa.

Ecology: primary and secondary forest, or rocky outcrops and thickets in woodland; alt. 0–1600 m.

Flowering: in Ghana flowers are found from February to April (rarely to July), and mature fruits are found from January to July.

Local names: *Isha giri* (Nigeria, Yoruba landguage); *Libobo li tokembe* (Zaïre; Turumbu language; Libobo is a generic name, but the second part of the name is probably specific); *Lofondja* (Zaïre; Kundu language: a generic name); *Ometwa* (Ghana; Twi and Ashanti languages).

Local uses: latex or seeds used to make arrow poison in Guinée, Haute Volta, Ghana, Togo, Benin, Nigeria, Cameroun, and Zaïre; locally cultivated for this purpose.



MAP 19. *Strophanthus hispidus* DC.

A selection of ca. 450 specimens examined:

SÉNÉGAL: Cap Vert Peninsula, Gorom area, *Berhaut* 5676 (P); Basse Casamance, Ziguinchor, *Berhaut* 5902 (BR, M, P).

GUINÉE-BISSAU: between Bissoram and Mansoa, *Espiritu Santo* 853 (BM, K, LISC, LISJC); between Cacine and Guilege, *Espiritu Santo* 2991 (BR, LISC, LISJC, P, WAG).

MALI: Bana, Sonkorian, *Chevalier* 552 (BM, G, K, L, P, W, Z); Faradiafé, *Chevalier* 669 (BM, BR, G, P); Sikasso area, Missirikoro Rocks, *Laferrère* 48 (K).

GUINÉE: banks of Rio Nunez, *Heudelot* 829 (FI-W, G, G-DC, K, P, TCD); Conakry, *Dybowski* 25 (K, P); Fouta Djallon, Pita area, *Jaques-Félix* 691 (P); Kouroussa, *Pobéguin* 150 (P); Nzérékoré, *Baldwin* 13306 (K, US).

SIERRA LEONE: Loma Mts., *Jaeger* 935 (K); Sherbro R., *Mann* 793 (A, GOET, K, LE, P, S, W); Pujehun, Mesima resthouse, *Morton & Jarrett* SL 1688 (GC, K, MO, WAG).

LIBERIA: Yéképah, Tokadeh, *Adam* 30015 (MO); Totata Distr., Salala, *Baldwin* 14175 (A, K, MO, NY, P, S, UC); Gbarnga, *Baldwin* 13212 (K); Tchien Distr., 15 m E of Zwedru, *Baldwin* 7054 (NY).

CÔTE D'IVOIRE: Comoé Nat. Park, Brelircho, *Geerling & Bokdam* 2079 (BR, K, MO, PRE, WAG); 40 km SE of Korhogo on road to Ngolodougou, *Versteegh & den Outer* 492 (WAG); Mt. Kouan, near Danané, *Chevalier* 21246 (P); Mt. Niénokoué, *Chevalier* 19475 (P); Dakpadou-Sago, *Geerling & Bokdam* 2278 (BR, K, MO, WAG); Oroumbo-Boka, *J. de Wilde* 621 (WAG); Yapo Forest, 4 km S of Bécédi-Brignan, *Oldeman* 243 (BR, K, MO, P, WAG).

HAUTE-VOLTA: Lobi Territory, *Gunn* 5 June 1906 (BM); Diébougou near Dano, *Bognounou* 320 (P); Ouagadougou, *Pannier* Nov. 1933 (P).

GHANA: Lambusie, near Nandom, *Adams* 4114 (GC); Chuchiliga, near Narrongo, *Katz & Schmutz* H66 (BM, K); Tuna, *Kitson* 894 (K); Tamale, *Bally* 143 (K); Kete-Kratchi, *Kitson* 11 april 1915 (BM, MO); Ashanti, Amentia, *Irvine* 455 (FHO, GC); 1 km W of Tsurkpe, *Leeuwenberg* 11190 (GC, WAG); Achimota, *Irvine* 2053 (E, K).

TOGO: Sokodé, *Kersting* 1 (WAG); Lomé, *Warnecke* 133 (BM, GOET, HBG, P).

BÉNIN: Dassa-Zoumé area, *Chevalier* 23656 (P); Torricada-Allada, *Le Testu* 172 (MPU).

NIGERIA, NIGER: Zungeru, *Lugard* 29 July 1907 (K). KADUNA: Kaduna Plains, near Sadana Zonkwa, *Lawton* 1836 (K). KWARA: Isanlu Mopo, *Latilo* FHI 62203 (K). OYO: Olokemeji Res., *Akpata* FHI 19905 (FHO, K, NY). ONDO: Ipe-Oka Road, *Daramola & Ihe* FHI 86414 (WAG). BENDEL: Sapoba, near Agbadi village, *Meikle & Keay* 534 (K, P). BENUE: Niger R., Nupe, *Barter* 749 (K, P); Aninsi, *Dalziel* anno 1912 (BM, MO). ANAMBRA: between Mamu R. and Agulu, *Latilo* FHI

27304 (GC). RIVERS: Nun R., Akasra, *Barter* 2102 (FHO, K). CROSS RIVER: Calabar, Agoi For. Res., *Binuyo* FHI 45452.

CAMEROUN: near Mamfe, *Krukoff* 32 (MO, NY); Kumba Distr., Banga Forest Res., *Binuyo & Daramola* FHI 35617 (FHO, K, P); Bipindi, *Zenker* 1683 (BM, BP, BR, E, G, GOET, HBG, K, L, LE, M, MO, NY, P, S, SAM, W, WU, Z); Kouen, *Krukoff & Letouzey* 161 (P, YA); between Kwaka and Djadom, 20 km S of Ngoila, *Letouzey* 11917 (BR, G, HBG, K, P, WAG, YA); near Madjoué, *Krukoff & Letouzey* 158 (P, YA); between Ngali and Pandama, 7 km N of Ngoko R., *Letouzey* 10602 (P, YA).

RÉPUBLIQUE CENTRAFRICAINE: Boukoko, *Tisserant* 1697 (BM, BR, LISC, P); Daembo on Kaba R., 100 km N of Fouloumbala, *Tisserant* 2449 (BM, BR, LISC, P).

RIO MUNI: sin. loc., *Krukoff* 20501 (NY).

GABON: Endama, Le Testu 9470 (B, BM, LISC, MO, P); Nounah R., NE of Belinga, *N. Hallé* 2916 (P); Cap Esterias Forest Res., *Brass & Woodward* 20911 (K, NY); Njigoni, Pobéguin 140 (P); Lastoursville, *Le Testu* 7096 (BM, MO, P); Boulembo, *Le Testu* 6315 (BM, BR, LISC, MO, P).

CONGO: Otende Forest, *Bouquet* 1710 (P); M'Bamou Isl., Kounia Forest, *Sita* 1918 (P).

ZAÏRE, EQUATEUR: Gemena-Karawa Road, $\frac{1}{2}$ km W of Baseurville, *Katz & Speiser* P9 (K, NY); Makanza, *Dewèvre* 866 (BR); Eala, Bolombo, *Bonnivair* 34 (A, BR, K, S); Tshuapa Distr., Boende, *Dubois* 338 (BR, NY); Bokota, *Evrard* 5653 (BR, K, PRE); Ikela, *unreadable* 23 (BR). HAUTE ZAÏRE: Mobwasa, *Lemaire* 418 (BR); upper Itimbiri R., Lebo, *Lebrun* 2398 (BR, K, US): Ituri R., Nduye area, Mt. Tikokeba, *Lisowski* 43452 (BR); Obi, or Nzoro R., *Gilbert* 1101 (BR); Yangambi, Lusambila R. Plateau, *Louis* 14707 (B, BR, K, MO, P). KIVU: Bunyakiri, *A. Léonard* 4026 (WAG). BAS-ZAÏRE: Kimuenza Terr., Ngili, *Carrington* 189 (BR). BANDUNDU: Nkaw, N of Lukenié, *Jans* 1073 (BR); Ipamu, *Vanderijst* 10725 (BR); Kasongolunda, *Callens* 4315 (BR, NY); Kiyaka-Kwango, *Devred* 2437 (BR); Panzi, *Callens* 2686 (NY). W KASAI: Hemptinne St. Benoit, *Vanderijst* 23784 (BR). E KASAI: Maniema Distr., between Katako Kombe and Looya, *Lebrun* 6183 (BR); Lusambo, *Rossignol* 135 (BR).

UGANDA, U2: Anole, Kashoya-Kitomi Forest, *Eggeling* 3210 (K). U4: Kitubulu near Entebbe, *Chandler* 2493 (B, BR, EA, K, P); Misozi, *Bagshawe* 128 (BM).

TANZANIA, T4: Kasakati Basin, 80 km S of Kigoma, *Itani* 49 (EA).

ANGOLA, CONGO: 81 km from Noqui, on the road to Sao Salvador do Congo, *Brass & Woodward* 20931 (NY).

Cultivated: TANZANIA, Amani, *Peter* 58105 (B, WAG); S. AFRICA, Durban, *Thorp* 17 Dec. 1938 (G); INDIA, Calcutta, *Davies* April 1898 (BM, FI, G, K, L, LE, P, WU, Z); VIÊT-NAM, Saigon, HIÊP 587 (P); SINGAPORE, *Lennan* 1371 (SING); INDONESIA, Bogor, *Djoemadi* 46 (K, L); U.S.A., Mayaguez (PR), *Winters* 2245 (NY); JAMAICA, sin. loc., *Harris* June 1900 (K); CUBA, Havana. *Acuna y Roig* PI 19236 (NY); ANTILLES, *Poiret* s.n. (P).

Notes: the three varieties of SCHNELL (1950) are based on the size of the follicles and their apical knob. I do not consider the types of these varieties to be outside the range of variation of *S. hispidus*, and therefore they are reduced into synonymy.

S. bariba and *S. tchabe* were described from specimens cultivated in Togo. The descriptions leave little doubt that they are identical to *S. hispidus*.

S. hispidus and *S. kombe* are closely related; they are distinguished most easily as follows:

follicles divergent at an angle of 200–260°; outer sepals ovate, 2.3–4 × as long as wide, much wider than the inner . . . . . **S. hispidus**

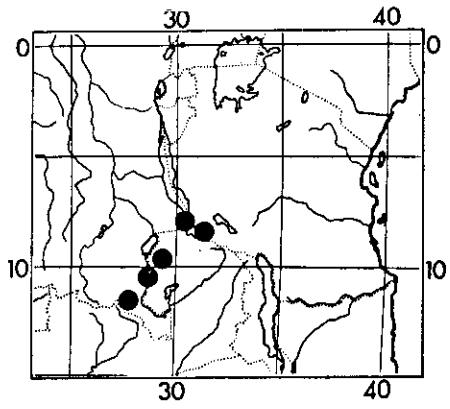
follicles divergent at an angle of 180°; outer sepals narrowly ovate, 4–14 × as long as wide, about as wide as the inner . . . . . **S. kombe**

The inflorescences of woodland plants of *S. hispidus* seem to be slightly smaller than those of forest plants.

17. S. holosericeus K. Schum. & Gilg 1902: 157; Stapf 1902: 171; Gilg 1903: 39, pl. 1; Staner & Michotte 1934: 32 (as *S. kombe*). . . . . **Fig. 22; Map 20**
Type: Zaïre, Mzimu Peninsula (Tanganika), *Descamps* 30 (BR, holotype).

Liana, up to 9 m long, deciduous, flowers appearing before or with the leaves. *Branches* reddish, greybrown, or blackish, sparsely lenticellate; branchlets densely puberulous or short-pubescent. *Leaves:* petiole 1–5 mm long, with 2 outer and 6–14 inner axillary colleters; blade dark green above, silvery or yellowish beneath, ovate, 1–1.4 × (in young leaves up to 2.5 ×) as long as wide, in mature leaves 6–17 × 5–12 cm, rounded or subcordate at the base, acuminate at the apex (acumen 1–5 mm long), slightly undulate at the margin, papyraceous or chartaceous, puberulous above, especially on the midrib and secondary veins, tomentellous beneath; 8–11 pairs of straight or slightly curved secondary veins, the basal at right angles with the midrib, the apical at an angle of ca. 45° with the midrib; tertiary venation in older leaves conspicuous beneath. *Inflorescence* on long or short branches or axillary, (1–)2–9-flowered (1–4 flowers open at a time), sessile or pedunculate, lax or congested, densely pubescent in all parts; peduncle – if present – up to 6 mm long; branches 5–25 mm long; pedicels 3–6 mm long; bracts ovate or elliptic, 6–10 × 2–4 mm, acute, sepal-like. *Calyx:* sepals subequal or with the outer slightly larger than the inner, ovate or narrowly elliptic, 2.5–5 × as long as wide, 10–17 × 3–6.5 mm, acute; with altogether 5 colleters, concentrated on the inner sepals. *Corolla:* tube 1.2–1.8 × as long as the calyx, white and turning pink via yellow on both sides, red-streaked and -spotted inside, 18–24 mm long and widening at 60–80% of its length into a cup-shaped upper part, at the mouth 11–14 mm wide, densely short-pubescent outside and glabrous inside; corona lobes red, lingulate or subulate, 1.5–3 × 1–1.5 mm, obtuse at the tip, fleshy, glabrous; corolla lobes white, turning pink via yellow, on both sides, tails presumably yellow or red; lobes ovate, 6–10 × 6–9 mm, gradually or abruptly narrowing into the 1–2 mm wide pendulous tails; lobes including the tails 100–150 mm long, puberulous or pubescent outside. *Stamens* 0–3 mm exserted; filaments inserted at 10.5–13 mm from the base of the tube, 4–5 mm long, straight, with an abaxial swelling, puberulous except for the apex which is pubescent, with 4–6 mm long puberulous ridges; anthers 5.2–6.9 × 1.5–2 mm, glabrous; tails 0.7–0.9 mm long; acumen 0.2–0.6 mm long. *Pistil:* ovary 1.4–1.8 × 2 mm, densely hispid with erect hairs; style 13–16 mm long; clavuncula 2 × 2 mm; stigma minute. *Fruit:* follicles divergent at an angle of 170–180°, tapering towards a narrow apex and ending in a knob, 19–40 cm long and 1.5–2.5 cm in diameter; exocarp thick and hard, with a few or rather many small protuberances, puberulous or short-pubescent, rather densely lenticellate, lenticels rather elongate. *Seeds:* grain 14–17 × 3–4 mm, densely pubescent; beak glabrous for 37–64 mm and bearing a coma for 18–37 mm; coma erect or spreading, 45–75 mm long.

FIG. 22. *Strophanthus holosericeus* K. Schum. & Gilg: 1. flowering branch, $\frac{2}{3}\times$; 2. leaf, $\frac{2}{3}\times$; 3. section of flower, 2 ×; 4. fruit, one follicle removed, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$. (1. *Bullock 3004*; 2. *Hodge A 118*; 3. *Letouzey Sept. 1950*; 4. *Hodge A 118*; 5. *Letouzey Sept. 1950*).



MAP 20. *Strophanthus holosericeus* K. Schum. & Gilg

Distribution: Southeast Zaïre and North Zambia.
Ecology: forest near waterfalls.

Specimens examined:
ZAMBIA: Kalambo Falls, *Bullock* 2854 (K), 3004 (K); ibid., *Greenway* 6199 (K), 8816 (FHO, K, PRE); ibid., *Greenway & Brenan* 8255 (FHO, K, NY); ibid., *Hodge* A 118 (NY); Kawambwa, *Fanshawe* 3867 (K), 3869 (K).
ZAÏRE, SHABA: Lumumbashi, *Krukoff & Letouzey* March 1949 (P, YA); ibid., Kasenga, *Letouzey* Sept. 1950 (NY, YA); Luapula R. bank, near Johnston Falls, *Lisowski* 60060 (BR); Kasenga region, Tanganika village, *Lisowski* 60059 (BR); Mzimu Peninsula, Tanganika, *Descamps* 30 (BR; type).

Notes: *S. holosericeus* is closely allied to both *S. eminii* and *S. ledienii*, and is morphologically intermediate between these two species. More material might very well show that *S. holosericeus* should be reduced to a variety of either of them.

18. S. hypoleucos Stapf 1914: 81; White 1962: 351.
Type: Moçambique, Cabo Delgado: Mt. M'Kota, *Stocks* 148 (K, holotype; isotype: K).
Fig. 23; Map 21

Shrub, 1–4 m high, rarely a *liana*; deciduous, the flowers appearing together with the leaves; latex white. *Branches:* bark purplish-brown or nearly black, sparsely lenticellate; branchlets reddish-brown, densely tomentellous. *Leaves:* petiole 2–7.5 mm long, with 2 outer and 6–10 inner axillary colleters; blade orbicular, elliptic, ovate, or obovate, 0.9–2 × as long as wide (in young leaves up to 3 × as long as wide), 1.7–8 × 1.3–5(–8.5) cm, cuneate, rounded, or subcordate at the base, slightly emarginate, rounded, or acute at the apex (rarely with an acumen up to 3 mm long). sometimes slightly undulate at the margin, papyraceous or thinly coriaceous, densely short-pubescent or tomentellous above, especially on the midrib and veins, and tomentose beneath with whitish hairs; 4–8 pairs of secondary veins at an angle of 40–60° with the midrib, slightly curved; tertiary venation inconspicuous. *Inflorescence* on long or short branches or in the forks, 1–6-flowered (1 or rarely 2 flowers open at a time), pedunculate, congested and sometimes partly reduced, densely tomentellous in all parts; peduncle 1–9(–18) mm long, lenticellate; branches 6–45 mm long; pedicels 4–15 mm long; bracts elliptic or broadly obovate, 4–10(–16) × 2.5–7 mm, acute or emarginate, sepal-like. *Calyx:* sepals subequal, the outer wider than the inner, reddish-brown, elliptic, broadly elliptic, or obovate, 0.8–5 × as long as wide,

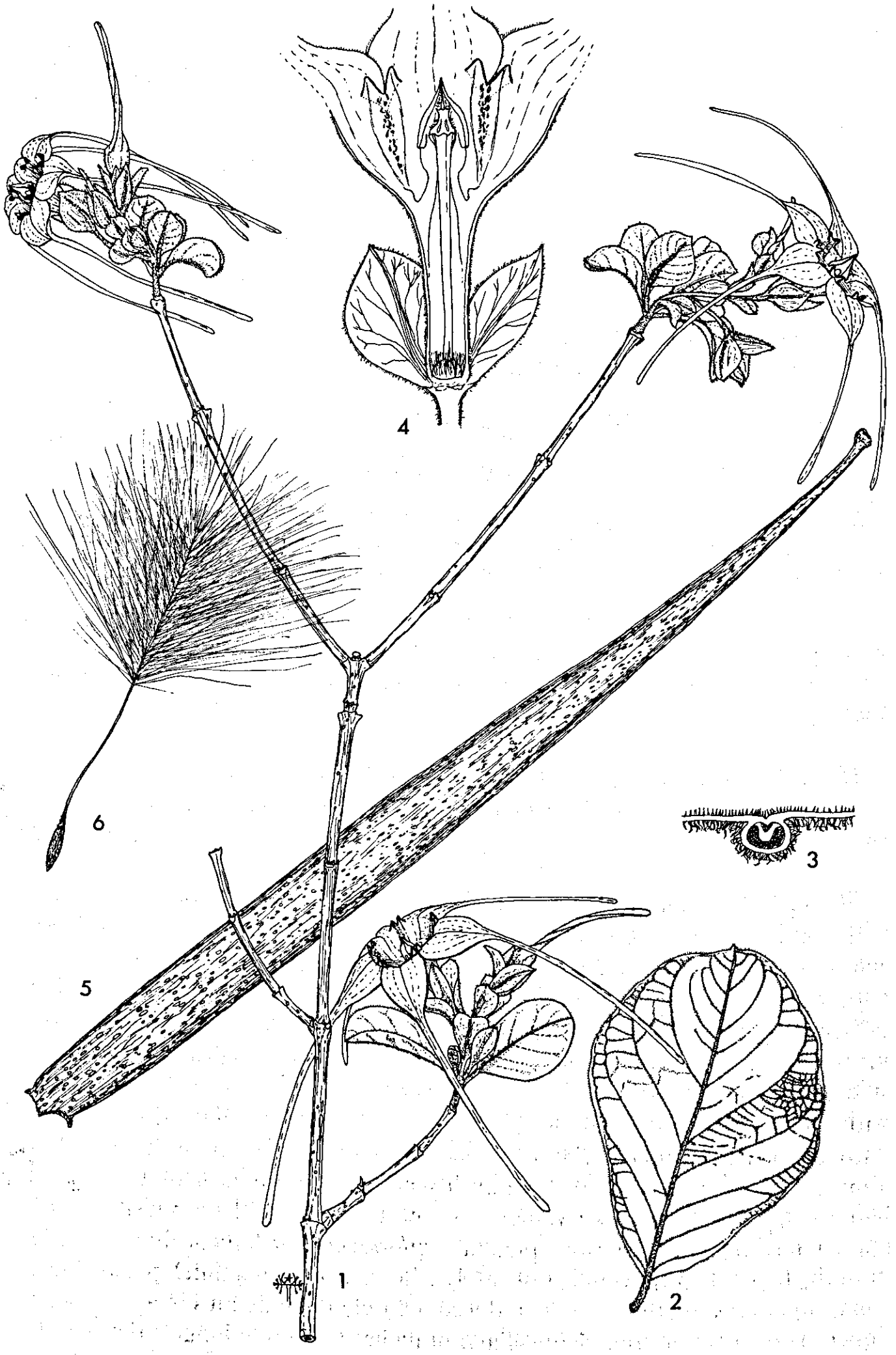
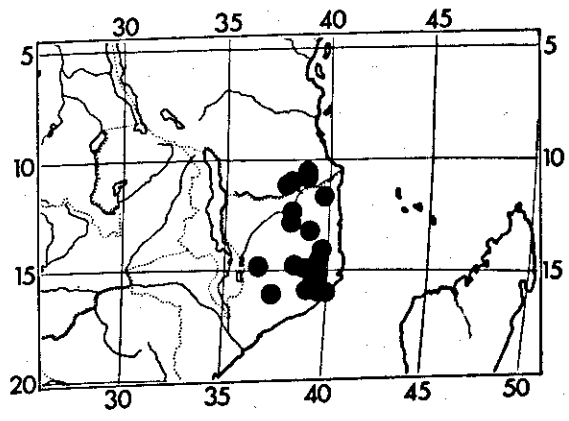


FIG. 23. *Strophanthus hypoleucos* Stapf: 1. flowering branches, $\frac{2}{3}\times$; 2. mature leaf, $\frac{2}{3}\times$; 3. cross section of leaf, detail, 6 ×; 4. section of flower, 2 ×; 5. follicle $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1. *Barbosa 2545*; 2–3. *Nuvunga 496*; 4. *Barbosa 2545*; 5–6. *Hornby 2627*).

5.5–12.5 × 2–9 mm, acute, often slightly undulate at the margin, densely tomentellous; eglandulose or less often with 2 colleters per sepal. *Corolla:* tube 1.3–2.4 × as long as the calyx, white and turning reddish via yellow on both sides, crimson-spotted and -streaked inside, 14–22 mm long and widening at 45-66% of its length into a more or less shallowly cup-shaped upper part, at the mouth 7–14 mm wide, densely short-tomentellous or pubescent outside, glabrous inside; corona lobes yellow, crimson-spotted and -streaked, triangular, 0.6–2 × 1–1.8 mm, obtuse, fleshy, minutely papillose; corolla lobes white and turning yellow on both sides, tails pink or red; lobes ovate, 6–12 × 5.5–11 mm, rather abruptly narrowing into the 1–2.7 mm wide spreading or pendulous tails; lobes including the tails 22–57 mm long, densely short-pubescent or tomentellous outside, glabrous inside. *Stamens* from 3 mm exserted to 0.4 mm included; filaments inserted at 8–12 mm from the base of the tube, straight, with an abaxial swelling near the apex as well as near the base, 2.3–4.5 mm long, glabrous but for the inside apex which is pubescent, with 3.5–7 mm long sparsely pubescent ridges; anthers 4.3–5.3 × 0.7–1.8 mm, glabrous; tails 0.7–1 mm long; acumen 0–0.2 mm long. *Pistil:* ovary 1–1.3 × 1.5–2.5 mm, densely pubescent; style 9–14.5 mm long; clavuncula 1.3–2.2 × 1.3–2.2 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180–200°, tapering towards the apex and ending in a small knob, 12.5–23 cm long and 2 cm in diameter; exocarp chocolate-brown, thick and hard, slightly sulcate, short-pubescent or glabrescent, sparsely or densely lenticellate. *Seeds:* grain 8–12.5 × 2.8–3.2 mm, densely pubescent; beak glabrous for 15–30 mm and bearing a coma for 12–33 mm; coma 32–53 mm long.



MAP 21. *Strophanthus hypoleucos* Stapf

Distribution: southern Tanzania and northern Moçambique.

Ecology: on rocks and in crevices, in woodland; alt. 300–1100 m.

Flowering towards the end of the dry and the beginning of the rainy season; mature fruits in the dry season.

Local names: *Maaku, Maco* (Moçambique, Marrupa region)

Specimens examined:

TANZANIA, T8: Majehi Rocks, near Lukuledi Mission, *Gritschneder* 18 Jan. 1952 (NY); Masasi, *Gillman* H 7/42 (EA, NY), 1206 (K); 32 km S of Masasi, near Lupaso, *Gerstner* s.n. (NY), 20 (NY), *Gillett* 7185 (NY, PRE); ibid., *Helg* s.n. (NY, PRE); 75 km from Tunduru on the road to Masasi,

17920 (BR, K, LISC, PRE); ibid., *Eggeling* 6388 (FHO, K).

MOÇAMBIQUE, NIASSA: Oekoewangoe, 16 km on Marrupa-Nungo Road, *P. Jansen et al.* 48 (WAG); Matiquite, 20 km on Marrupa-Mecula Road, *Nuvunga* 496 (WAG); Cuamba, Mts. Inhamuelos, *Gomes e Sousa* 1586 (COI). CABO DELGADO: Mt. M'Kota, *Stocks* 148 (K; type); Montepuez, *Mendonca* 897 (BM, LISC), 906 (BM, LISC); ibid., *Torre* 710 (COI, LISC). MOÇAMBIQUE: Evati, *Torre & Paiva* 9541 (LISC); Imala, Mocaburi Road, *Torre* 1049 (COI, LISC, PRE); between Imala and Muecate, *Barbosa* 2545 (BM, LISC, PRE); Ribaué, *Gomes e Sousa* 759 (K); ibid., *Hornby* 2627 (PRE); ibid., *Mendonca* 1243 (BM, LISC); ibid., Serra de Chinga, *Torre & Correia* 16484 (LISC); Ribaué, 102 km from Altomolocué, *Torre & Correia* 16355 (LISC); Nampula, *Andrada* 931 (LISU), 967 (LISU); ibid., *Gerstner* 7131 (PRE); ibid., km 23 on Meconta Road, *Torre & Paiva* 9914 (LISC); between Corrane & Nametil, *Velgueiras* 1 (PRE); between Liupo and Mogincual, *Torre* 1016b-2 (PRE); Nametil, *Pedro & Pedrogao* 4608 (EA); km 21 from Nametil on Iuluti Road, *Torre & Correia* 17405 (LISC). ZAMBEZIA: Mts. do Ile, Errego, *Torre* 5569 (BM, LISC); ibid., *Torre & Correia* 15022 (LISC), 16111 (LISC).

Cultivated: INDONESIA, Bogor, *Forman* 558 (K).

19. S. kombe Oliver 1871: 79, pl. 1098: Christy 1887: 14; Blondel 1888a: 121, pl. 36–49; Fraser 1890: 955, pl. 3–7 (as *S. hispidus*); Franchet 1893b: 273; Planchon 1894: 49; Gilg 1902b: 553, fig. 1; Stapf 1902: 173; Gilg 1903: 36, pl. 3; Braun 1910: 260; Staner & Michotte 1934: 32; Codd 1951: 158; White 1962: 351; Codd 1963: 290; Verdcourt & Trump 1969: 148, fig. 10.

Fig. 24, 25; Map 22

Type: Malawi, Manganja Hills, *Meller* Nov. 1861 (K, holotype).

Homotypic synonym: *S. hispidus* var. *kombe* (Oliver) Holmes 1890: 223.

Sarmentose *shrub,* 1–3.50 m high, or *liana*, 2.50–20 m high, deciduous, flowers and leaves appearing at the same time; latex clear, white, or yellow. Roots thick and fleshy, moniliform. *Trunk* up to 10 cm in diameter, bark reddish-brown or grey-brown; branches dark brown, dark grey, or black, sulcate, scabrous by the remaining bases of the hairs, sparsely or densely lenticellate; branchlets brown, densely hispid. *Leaves:* petiole 1.5–5 mm long, with 2 outer and (4–)8–12 inner axillary colleters; blade dark green, paler beneath, ovate or elliptic, less often obovate or nearly orbicular, 1.1–2.3 × as long as wide, in mature leaves 8–23.5 × 5–16.5 cm, cuneate, rounded, or subcordate at the base, obtuse, acute, or acuminate at the apex (acumen 1–11 mm long), papyraceous or chartaceous, sometimes bullate in older leaves, in young leaves densely hispid on both sides, in older leaves glabrescent above; 7–13 pairs of nearly straight secondary veins at an angle of 45–60° with the midrib; tertiary venation conspicuous beneath, translucent. *Inflorescence* on short branches or in the forks, 1–12-flowered (1–3 flowers open at a time), pedunculate, rather congested, densely hispid in all parts; peduncle 2–14(–25) mm long; branches 3–30 mm long; pedicels 3–14(–20) mm long; bracts linear or narrowly obovate, 5–23 × 0.5–2(–3.2) mm, acute, sepal-like. *Flowers* fragrant. *Calyx:* sepals subequal, the outer slightly wider than the inner, narrowly ovate or linear, 4–12 × as long as wide, 9–20(–27) × 1.5–3.5 mm, acute, densely hispid; eglandulose or with 5 colleters in total. *Corolla:* tube (0.8–)1–1.7(–2.2) × as long as the calyx, white and turning yellow on both sides, red-spotted and -streaked inside, 13–24 mm long and widening at 45–66% of its length into a cup-shaped upper part,

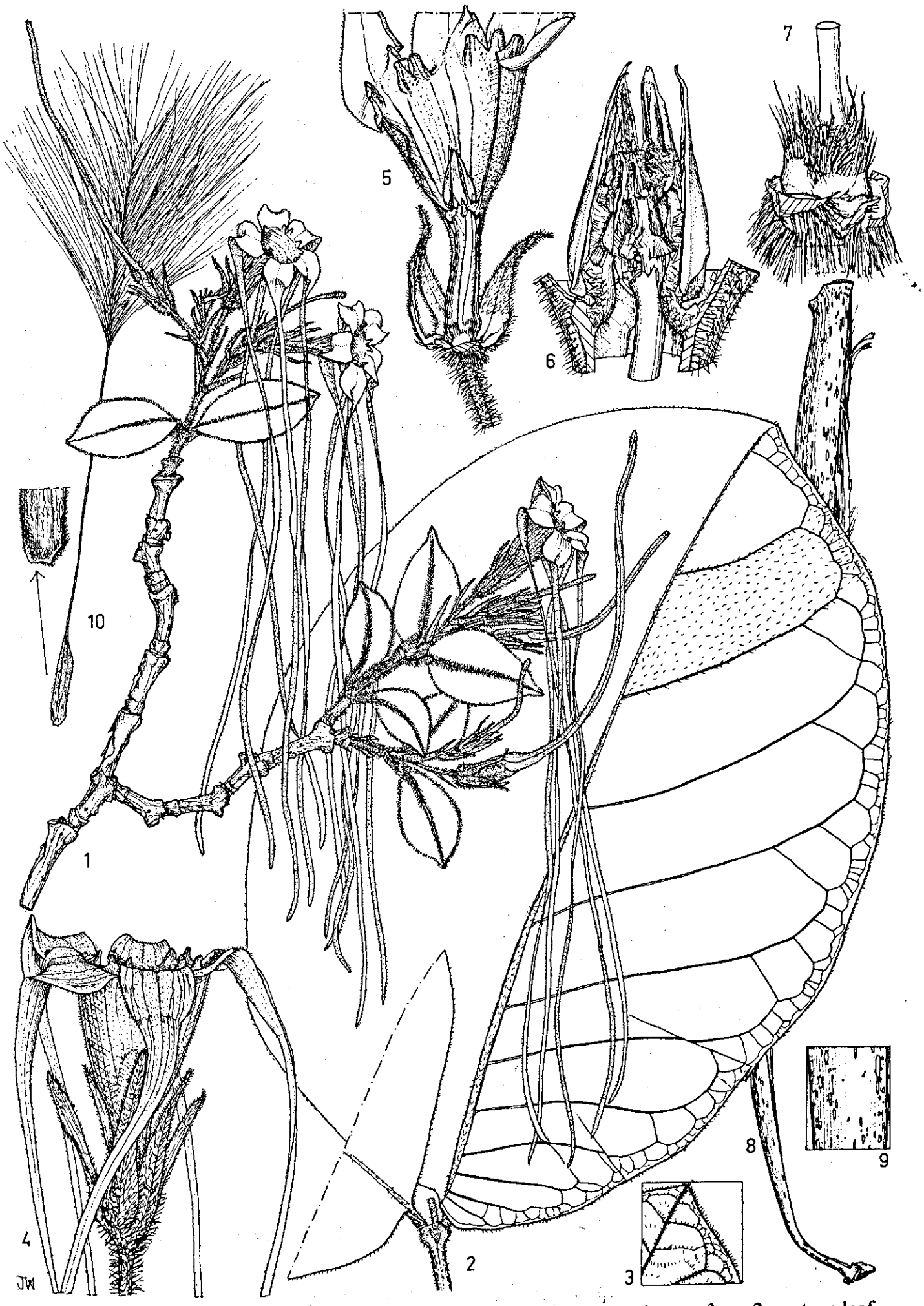
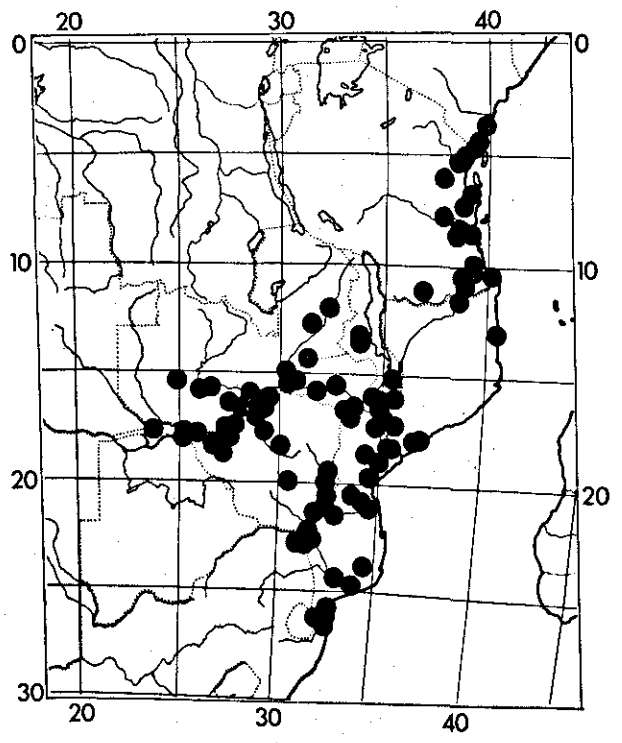


FIG. 24. *Strophanthus kombe* Oliver: 1. flowering branches with young leaves, $\frac{2}{3}\times$; 2. mature leaf, $\frac{2}{3}\times$; 3. detail of lower leaf surface, $\frac{2}{3}\times$; 4. flower, 2 ×; 5. section of flower, 2 ×; 6. stamens $\frac{2}{3}\times$; 3. detail of lower leaf surface, $\frac{2}{3}\times$; 4. flower, 2 ×; 5. section of flower, 2 ×; 6. stamens and apex of gynoecium, 8 ×; 7. ovary, 8 ×; 8. follicle, $\frac{1}{3}\times$; 9. detail of exocarp, $\frac{2}{3}\times$; 10. seed, with detail of grain, $\frac{2}{3}\times$. (1. *Strid 2315*; 2–3. *Pienaar 212*; 4. *Chase 8056*; 5–7. *Davies 2222*; 8–10. *Chase 8056*).

at the mouth (6–)8–14 mm wide, densely hispidulous outside except for the base, sparsely hispidulous inside except for the base; corona lobes yellow- and pink-spotted, the pink turning purple, lingulate, 1–3 × 1–2.4 mm, rounded, fleshy, minutely puberulous or papillose; corolla lobes white and turning yellow, tails yellow; lobes ovate, 3–16 × 4–8.5 mm, gradually or rather abruptly narrowing into the 1 mm wide pendulous tails; lobes including the tails 100–160(–200) mm long, puberulous except for the inner side of the tails. *Stamens* included for 2.7–7.3 mm; filaments inserted at 7–12 mm from the base of the tube, curved, with a small abaxial swelling near the base, 0.6–1.2(–2) mm high, pubescent, with puberulous or pubescent ridges reaching the base of the tube; anthers 3.7–6.2 × 0.6–1.1 mm, glabrous; tails 0.3–0.8 mm long; acumen 0.1–0.5 mm long. *Pistil:* ovary 0.8–1.7 × 1.5–2.3 mm, densely hispid with long erect hairs, sometimes glabrous at the base; style 6.5–13.5 mm long; clavuncula 1–1.8 × 0.9–1.3 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180°, long tapering toward the apex and ending in a small or large knob, rarely without knob and then with an obtuse tip, 15–47 cm long and 1.3–2.6 cm in diameter; exocarp thick and hard, sulcate, densely hispid or pubescent in young fruits and glabrescent when maturing, especially on the adaxial side densely lenticellate. *Seeds:* grain 11–21 × 2.5–4.5 × 1.5 mm, densely pubescent; beak glabrous for 20–57 mm and bearing a coma for 20–42 mm; coma 42–80 mm long. *Seedling* sap clear; primary root swollen; cotyledons elliptic, rounded, glabrous; first leaves elliptic, acuminate, hispid.



MAP 22. *Strophanthus kombe* Oliver

Distribution: East and Southern-Central Africa.

Ecology: mopane woodland, gallery forest or thickets, often on inselbergs; alt. 0–1100 m.

Flowering towards the end of the dry and the beginning of the rainy season; mature fruits in the dry season.

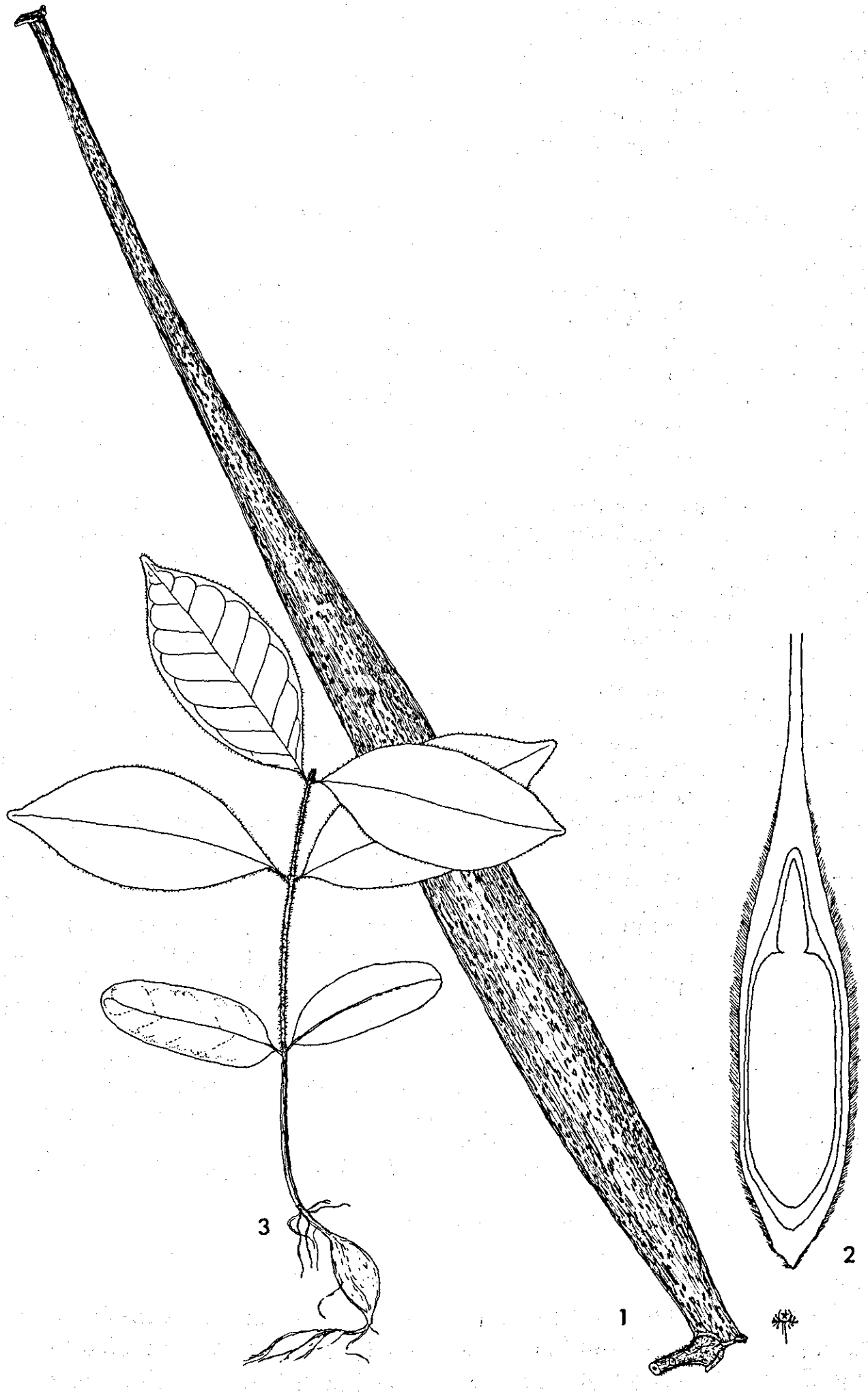


FIG. 25. *Strophanthus kombe* Oliver: 1. fruit, one follicle removed, $\frac{2}{3}\times$; 2. longitudinal section of seed grain showing embryo, 4 ×; 3. seedling, $\frac{2}{3}\times$. (1–2. *Gerstner* 6630; 3. *Monachino 5 Oct. 1951*).

Local names: *Ulembe/Mulembe/Bulembe* (Zambia: widespread and generic name); *kombe* (Malawi, widespread name).

Local uses: the seeds and roots were (or are) used for arrow-poison in the major part of the distribution area. Seeds exported to Europe and the U.S.A. for the extraction of strophanthine.

A selection of the ca. 125 examined specimens:

KENYA: Jumbini, *Swynnerton K51 (EA); Giriama, Sacleux* 2132 (P); Muhaka Forest, *Gillett* 21065 (BR, K).

TANZANIA, T3: Moa Distr., Mtotohovu, *Greenway* 8704 (K, MO, PRE); Makumba Forest to Korogwe, *Peter* 58183 (B); Kijango-Mashewa, *Peter* 13172 (K, WAG); Segoma Forest, *Faulkner* 3912 (B, K); Sindeni Hill, *Brass & Woodward* 20968 (K, NY). T6: Liwale, near Djurumye, *Busse* 563 (BM, G, HBG, K, L); Pande For. Res., *Harris c.s.* 3623 (EA); Maneromanga, *Goetze* 24 (K). T8: Selous Game Res., *Vollesen* MRC 4246 (WAG); Kilwa Distr., Kikande, *Braun* 10 April 1912 (B); Lake Lutama, 40 km W of Lindi, *Schlieben* 5610 (B, BM, BR, G, HBG, L, M, MO, P, PRE, S, Z); Mikindani, *Gillman* H7/42 (K); Lupaso, *Helg* s.n. (NY); Yao Forest, *Bishop Steere* March 1878 (K).

ZAMBIA: 3 km W of Kateti and Luangwa Rs. confluence, Mpika, *Mitchell* 2837 (K); Mpika Distr., near Mfuwe, *Astle* 5121 (K, SRGH); Petauke, *Burroughs Wellcombe & Co* 1 (K); Luangwa Valley near Beit Bridge, *Trapnell* 1859 (BR, K); Bombwe, *Martin* 335 (EA, FHO, K); Gwembe Distr., Chete Gorge, *Bainbridge* 193/55 (FHO, SRGH); Knife Edge near Livingstone, *Rogers* 13060 (BOL).

MALAWI: Chibisa, *Kirk* Jan. 1864 (K); Liwonde Nat. Park, Namitembo thicket, *Dudley* 20 Aug. 1976 (K); Lengwe Nat. Park, *Hall-Martin* 1398 (K, SRGH); Mlanje, Sambani Forest, *Townsend* 243 (FHO).

MOÇAMBIQUE, CABO DELGADO: between Negomano and Chomba, *Gomes e Sousa* 4515 (COI, K, PRE); Porto Amelia, *Gomes e Sousa* 4843 (SRGH). TETE: Cabora Bassa, road Songa-Dam, *Correia c.s.* 3645 (WAG); Boruma, on Mt. Kandulire, *Menyhart* 1068 (US, WU, Z); between Changara and Mungari, *Torre* 6088 (BM, LISC, PRE). ZAMBEZIA: Mt. Morrumbala, *Luja* Nov. 1901 (BR); between Marral and Quelimane, *Torre* 3675 (BM, LISC). MANICA E SOFALA: Jambara, N of Chemba, *Bond* 21 (LISC, SRGH); Caca Nat. Park, Gorongosa, *Torre & Paiva* 9044 (LISC); Mucheve For. Res., *Carvalho* 662 (K). INHAMBANE: 10 km N of Mavume, *Gomes e Sousa* 2168 (K, LISC, PRE); Limpopo R., between Chamusca and Mejinge, *Torre* 7860a (LISC). MAPUTO: Porto Henrique on Zululand border, *Gerstner* 6630 (BOL, PRE).

ZIMBABWE: Urungwe Distr., near confluence of Sanyati and Chiroti Rs., *Phipps* 789 (B, K, PRE, SRGH); Sebungwe Distr., Kariyangwe, *Lovemore* 492 (BR, K, PRE, SRGH); 3 km W of Lukozi R. bridge in Bulawayo-Victoria Falls road, *Raymond* 191 (B, BR, E, K, PRE, SRGH); Copper Queen Purchase Land, *Bingham* 828 (SRGH); Fort Victoria, Iokwe Gorge, at Dam site, *West* 6939 (B, SRGH); Melsetter Distr., near Odzi R., Hot Springs, *Chase* 1480 (BM, BR, COI, LISC, NY, SRGH); Ndanga Distr., Chipinda Pools, *McGregor* 82/51 (FHO, MO, NY, PRE, SRGH).

NAMIBIA: Caprivi Strip, Singalamwe, Sibinda, *Pienaar & Vahrmeyer* 212 (K, PRE).

BOTSWANA: Kazungula, confluence of Chobe and Zambesi Rs., *Holub* 3225 (W, Z); Chobe Distr., 13 km W of Serondela, *Miller* B 1123 (PRE).

S. AFRICA: Kruger Nat. Park, Punda Maria, *Codd* 5970 (K, PRE); ibid., Dzunwini Hill, *Codd* 5338 (K).

Cultivated: U.S.A., New York: *Monachino* 5 Oct. 1951 (NY).

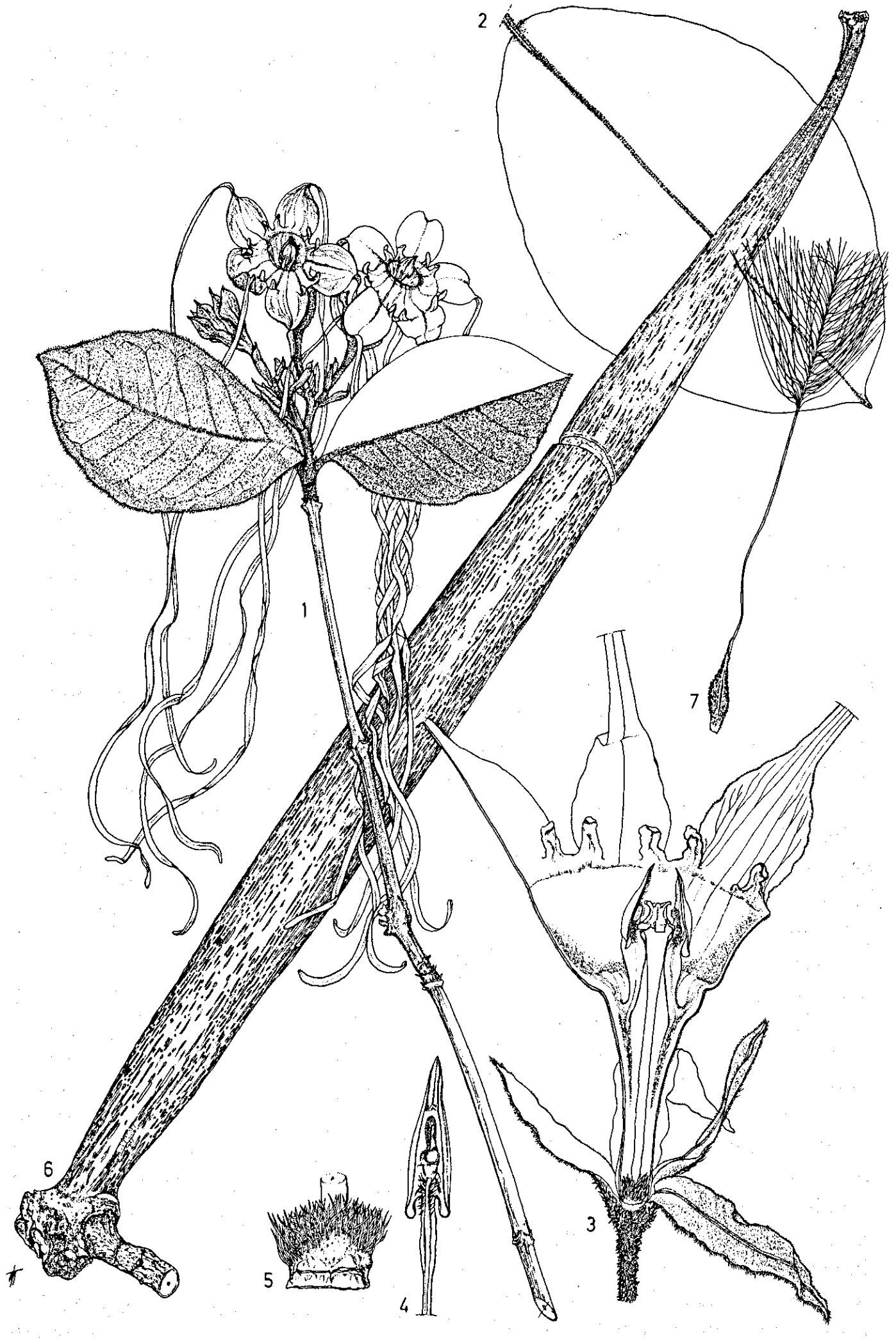
Notes: *S. kombe* is closely allied to *S. hispidus,* and collections of densely hispid *Strophanthus* from East Africa were for some time considered to be normal *S. hispidus*. The two species can be distinguished by the key given under *S. hispidus*.

20. S. ledienii Stein 1887: 145, pl. 1241; Pax 1892: 368; Franchet 1893b: 270; Stapf 1902: 171; Gilg 1903: 34.

Type: Zaïre, Bas-Zaïre: Vivi on Zaïre R. bank, *Ledien* Sept. 1885 (holotype, destroyed at B); Neotype: Zaïre, Bas-Zaïre; 1 km N of ferry crossing in the Matadi-Boma Road, *Hess* 1 Nov. 1950 (Z, neotype). **Fig. 26; Map 23**

Homotypic synonym: *S. kombe* var. *ledienii* (Stein) Staner & Michotte 1934: 34, syn. nov.

Sarmentose *shrub* or *liana*, 3–4 m high, deciduous, flowers appearing before or with the leaves; latex white. *Branches* dark purplish-brown, sparsely lenticellate; branchlets light reddish-brown, densely pubescent or tomentose. *Leaves:* petiole 0.5–4 mm, with 2 outer and 8–10 inner axillary colleters; blade dark green above, pale yellow beneath, ovate or obovate, 1–2.3 × as long as wide, 2–16 × 1–9 cm, rounded or subcordate at the base, obtuse or acuminate at the apex (acumen 0.5–6 mm long), papyraceous or thinly coriaceous, pubescent above and tomentose beneath; 7–12 pairs of straight or slightly curved secondary veins at an angle of 45° with the midrib; tertiary venation inconspicuous, or rarely conspicuous. *Inflorescence* on long or short branches or in the forks, 1–20-flowered (1–3 flowers open at a time), sessile or pedunculate, congested, densely pubescent in all parts; peduncle – if present – 1–7 mm long; branches 2–35 mm long; pedicels 3–15 mm long; bracts elliptic or obovate, 5–16 × 1.5–4.5 mm, acute, sepal-like. *Calyx:* sepals unequal, the outer ones ovate and 1.3–3.2 × as long as wide, the inner narrowly elliptic and 6–10 × as long as wide, 9–19(–24) × 1.7–9 mm, acute, densely pubescent; with 0–2 colleters per sepal. *Corolla:* tube 1.1–1.8 × as long as the calyx, pink-suffused white and turning yellow outside, yellow inside, 19–25 mm long and widening at 60–65% of its length into a cup-shaped upper part, at the mouth 9.5–17 mm wide, densely pubescent outside, glabrous inside except for some hairs near the mouth; corona lobes dark pink or purple, lingulate, 2–3.2(–4.7) × 1.5–2.1 mm, obtuse, fleshy, glabrous; corolla lobes pink-suffused white and turning yellow on both sides; lobes ovate, 7.5–14 × 5–10 mm, abruptly narrowing into the 2–2.5 mm wide pendulous tails; lobes including the tails 110–150(–200) mm long, pubescent outside, glabrous inside. *Stamens* 0–2 mm exserted; filaments inserted at 13–14 mm from the base of the tube, straight, with an abaxial swelling, 4.8–5 mm long, glabrous except for the apex inside, which is pubescent, with 6–7 mm long puberulous ridges; anthers 5–6 × 1.6–2 mm, glabrous, or rarely with some pubescence near the apex; tails 0.3–0.9 mm long; acumen 0.4–1 mm long. *Pistil:* ovary 1–1.3 × 1.3–1.8 mm, densely hispid with long erect hairs; style 17–18.5 mm long; clavuncula 2 × 1.9–2.4 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180–200°, long-tapering towards the apex and ending in a minute, inwards-curved knob, 22–38 cm long and 2 cm in diameter; exocarp medium, dark, or purplish-brown, thick and hard, sulcate, with sparse glabrous protuberances, pubescent in young fruits and glabrescent in older fruits, densely lenticellate; lenticels elongate. *Seeds:* grain 10–17 × 3–3.5 mm, densely long-pubes-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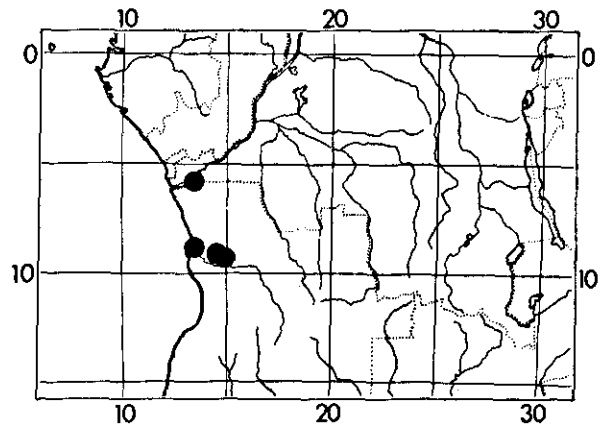
cent; beak glabrous for 30–47 mm and bearing a coma for 25–30 mm; coma 35–55 mm long.



MAP 23. *Strophanthus ledienii* Stein

Distribution: Western Zaïre and northern Angola.
Ecology: gallery or riverine forest.

Specimens examined:

ZAÏRE, BAS-ZAÏRE: 1 km N of Matadi-Boma ferry, *Brass & Woodward* 20929 (K, NY); ibid., *Hess* 1 Nov. 1950 (Z, type); ibid., *Hess & Speiser* 2 Nov. 1950 (ZT); Léopold Ravine near Matadi, *Dacremont* 296 (B, BR, K, MO, NY, S).

ANGOLA, LUANDA: Viana, Bengo R. Valley, *Brito Teixeira* 10236 (LISC). CUANZA NORTE: R. Zenza Cataracts near Castende, *Gossweiler* 8414 (BM, K); Cazengo, N'Dalatando, Granja St. Luiz, *Gossweiler* 5946 (BM, LISU, LISJC); ibid., Muembeje R. near Chibera Rock, *da Silva* 2459 (LISC).

Notes: The plate with the original description is incorrect as for the insertion of the leaves, the branching of the inflorescence, and the shape of the calyx.

The roots of cultivated plants grown from seed of the holotype, were thick, fleshy, and moniliform, with many small tuberous growths on the secondary roots (teste STEIN).

S. ledienii is closely allied to *S. eminii* and *S. holosericeus,* and quite distinct from *S. kombe,* of which it formerly was a variety.

FIG. 26. *Strophanthus ledienii* Stein: 1. flowering branch, $\frac{2}{3}\times$; 2. leaf, $\frac{2}{3}\times$; 3. section of flower, 2 ×; 4. adaxial side of stamen, 4 ×; 5. ovary, 6 ×; 6. fruit, one follicle removed and a section removed from the other, $\frac{2}{3}\times$; 7. seed, $\frac{2}{3}\times$. (1. *Hess & Speiser 2 Nov. 1950*; 2. *Brito Teixeira 10236*; 3–5. *Gossweiler 5946*; 6–7. *Brass & Woodward 20929*).

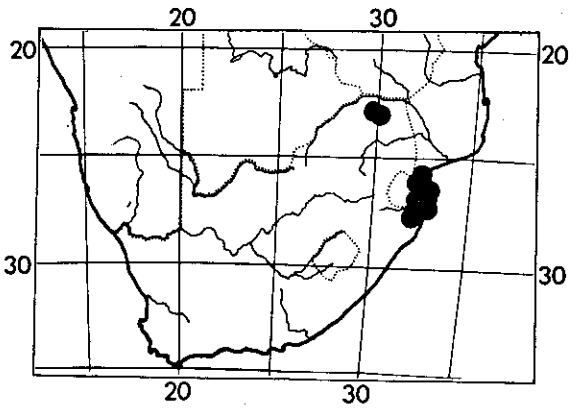
FIG. 27. *Strophanthus luteolus* Codd: 1. flowering branches, $\frac{2}{3}\times$; 2. section of flower, 2 ×; 3. abaxial side of stamen, 6 ×; 4. fruit, one follicle removed, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$. (1. *Ward 3502*; 2–3. *Tinley 499*; 4–5. *Stephen 750*).

21. S. luteolus Codd 1961: 454; 1963: 291; 1969: pl. 1561.

Fig. 27; Map 24

Type: S. Africa, Transvaal, Soutpansberg at Wyllie's Poort, *Hardy & Wells* 359 (PRE, holotype; isotypes BM, K, M, NY, PRE, S).

Liana, 2–6 m high; deciduous, flowers and leaves appearing at the same time; latex white or yellow. Roots semi-tuberous, main root up to 1.25 cm in diameter. *Trunk* up to 1.25 cm in diameter; branches reddish-brown, sparsely to rather densely lenticellate; branchlets puberulous. *Leaves:* petiole 1–5 mm long, with 2 outer and 2–4 inner axillary colleters; blade elliptic, obovate, or rarely ovate, 1.4–3(–4.6) × as long as wide, 2.5–6.5 × 1.1–3.1 cm, cuneate at the base, rounded, mucronate, acute, or acuminate at the apex (acumen 1–3(–7) mm long), slightly undulate at the margin, membranaceous or papyraceous, glabrous or sparsely to densely puberulous; 4–6(–8) pairs of slightly curved secondary veins at an angle of 35–60° with the midrib; tertiary venation conspicuous beneath. *Inflorescence* on long or short branches or in the forks, 1(–6)-flowered, sessile or pedunculate, rather congested if branched, puberulous in all parts; peduncle – if present – 1–6(–19) mm long, lenticellate; branches – if present – 1–22(–30) mm long; pedicels 3–13 mm long; bracts elliptic or narrowly obovate, 4–14 × 1–3 mm, acute or rarely obtuse, sparsely puberulous, sepal-like. *Calyx:* sepals subequal, the outer ones longer and wider than the inner, elliptic or narrowly ovate, 4–10 × as long as wide, 5–14.8 × 1–4 mm, acute, puberulous; eglandulose. *Corolla:* tube 1–2(–2.5) × as long as the calyx, yellow and pink-streaked outside, white and turning pink inside, 10–18 mm long and widening at 50–66% of its length into a cup-shaped upper part, at the mouth 6–12 mm wide, puberulous on both sides except for the base inside; corona lobes dark pink or purple, lingulate or subulate, 1.5–3.5 × 1–2 mm, obtuse at the tip, fleshy, minutely papillose or minutely puberulous; corolla lobes white and turning yellow on both sides, pink- or purple-streaked and -spotted inside; lobes ovate, 4–8 × 2.8–5.5 mm, abruptly narrowing into the 1 mm wide pendulous tails; lobes including the tails 36–86 mm long, puberulous on both sides except for the apex. *Stamens* included for 0.5–2 mm; filaments inserted at 7.8–10 mm from the base of the tube, curved, 0.9–1.1 mm high, puberulous or pubescent, with at least 2.2 mm long ridges which may reach the base; anthers 3.3–4.5 × 1–1.3 mm, glabrous, except for a small pubescent patch around the filament; tails 0.4–0.7 mm long; acumen 0.2–0.3 mm long. *Pistil:* ovary 0.7–1.8 × 1.1–2.4 mm, pubescent in the upper part or all over with erect hairs; style 7–9.6 mm long; clavuncula 0.9–1.1 × 0.8 × 1.2 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180–200°, long-tapering towards the apex and ending in a small knob, 16–29 cm long and 1–1.5 cm in diameter; exocarp brown, rather thick and hard, slightly sulcate, densely pubescent in young fruits and glabrescent in older fruits, densely lenticellate. *Seeds:* grain 12–17 × 2–3 mm, densely short-pubescent; beak glabrous for 28–45 mm and bearing a coma for 30–45 mm; coma 58–80 mm long.



MAP 24. *Strophanthus luteolus* Codd

Distribution: southern Moçambique, North-East S. Africa.

Ecology: low coastal forest on sand-dunes; alt. 30–100 m. 3 times collected on the densely wooded slopes of the Soutpansberg, alt. 1400–1600 m.

Flowering towards the end of the dry and the beginning of the rainy season; mature fruits probably in the dry season.

Specimens examined:

MOÇAMBIQUE, MAPUTO: 32 km W of Maputo, *Leach* Aug 1964 (PRE); 3 km S of Bela Vista, turnoff on Catuane Road, *Leach & Bayliss* 11949 (K, SRGH, Z); km 5, Porto Henrique-Bela Vista Road, *P. Jansen et al.* 4/1981 (WAG); km 25, Boane-Porte Henrique Road, *de Carvalho* 659 (K); sin. loc., *Maputoland Expedition* 77 (LISC, PRE).

S. AFRICA, TRANSVAAL: Soutpansberg, Great Saltpan, *Hardy* 350 (PRE); Soutpansberg, Wyllie's Poort, *Hardy & Wells* 359 (BM, K, M, NY, PRE, S; type); ibid., *Hardy* 399 (B, BR, FHO, K, M, NY, PRE). NATAL: Bela Vista, Ndumu, *Strey & Moll* 3759 (NH, PRE); Ndumu Game Res., *Oatley* 56 (PRE); ibid., *Tinley* 499 (K, PRE); 3 km S of Ndumu Police Stn., *Stephen* 708 (PRE), 750 (PRE), 755 (PRE); Ndumu Game Res., near Pongoal R., *Ross* 1951 (K, NH, PRE); km 26, Ndumu-Ingwavuma Road, *Moll* 4355 (NH); Ubombo, 20 km E of Jozini-Maputa, *Moll* 5649 (PRE); Bella Vista, Makane, *Strey* 10270 (NH, PRE); 5 km W of Shongwe on Ubombo Road, *Ward* 3502 (K, NH, NY, PRE); km 27, Jozini-Mbazwane Road, *Vahrmeyer* 1025 (PRE); Ubombo Distr., Mkuzi Game Res., *Ward* 3574 (K, PRE); uncertain localities: Hluzi-Maputa, *Bell-Masley* Dec. 1945 (NH); N Zululand, Ulukondo, Nelumu Hill, *Pooley* 27 (E, NH).

Notes: the illustration in CODD (1969) is insofar incorrect, that the acumen of the anther is figured as being pubescent, while in fact it is glabrous.

The fruit of *Jansen et al.* 4/1981 has follicles that are syncarpous at their apex; this is the only fruit of all fruits observed in this genus showing this peculiarity.

22. S. mirabilis Gilg 1902a: 32; Stapf 1902: 186; Gilg 1903: 27, pl. 6.

Fig. 28; Map 25

Type: Kenya, K1: Gave Libin near Wonte, *Ellenbeck* 2205 (holotype destroyed in B; lectotype: K).

Shrub, 1–3 m high, densely branched, occasionally with lianescent branches up to 4.50 m high, deciduous, flowers appearing before or with the leaves; latex amber. *Branches* dark brown or dark grey-brown, sparsely or rather densely lenticellate; branchlets densely puberulous. *Leaves* subsessile or with a petiole up to 2(–3) mm long, with 2 outer and 0–2(–5) inner axillary colleters; blade

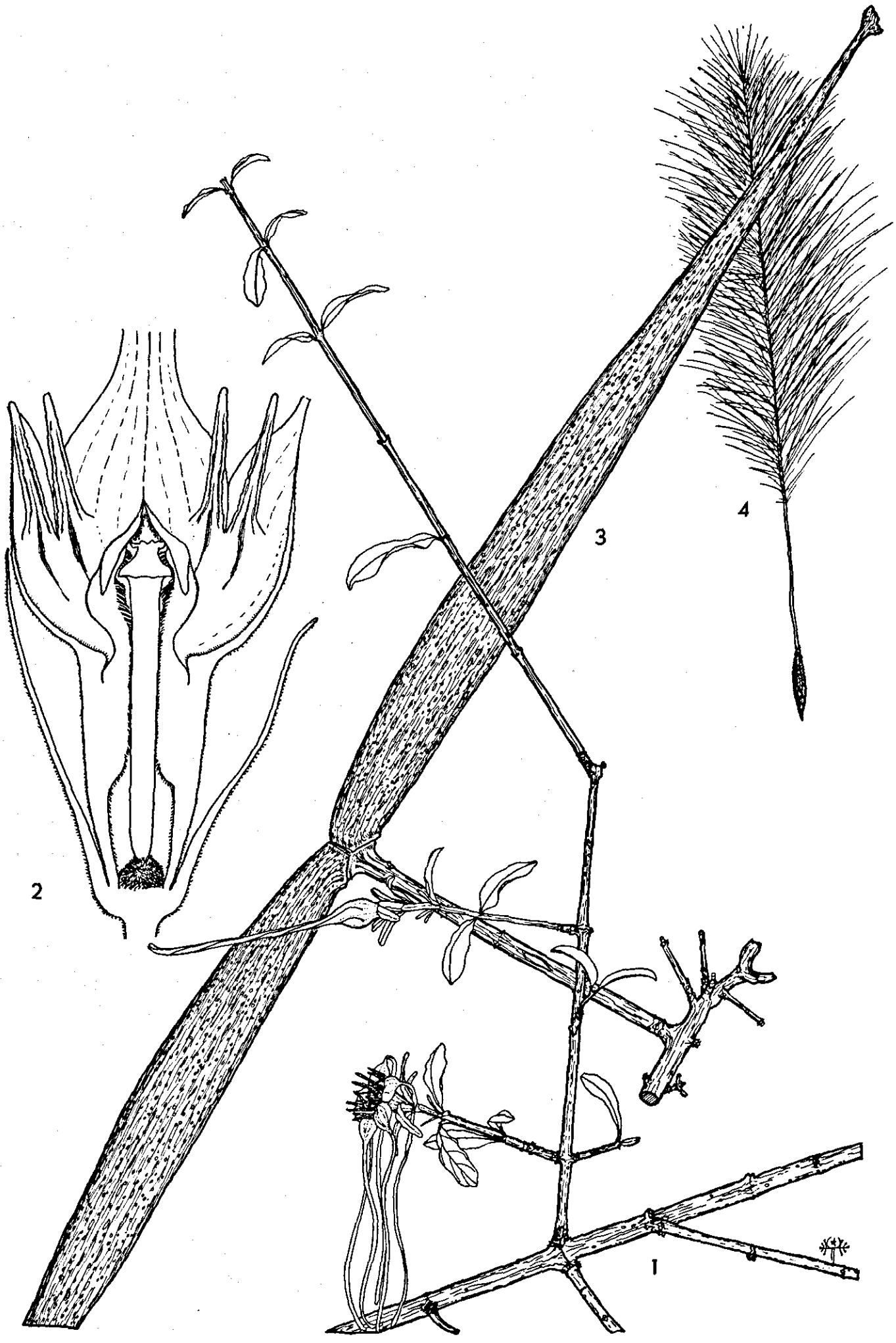
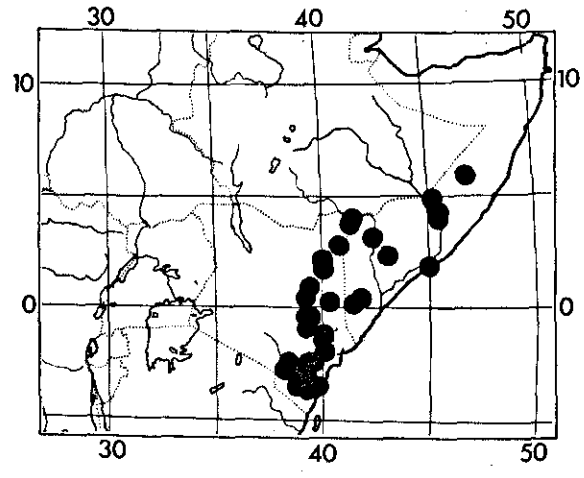


FIG. 28. *Strophanthus mirabilis* Gilg: 1. flowering branches, $\frac{2}{3}\times$; 2. section of flower, 4 ×; 3. fruit, $\frac{2}{3}$; 4. seed, $\frac{2}{3}\times$. (1. *Gillett 13322*; 2. *Greenway & Kanuri 12871*; 3. *Bally 16666*; 4. *Greenway & Kanuri 12871*).

dark or yellow-green above, paler beneath, narrowly elliptic, 2–6 × as long as wide, 0.8–3.6 × 0.3–1(–1.4) cm, cuneate at the base or decurrent into the petiole, rounded or obtuse at the apex, undulate and often slightly recurved at the margin, thinly coriaceous, nearly glabrous or hispidulous on the midrib and margins; secondary veins inconspicuous, in 3–5 pairs at an angle of 45° with the midrib and slightly curved; tertiary venation not visible. *Inflorescence* on long or short branches or on short-shoots, 1(–3)-flowered, densely puberulous in all parts; pedicels 1.5–7.5 mm long; bracts narrowly ovate or linear, 2–6(–9) × 1–1.2 mm, mucronate, sepal-like. *Calyx:* sepals erect or spreading, subequal, the outer slightly shorter and wider than the inner, greenish-purple or brown-red, elliptic or narrowly obovate, 4–6 × as long as wide, 6–15 × 1–3 mm, mucronate, minutely puberulous or hirtellous, ciliate with larger hairs; eglandulose. *Corolla*: tube 0.6–1.2 × as long as the calyx, white and suffused with pink, turning yellow on both sides, 6.5–13 mm long and widening at 54–80% of its length into a cup-shaped upper part, at the mouth 6–11 mm wide, hirtellous or puberulous on both sides; corona lobes spreading, yellow and red- or chocolate-brown-streaked, subulate, 2.5–6.5 × 0.5 mm, obtuse or apiculate at the tip, fleshy, minutely papillose or minutely puberulous; corolla lobes white and turning pale yellow on both sides, tails orange and turning red outside, yellow and turning orange inside; lobes ovate, 4–8 × 3–5.5 mm, narrowing into the 1–2.5 mm wide pendulous tails; lobes including the tails 42–85 mm long, glabrous, hirtellous, or minutely puberulous and ciliate. *Stamens* 1–3.5 mm exserted; filaments inserted at 4–6 mm from the base of the tube, slightly curved, with an abaxial swelling, 2–3.8 mm long, glabrous or puberulous, with 2.8–4(–6) mm long puberulous ridges; anthers 3–4 × 1–1.5 mm, glabrous; tails 0.3–0.7 mm long; acumen 0.1–0.3 mm long. *Pistil:* ovary 0.6–1.2 × 0.9–1.5 mm, densely long-pubescent; style 5.8–9 mm long; clavuncula 1.1–1.6 × 0.9–1.5 mm; stigma minute. *Fruit:* follicles divergent at an angle of 165–210°, long-tapering towards the apex and ending in a small or minute knob, 16.5–32 cm long and 1–1.8 cm in diameter; exocarp brown, red-brown, or purplish-brown, rather thick and hard, sulcate, glabrous, (very) densely lenticellate. *Seeds:* grain 9.5–21 × 2–2.5 × 1.2–1.8 mm, densely pubescent; beak glabrous for 18–35 mm and bearing a coma for 42–120 mm long; coma 50–140 mm long.



MAP 25. *Strophanthus mirabilis* Gilg

Distribution: Kenya and Somalia.

Ecology: *Acacia-Commiphora* steppe; alt. 0–600 m.
Flowers and mature fruits have been found throughout the year.
Local names: *Goyo gasha/Goior Gusho* (Somali).

Specimens examined:

SOMALIA: 48 km S of Ghelinsov, *Hemming* 1430 (EA); 6 km E of Belet Uen Fer along road to Motabass Galkayn, *Bally* B 9561 (G, K); km 10, Bulo Burti-Ceel Buur Road, *Elmi & Hansen* 4021 (WAG); 10 km N of Bulo Burti, *Roffey* JR 60041/7 (EA); Juba R. right bank, Jubaland, *Paoli* 493 (FI); between Dorianle and Oneiatta, *Paoli* 898 (FI); between Goriei and el Magu, *Paoli* 627 (FI); Merka, *Brichetti* 316 or 66 (FI); Belesc Cogani, *Hemming* 410 (FI, K); Baddana, *Senni* 267 (FI).

KENYA, K 1: Gave Libin near Wonte, *Ellenbeck* 2205 (K; type); Sala area, *Hucks* 939 (EA); 80 km SW of Mandera on El Wak Road, *Gillett* 13322 (B, BR, FI, G, K, LISC, P, PRE, S, W, Z); 19 km S of El Wak on Wajir Road, *Gilbert & Thulin* 1642 (UPS, WAG); 40 km N of Wajir on Tarbaj Road, *Gillett* 19742 (EA); Wajir, *Kirrika* 65 (K); ibid., *Hemming* 466 (FI, K); 56 km N of Habaswein, *Bally* B 9063 (G); 22 km S of Mado Gashi on Garissa road, *Gillett & Newbould* 19195 (BR, K); Dadaab Police Post, *Gillett* 21235 (EA); 23 km W of Garissa, *Bally & Smith* B 14985 (C, K, WAG). K 7: Garissa, *Hemming* 1313 (PRE); 48 km S of Garissa, *Bally* 2027 (K); 20 km S of Garsen on Ngao road, *Adams* 89 (BR, K); 40 km S of Garsen on Malindi road, *Greenway* 9496 (FI, K, PRE); 80 km E of Bura, *Oxtoby* 15390 (EA); 8 km S of Bura on Garissa-Garsen road, *Faden & Faden* 74/1018 (MO, PRE, UPS, WAG); Hola, *Ritchie* 1422 (K); ibid., *Robertson* 1765 (K, MO); 13 km N of Galole, *Gillett* 16388 (FI, K, WAG): Galole, *Makin* EA 14521 (EA); Galana Ranch, *Bally* 16666 (EA); ibid., *Masheti & Mumiukha* 23 (EA); Dakadima Hill, *Bally* 16969 (EA, K); ibid., *Parker* GM 333/S (K), 334/S (EA); Lali Hills, *Adamson* 15 (EA); ibid., *King* 16 (EA); ibid., *Williams* s.n. (BR, K, PRE); Tsavo Nat. Park East, *Greenway* 9825 (FI, K, PRE); ibid., 2 km on Galana Ranch-Voi Road, *Agnew* c.s. 7348 (EA); ibid., *Schenkel* 79 (EA); 13 km E of Sala Hill, *Lavranos* 12448 (PRE); km 48, Voi Gate-Lugard Falls Road, *Greenway & Kanuri* 12871 (FI, K, PRE); Buchuma Road, *Hucks* 827 (EA); Muanga, *Parsons* 11 (EA); MacKinnon Road, *Archer* 592 (EA); ibid., *Graham* 1579 (K, FHO); ibid., *Greenway* 10433 (FI, K, PRE); ibid., *Venour* Sept. 1950 (EA), Oct. 1950 (K, NY), 21 Nov. 1950 (EA), 10 Feb. 1951 (EA); Voi Distr., Bachuma Range Res. Stn., *Ivens* 2314 (EA); unknown locality: Lebugombisso, *Adamson* 113 (EA, K).

Notes: the branching of *S. mirabilis* as well as the short-shoots seem characteristic for this species.

23. S. mortehanii De Wild. 1915: 102; 1920: 23; Staner & Michotte 1934: 36 (as *mortehani*). **Fig. 29; Map 26**

Type: Zaïre, Equateur: Dundusana, *Mortehan* 719 (BR, lectotype; isotypes: BR, NY).

Liana, 4–20 m long, presumably evergreen; latex clear or white. *Trunk* up to 10 cm in diameter; branches dark brown, sparsely lenticellate, branchlets densely tomentose. *Leaves:* petiole 2–8 mm long, with 2 outer and 3–9 inner axillary colleters; blade dark green above, whitish or rarely green beneath, ovate, elliptic, or rarely obovate, 1.2–3.6 × as long as wide, 4–16 × 2–7.5 cm, cuneate, rounded, or subcordate at the base; rounded or acuminate at the apex (acumen up to 15 mm long), slightly undulate at the margin, papyraceous, sparsely pubescent above, tomentose or rarely densely pubescent beneath; 7–11 pairs of slightly curved secondary veins at an angle of 45–60° with the midrib; tertiary venation conspicuous above. *Inflorescence* on short branches or in the forks, 1–16-flow-

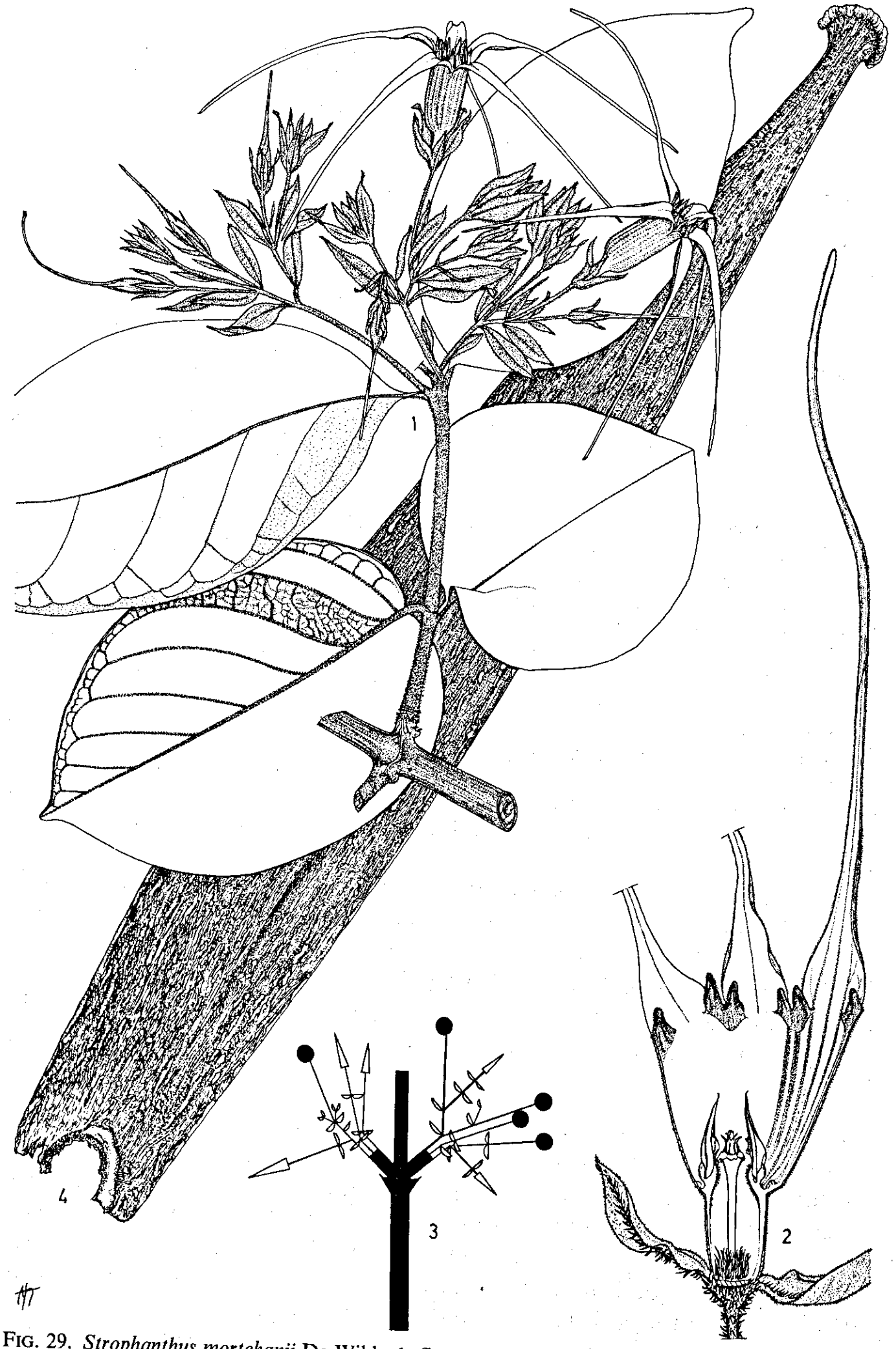
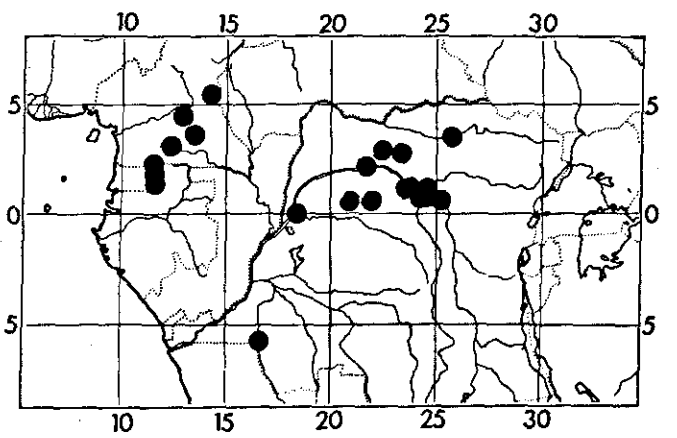


FIG. 29. *Strophanthus mortehanii* De Wild.: 1. flowering branch, $\frac{2}{3}\times$; 2. section of flower, 2 ×; 3. inflorescences, schematic; 4. open follicle, $\frac{2}{3}\times$. (1. *Breteler 2068*; 2–3. *Gerard 5403*; 4. *Krukoff 235*).

ered (1–7 flowers open at a time), sessile or pedunculate, rather congested, densely pubescent or tomentose in all parts; peduncle – if present – up to 10(–40) mm long; branches 2–25 mm long; pedicels 3–18 mm long; bracts deciduous, ovate or narrowly elliptic, 5–19 × 1–6.5 mm, acute, tomentose, sepal-like. *Calyx:* sepals subequal, the outer longer and wider than the inner, green and with a purple base, ovate or narrowly ovate, 2.5–9 × as long as wide, 8–18 × 1–7 mm, acute, tomentose; eglandulose or with 2 minute colleters per sepal. *Corolla:* tube 1–2.2 × as long as the calyx, reddish-purple outside, creamy and purple-streaked inside, 12–21 mm long and widening at 26–36% of its length into a cylindrical upper part, at the mouth 6–11.5 mm wide, puberulous on both sides except for the base; corona lobes presumably red or purple, subulate, 2–4 × 1.2–1.9 mm, obtuse at the tip, fleshy, minutely papillose; corolla lobes purple-red outside, white inside, tails yellow; lobes ovate, 5–10 × 3–4.5 mm, gradually narrowing into the 0.5–1 mm wide spreading or pendulous tails; lobes including the tails 32–100 mm long, puberulous on both sides except for the apex. *Stamens* included for 3.8–6.5 mm; filaments inserted at 5–6 mm from the base of the tube, curved, 0.8–1.6 mm high, pubescent inside, with 1.8–3.2 mm long ridges; anthers 5–6.5 × 1–1.3 mm, glabrous; tails 0.5–0.8 mm long; acumen 0.1–0.3 mm long. *Pistil:* ovary 1–2 × 1.3–2.2 mm, densely hispid with long erect hairs; style 5–7 mm long; clavuncula 1.3–2.4 mm high; stigma 0.3–0.8 mm long. *Fruit:* divergence of follicles unknown, follicles tapering towards the apex and ending in a large knob, 24.5–29 cm long; exocarp dark brown or purple-brown, rather thick and hard, sulcate, glabrous, densely lenticellate; lenticels more or less elongate. *Seeds:* grain 11 × 3 mm, densely pubescent; other parts unknown.



MAP 26. *Strophanthus mortehanii* De Wild.

Distribution: Cameroun to Zaïre.

Ecology: swamp forest and river banks; alt. 450–700 m.

Flowering specimens were collected in Zaïre in most months except for the period July-September.

Specimens examined:

CAMEROUN: 40 km SSE of Bétaré Oya, *Satabie* 541 (WAG); 3 km N of Nguélémendouka, *Breteler* 2068 (BR, K,LISC, M, P, WAG, YA); km 54, Abong Mbang-Lomié Road, *Lowe* 3138 (K, YA); Bityé, *Bates* 1230 (BM), 1750 (K, P).

EQUATORIAL GUINEA, RIO MUNI: sin. loc., *Tessmann* 852 (K).

GABON: Woleu Ntem, Medoumou, *Le Testu* 9098 (BM, LISC, P); Ehong, 27 km NNW of Bitam,

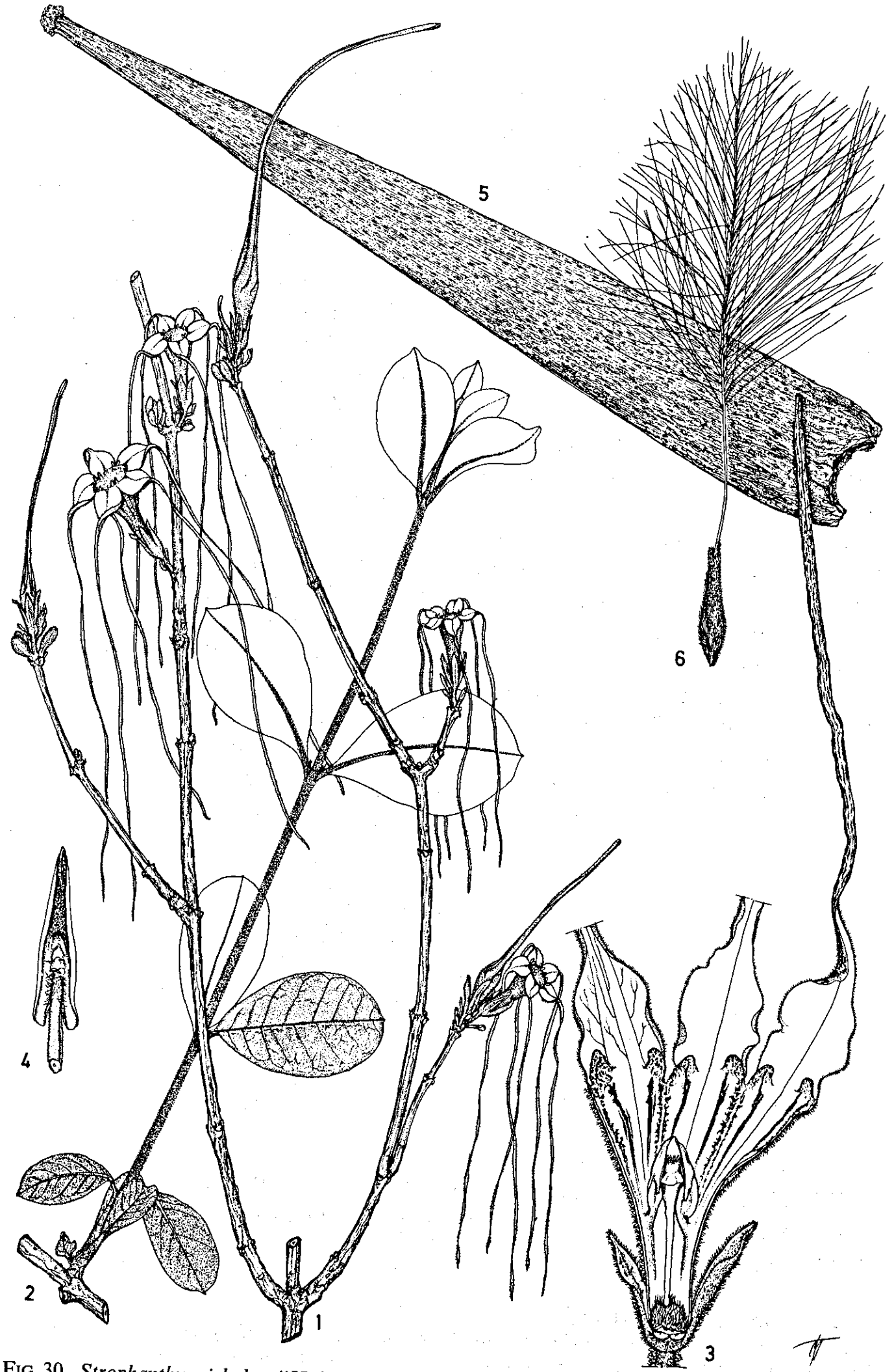


FIG. 30. *Strophanthus nicholsonii* Holmes: 1. flowering branches, $\frac{2}{3}\times$; 2. leafy branch, $\frac{2}{3}\times$; 3. section of flower, 2 ×; 4. adaxial side of stamen, 6 ×; 5. open follicle, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1. *van Rensburg* 2533; 2. *Mitchell 25/86*; 3–4. *Pawek 7406*; 5. *Wild 4266a*; 6. *Pawek 7406*).

Brass & Woodward 20901 (NY); Acam, *Le Testu* 9422 (BM); Oyem, *Le Testu* 9078 (BM, P).

ZAÏRE, EQUATEUR: km 7, Yandonge-Dundusana Road, *Katz & Speiser* P19 (NY); Dundusana, *Mortehan* 719 (BR, NY; type); km 20, Lisala-Madjamboli Road, *Katz* P16 (K); Eala, *Staner* 1495 (A, BR, K, P); Befale, *Evrard* 3650 (BR, K); Nkembé, Hulstaert 1193 (BR). HAUTE ZAÏRE: Bambesa, *Gerard* 5403 (BR); Mobwasa, *de Giorgi* 851 (BR; paratype); confluence of Ekekeli and Basoko Rs., *Evrard* 3507 (BR, K); W of Basoko, Longa R. basin, *Germain* 4751 (BR, M); Ngazi, Lotembo R. bank, *Louis* 7611 (BR, K); Yangolo, 20 km W of Yangambi, *Louis* 11956 (BR), 13599 (BR, K); Isangi Terr., Lilanda, *Toussaint* 843 (BR, K), 844 (BR, K, M), 845 (BR, K); ibid., *Brass & Woodward* 20950 (NY); Lake Yandya, *Germain* 7226 (BR, P); Yakusu, *Louis* 8521 (BR, K); 20 km N of Kisangani, *Bokdam & de Wit* 3317 (WAG). BANDUNDU: Goa, *Vanderijst* 19117 (BR).

Sin. loc.: *Krukoff* 232 (NY), 234 (NY), 235 (NY).

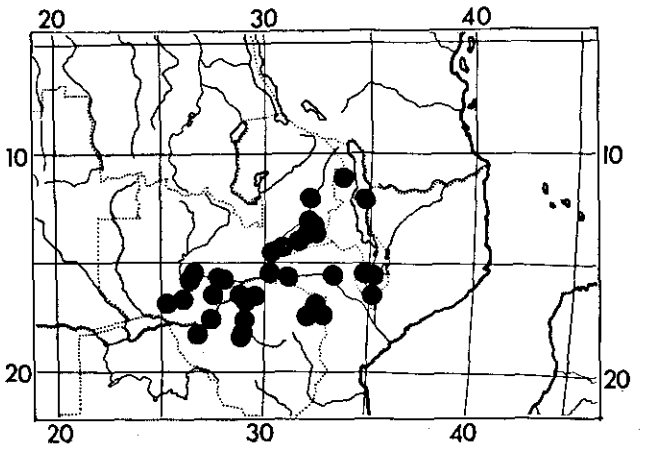
24. S. nicholsonii Holmes 1897: 209; Stapf 1902: 172; Gilg 1903: 39, pl. 1; White 1962: 352.

Fig. 30; Map 27

Type: Zambia, between Lusengasia and upper Luangwa Rs., *Nicholson* s.n. (PHA, holotype, not seen; isotypes: P, PRE).

Shrub, 0.50–2.50 m high, densely branched, sometimes lianescent and up to 6 m high, deciduous; flowers appearing before or with the leaves; latex clear or orange. *Branches* grey-brown or dark purplish-brown, sparsely lenticellate; branchlets light brown, densely puberulous. *Leaves:* petiole 1–2(–3) mm long, with 2 outer and 4–10 inner axillary colleters; blade medium to dark green above, pale yellowish-green beneath, obovate, rarely almost orbicular, 1.2–2.5 × as long as wide, 2.5–5.7 × 1.3–3.7 cm, rounded or cuneate at the base, rounded or acute at the apex, slightly undulate at the margin, papyraceous, densely puberulous above, shortly tomentose beneath; 4–9 pairs of straight secondary veins at an angle of 40–60° with the midrib; tertiary venation inconspicuous. *Inflorescence* on short branches or in the forks, 1–5(–10)-flowered (1–2(–5) flowers open at a time), sessile or pedunculate, densely puberulous in all parts; peduncle – if present – up to 6 mm long; branches 1–10 mm long; pedicels 2–7 mm long; bracts reddish-brown, narrowly elliptic or obovate, 2–5 × 1–2 mm, acute, sepal-like. *Flowers* fragrant. *Calyx:* sepals subequal, the outer shorter and wider than the inner, reddish- or pinkish-brown, linear or narrowly ovate, 2–7.5 × as long as wide, 4.5–12 × 1.3–3 mm, acute, densely puberulous; eglandulose. *Corolla:* tube 1.2–3 × as long as the calyx, white and turning reddish outside, white and red-spotted inside, 10–19 mm long and widening at 55–73% of its length into an infundibuliform upper part, at the mouth 5–14 mm wide, puberulous outside and puberulous or glabrous inside; corona lobes red, lingulate, 1–2.5 × 1–1.6 mm, rounded, glabrous or minutely papillose; corolla lobes pink and turning yellow on both sides, with a dark pink stripe on the right side outside, tails pink-suffused yellow and turning dark pink; lobes ovate, 4–15 × 3.8–8 mm, narrowing into the 1 mm wide pendulous tails; lobes including the tails 55–115 mm long, puberulous outside and glabrous or puberulous inside. *Stamens* from 1 mm exserted to 2.1 mm included; filaments inserted at 6–9 mm from the base of the tube, straight, with an abaxial swelling, 1–2.3 mm long,

puberulous near the base and pubescent near the apex inside, with 1.5–5.2 mm long puberulous ridges; anthers 4–4.8 × 1–1.2 mm, glabrous; tails 0.4–0.9 mm long; acumen 0.1–0.2 mm long. *Pistil:* ovary 0.8–1.5 × 1.2–1.8 mm, densely pubescent; style 6–10 mm long; clavuncula 1–1.8 × 0.9–1.3 mm; stigma minute. *Fruit:* divergence of follicles unknown, long-tapering towards the narrow apex and ending in a small knob or an obtuse tip, 17–28 cm long and 1.4–2.7 cm in diameter; exocarp dark brown or purplish-brown, thick and hard, sulcate, pubescent in young fruits and later glabrescent, rather densely lenticellate; lenticels elongate. *Seeds:* grain 12–22 × 3–5 × 1–1.5 mm, densely pubescent or lanate; beak glabrous for 13–44 mm and bearing a coma for 20–65 mm; coma 35–80 mm long.



MAP 27. *Strophanthus nicholsonii* Holmes

Distribution: Malawi to Zimbabwe.

Ecology: mopane woodland; alt. 400–1100 m.

Flowering at the end of the dry and the beginning of the rainy season; mature fruits in the dry season.

Local names: *Bulembe* (Zambia: Ambo language, also used for *S. kombe*).

Specimens examined:

MALAWI: Mzimba Distr., above Lake Kazuni, *Pawek* 7406 (MO, PRE, UC, WAG); Lukoma Isl., *Bellingham* Aug. 1887 (BM); Blantyre Distr., Lisungwe, *Topham* 1803 (MO, NY); Shire Highlands, *EMH* s.n. (BM); N of Shire R., *Townsend* 267 (FHO); Chirono Distr., between Dande and Jangayi Rs., 16 km S of Ngaba Road, *Usher* Oct. 1950 (NY).

ZAMBIA: Luangwa Valley N, Mpika Distr., *Astle* 5134 (SRGH); 27 km N of Jumbwe, *Robson* 53 (BM, BR, K, LISC, PRE, SRGH); Jumbwe, *Mutimushi* 1644 (K); Chipata Distr., Lupande R., *Grout* 168 (FHO); Chipata Distr., Mkharia, *Astle* 5373 (K, SRGH); Petauke Distr., between Muwenje's and Mwape's villages, *Trapnell* AH 9874 (EA); Luangwa Valley near Lusembwe R., *Trapnell* 1860 (K); Petauke, *Burroughs Wellcome & Co.* 1 (K, partly, the rest is S. kombe); Luangwa R., latitude 14°30′, *Nicholson* s.n. (P, PRE; type); Katondwe, *Fanshawe* 9839 (K); Namwala, along Muchila Road, *Lawton* 1140 (FHO); Mazabuka, *Trapnell* CRS 443 (BR, K, PRE); between Kafue and Mazabuka, *Pole Evans* 3069 (NY, PRE); Namwala, *Astle* 1662 (SRGH); ibid., near Baambwe, *van Rensburg* 2533 (K, SRGH); ibid., *Martin* 338/32 (FHO, K); Machili, *Fanshawe* 6028 (K); Kafue Nat. Park, Nakahoka, 13 km N of Ndundumwense Hill, *Mitchell* 25/77 (FHO, K, LISC, SRGH), 25/86 (FHO, K, LISC, SRGH); Gwembe, *Bainbridge* 171/55 (FHO, K, SRGH).

MOÇAMBIQUE, TETE: Zambesi R., 60 km W of Msasa, *Chase* 10 Jan. 1951 (MO, NY); between Cafucué and Sanangoé Rs., *Macêdo* 5382 (LISC).

ZIMBABWE: Urungwe Distr., Gache-gache Triangle, *Wild* 4226a (B, BR, FI, K, MO, PRE, S,

SRGH); ibid., Phipps 818 (BR, K, PRE, SRGH); Urungwe Distr., Nyanyanya R., *Mullin* 72/56 (SRGH); Urungwe Distr., Chuivore R., *West* 4536 (K, SRGH); Sebungwe Distr., 16 km N of Binga, *Phipps* 1377 (BR, K, PRE); Sebungwe Distr., near Muzaza Hill, *Whellan* 396 (NY, SRGH); Wankie, *Eyles* 7976 (SRGH); ibid., *Levy* 65 (K, PRE), 1149 (E, K, PRE); ibid., 15 km from Mbala Lodge on Wankie Road, *Rushworth* 1222 (K, LISC, PRE, SRGH); Gokwe Distr., Copper Queen Area, *Bingham* 853 (K, SRGH); 32 km N of Gokwe, *Goldsmith* 14/47 (FHO, SRGH); Gokwe Distr., Senwa Research Sta., *Jacobsen* 282 (SRGH), 3581 (PRE); Mtoko Distr., Ngahwe Res., *Corby* 1415 (SRGH); Mtoko Distr., Chazarini Camp, *Brayne* 2 (SRGH); Inyanga N Res., Gairezi R. bank, *Davies* 2518 (K, PRE, SRGH).

Sin. loc.: *Director of Agriculture Dar es Salaam* DM/2/5 (EA); *Dunstan* Nov. 1906 (K); *Graham* s.n. (K).

25. S. parviflorus Franch. 1893a: 303; 1893b: 281, pl. 11; Stapf 1902: 178; Gilg 1903: 28. **Fig. 31; Map 28**

Type: Angola, Cuanza Norte: Golungo Alto, N side of Queta Mt., *Welwitsch* 5994 (P, holotype; isotypes: BM, G, K, LISU).

Heterotypic synonym: *S. dewevrei* De Wild. 1900: 40; De Wildeman & Th. Durand 1901: 154; Gilg 1903: 25, pl. 5. Type: Zaïre, W Kasai: Luebo on the Lulua R., *Laurent* Nov. 1895 (BR, lectotype; isotype: K).

Liana, 3–5 m high, presumably evergreen; latex clear. *Branches* medium reddish-brown, sparsely lenticellate; branchlets glabrous or rarely puberulous. *Leaves:* petiole 1–3 mm long, with 2 outer and 1–4 inner axillary colleters; blade dark green above, lighter beneath, ovate, elliptic, or rarely slightly obovate, 1.8–3 (and in young leaves up to 4.2) × as long as wide, 4.5–11 × 2–5 cm, rounded or subcordate at the base, acuminate at the apex (acumen slender, 5–19 mm long), slightly undulate at the margin, membranaceous or chartaceous, glabrous or rarely puberulous on the midrib and veins, with translucent dots, especially in the axils of the secondary veins; 4–6 pairs of curved secondary veins at an angle of 40–65(–90)° with the midrib; tertiary venation inconspicuous. *Inflorescence* on long branches or in the forks, (1–)3–12-flowered (1–5 flowers open at a time), pedunculate or rarely sessile, lax or congested, glabrous or puberulous in all parts; peduncle – if present – 4–24(–50) mm long, lenticellate; branches 2–40(–50) mm long; pedicels 4–24 mm long; bracts erect or spreading, dusky purple-brown, elliptic or narrowly elliptic, 5–13.5 × 1–2.5 mm, acute or mucronate, sepal-like. *Calyx:* sepals erect or spreading, subequal, the outer slightly wider than the inner, brownish-green or purplish, narrowly elliptic or ovate, (2.2–)3–14 × as long as wide, 7–16.5 × 1–4.5(–5.5) mm, acute or rarely mucronate, puberulous to nearly glabrous; with 5 colleters on both inner sepals. *Corolla*: tube 0.8–1.6 × as long as the calyx, white and turning yellow on both sides, red-streaked inside, 10–18 mm long and widening at (50–)60–80% of its length into a shallowly cup-shaped upper part, at the mouth 6–12 mm in diameter, on both sides glabrous in the cylindrical, and puberulous in the cup-shaped part; corona lobes white or yellow, red- or purple-spotted, lingulate, 1–2.5 × 1 mm, rounded, fleshy, minutely papillose or minutely puberulous; corolla lobes white and turning yellow on both sides, tails yellow or greenish-yellow; lobes ovate, 3–8 × 2.3–5 mm, abruptly narrowing into the 0.5–1

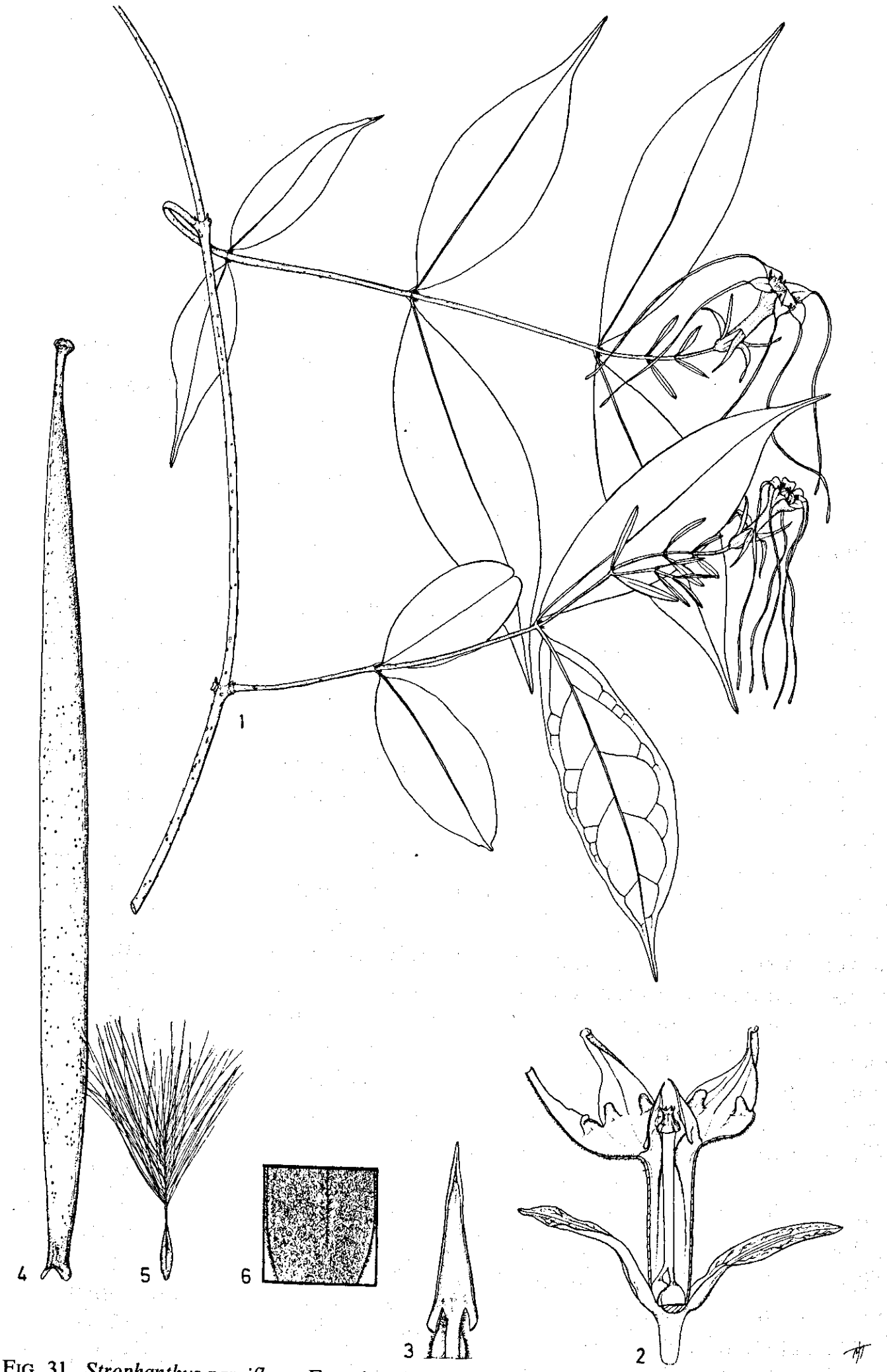
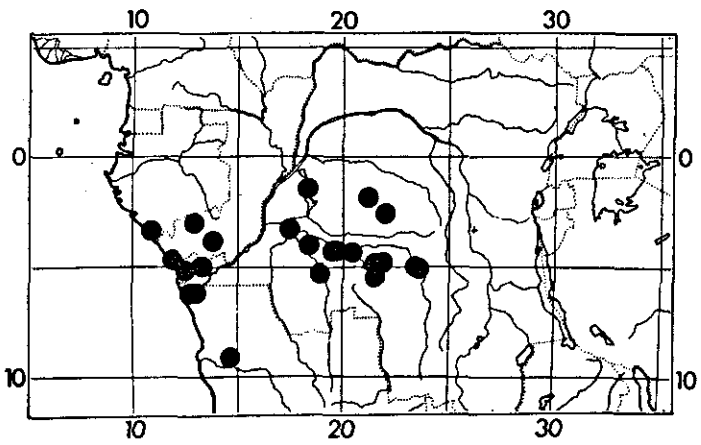


FIG. 31. *Strophanthus parviflorus* Franch.: 1. flowering branches, $\frac{2}{3}$ ×; 2. section of flower, 2 ×; 3. abaxial side of stamen, 6 ×; 4. follicle, $\frac{2}{3}$ ×; 5. seed, $\frac{2}{3}$ ×; 6. testa detail, 6 ×. (1. *Sita 2464*; 2–3. *Dawe 286*; 4–6. *Gossweiler 17 March 1922*).

mm wide pendulous tails; lobes including the tails 40–74 mm long, minutely puberulous on both sides. *Stamens* from 3.5 mm exserted to 2.5 mm included; filaments inserted at 7.4–12 mm from the base of the tube, straight, with a small abaxial swelling at the base, 0.6–1.3 mm long, pubescent inside, with inconspicuous ridges reaching the base of the tube; anthers 4.1–5 × 0.8–1.2 mm, glabrous or rarely short-pubescent near the base; tails 0.6–0.9 mm long; acumen 0.2–0.4 mm long. *Pistil:* ovary 0.8–1.4 × 0.9–2 mm, glabrous; style 8–11.5 mm long; clavuncula 0.7–1.4 mm high; stigma minute. *Fruit:* no fruits of this species were previously known, but a Gossweiler collection of 17 March 1922 is presumably *S. parviflorus*. This specimen has some very young leaves and bears mature fruits which do not resemble those of other *Strophanthus* species from this area. The follicles are divergent at an angle of 180°, long-tapering towards a narrow apex and ending in a small knob, 18 cm long and 0.9 cm in diameter, slightly sulcate, glabrous, and sparsely lenticellate. Seeds: grain 10 × 2–2.5 mm, densely short-pubescent; beak glabrous for 3–4 mm and bearing a coma for 15–20 mm; coma 35–53 mm long.



MAP 28. *Strophanthus parviflorus* Franch.

Distribution: Western Central Africa.
Ecology: primary or secondary forest or clearings; alt. 0–1000 m.
Flowering season not known with certainty.

Specimens examined:

GABON: Mayumba, Tchibanga, *Le Testu* 972 (BM, P).

CONGO: Madingou, between Komono and Zanaga, *Bouquet* 925 (P); Mouyondzi, Bouenza R. Falls, *Sita* 2464 (P); Pointe Noire, *anonym.* 5423 (P).

ZAÏRE, EQUATEUR: Isandja, *Evrard* 2854 (BR). BAS ZAÏRE: Mt. Kosi, *Flamigni* 10043 (BR), 10160 (BR). BANDUNDU: Mai N'dombe, between Kole and Bekese, *Lebrun* 6379 (BR); Djuma, S of Kwila, *Callens* 13 March 1960 (NY); Lukombe, *Sapin* Oct. 1910 (BR), Dec. 1910 (BR, K); Ipamu, *Vanderijst* 10328 (BR), 10361 (BR), 11025 (BR), 11116 (BR), 12053 (BR); Ipamu, Euke, Kikgat, *Vanderijst* 9845 (BR); Ipamu, Euke, Pangu, *Vanderijst* 9577 (BR); Kijaka-Kwango, *Devred* 2367 (BR, K, M). W KASAI: Sankuru, *Luja* anno 1906 (BR), anno 1908 (BR); Mweka, *Liben* 2745 (Br); Luebo, Lulua R., *Laurent* Nov. 1895 (BR, K; type of *S. dewevrei*); Kakange, *Gillardin* 295 (BR), 335 (BR). E KASAI: S of Booke, *Robin* 77 (BR); Sangaïe, *Gillardin* 500 (BR), 524 (BR, K); Ikoka, *Sapin* 25 Oct. 1906 (BR). KIVU: Nyangwe, Lualuba R., *Dewèvre* 1058 (BR; paratype of *S. dewevrei*). Unknown locality: Shaba, Bomkolo, *Sapin* Feb. 1910 (BR); sin. loc., *Renier* 25 (BR).

ANGOLA, CABINDA: Punga Munga, *Dawe* 286 (K); ibid., Luali, *Gossweiler* 6008 (BM, LISJC,

FIG. 32. *Strophanthus perakensis* Scortechini ex King & Gamble: 1. flowering branches, $\frac{2}{3}$ ×; 2. opened flower, 4 ×; 3. adaxial side of stamen, 10 ×. (1. *Lace 3041*; 2–3. *Squires 901*).

LISU); CONGO: Sumba, Peco, *Gossweiler* 8799 (BM, K), 8974 (BM, K, LISJC); Muanda R., lower Congo R., *Gossweiler* 17 March 1922 (BM). CUANZA NORTE: Golungo Alto, N side of Queta Mt., *Welwitsch* 5994 (BM, G, K, LISU, P; type).

26. S. perakensis Scortechini ex King & Gamble 1908: 470; Ridley 1923: 355. **Fig. 32; Map 29**

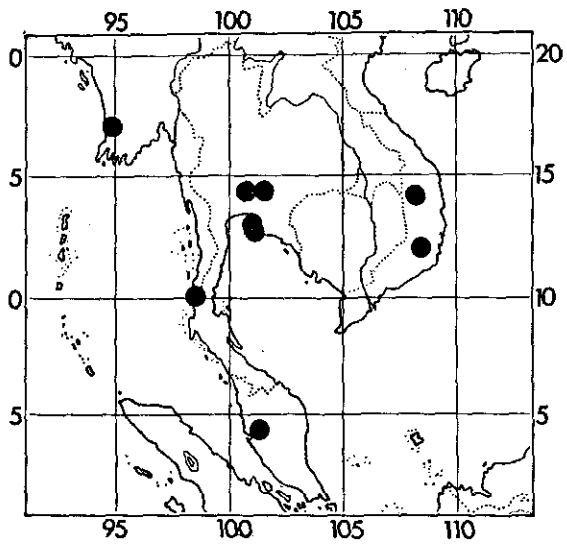
Type: Malaysia, Malacca Penins.: Dipong, *Scortechini* 1818 (K, holotype, isotypes: CAL, NY).

Heterotypic synonyms: *S. siamensis* Kerr 1937: 90, syn. nov. Type: Thailand, Sriracha, Naung Nam Kio, *Kerr* 4173 (K, holotype; isotypes: BM, BR).

S. annamensis Tsiang 1946: 116, fig. 7, syn. nov. Type: Viêt-nam, Dalat and vicinity, *Squires* 901 (A, holotype, not seen; isotypes: A (not seen), BM, K, M, MO, NY).

S. kontumensis Lý 1980: 7, fig. 1, syn. nov. Type: Viêt-nam, Gialai-Kontum, Dakley (Dakmon), *Lý* 357 (HN, holotype, not seen; isotypes: HM, HN, not seen).

Liana, or rarely a *shrub*, presumably evergreen. *Branches* dark brown, (very) densely lenticellate; branchlets medium (reddish-)brown, glabrous. *Leaves:* petiole 3–8 mm long, with 2 outer and 2–4 inner axillary colleters; blade ovate, elliptic, or slightly obovate, 2–4 × as long as wide, 2.5–12 × 0.5–4 cm, cuneate at the base or decurrent into the petiole, acute or acuminate at the apex (acumen 2–12 mm long), with somewhat revolute margin, papyraceous, glabrous; 8–16 pairs of straight secondary veins at an angle of 70–90° with the midrib; tertiary venation sometimes conspicuous. *Inflorescence* on long or short branches or in the forks, 4–24-flowered (1–2 flowers open at a time), pedunculate, lax, minutely puberulous in all parts; peduncle 4–30 mm long, lenticellate; branches 4–50 mm long; pedicels 1–2.5 mm long; bracts erect or spreading, narrowly ovate, 1.5–5 × 0.5–1 mm, acute, sepal-like. *Flowers* fragrant. *Calyx:* sepals equal, greenish and with a maroon-brown apex, ovate or narrowly ovate, 1.5–4 × as long as wide, 1.5–4 × 1–1.5 mm, acute, minutely puberulous; with 2 colleters per sepal. *Corolla:* tube 1.7–4 × as long as the calyx, white and turning yellow on both sides, 5.5–8 mm long and widening at 60–80% of its length into a cup-shaped upper part, at the mouth 3.5–5.2 mm wide, sparsely puberulous near the mouth on both sides; corona lobes presumably red, narrowly triangular, 1–2 × 0.3 mm, acute, glabrous; corolla lobes white and turning yellow on both sides, red near the apex; lobes ovate, 2–3.5 × 2–3.5 mm, abruptly narrowing into the 1 mm wide erect or spreading tails; lobes including the tails 5–10 mm long, glabrous on both sides. *Stamens* 3–3.5 mm exserted; filaments inserted at 3.6–4.3 mm from the base of the tube, straight, with an abaxial swelling near the base, 0.6–0.9 mm long, pubescent, with 1.2–2 mm long fleshy ridges, ending at the base in an obtuse spur; anthers 5.7–6.1 × 0.7–0.9 mm, densely pubescent; tails 0.1–0.2 mm long; acumen 4–4.3 mm long. *Pistil:* ovary 1.4–1.6 × 1.2 mm, pubescent; style 4.2–4.5 mm long, wrinkled; clavuncula 0.6 mm high; stigma 0.6 mm long. *Fruit:* not known.



MAP 29. *Strophanthus perakensis* Scortechini ex King & Gamble

Distribution: South-East Asia.
Ecology: forest and clearings; alt. 0–250 m.
Flowering from March to May (all collections).

Specimens examined:

BURMA: Bassein distr., Shangwin, *Lace* 3041 (E, K); Tenasserim, Victoria Point, Tha-tay-kyun, *Po Khant* 11377 (K1; Tenasserim, sin. loc., *Meebold* 15423 (CAL).

THAILAND: Saraburi Prov., Sahm Latu Forest, *Maxwell* 75–175 (AAU, L); Chantaburi Prov., Khao Sap Mut, *Maxwell* 75–500 (AAU, L); Sattalup, Tong Brong, *Maxwell* 72–160 (AAU); Sriracha, Naung Nam Kio, *Kerr* 4173 (BM, K; type of *S. siamensis*); unknown locality: Peninsula, Klong Chee, *Phra Vanpruk* 664 (E, K).

VIÊT-NAM: Dalat, *Squires* 901 (BM, K, M, MO, NY; type of *S. annamensis*).

MALAYSIA, MALACCA PENINSULA: Perak, Dipong, *Scortechini* 1818 (CAL, K, NY; type).

Notes: the types of *S. siamensis* and *S. annamensis* agree with the type of *S. perakensis*; the description of *S. kontumensis* leaves little doubt that this is also identical to *S. perakensis*, although the pedicel is described as slightly longer, and the ovary as glabrous.

27. S. petersianus Klotzsch 1861: 276; Franchet 1893b: 290; Stapf 1902: 182; Gilg 1903: 33, pl. 8; Codd 1951: 158, fig. 145 & 147; 1963: 291; Verdcourt & Trump 1969: 136; Retief 1972: pl. 1658. **Fig. 33; Map 30**

Type: Moçambique, Tete: Zambesi R., Tete, *Peters* s.n. (holotype destroyed in B; lectotype: K).

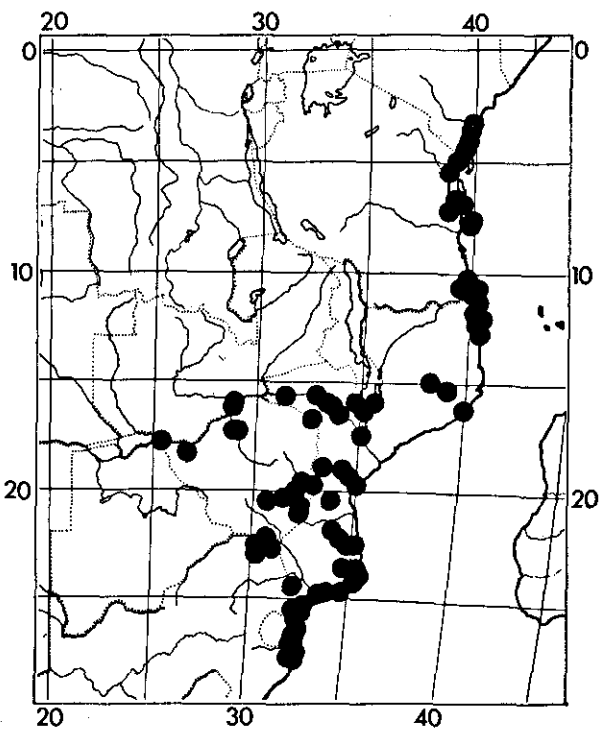
Heterotypic synonyms: *S. petersianus* var. *grandiflorus* N. E. Brown 1892: 126; Hooker f. 1894: pl. 7390; Gilg 1903: 28 (excl. synon. *S. sarmentosus*). Type: Moçambique, Maputo: Delagoa Bay, *Monteiro* 1 (K, holotype; isotypes: FI, G, P, W). Homotypic synonym: *S. grandiflorus* (N. E. Brown) Gilg 1902a: 161, pl. 7; Stapf 1907: 510; Braun 1910: 296.

S. sarmentosus var. *verrucosus* Pax 1892: 374; Franchet 1893b: 284. Type: Kenya, K7: coast near Mombasa, *Hildebrandt* 1976 (holotype destroyed in B; lectotype: W; isotypes: BM, K, L, LE, NY, P, WU). Homotypic synonym: *S. verrucosus* (Pax) Stapf 1902: 181.

Sarmentose *shrub* or *liana*, 1–15 m high, deciduous, flowers appearing with or rarely before the leaves; latex – if present – white or reddish. *Trunk* up to 10 cm in diameter, pale grey; branches pale or dark brown, with at the nodes, or less often in between, 2–4 corky laterally compressed triangular protuberances up to 25 mm high, densely lenticellate; branchlets light brown, glabrous or rarely puberulous. *Leaves:* petiole (2–)3–13 mm long, with 2 outer and 4–6 inner axillary colleters; blade dark green, paler beneath, elliptic or ovate, 1.3–3(–3.4) × as long as wide, 2.8–11 × 1.7–5.2 cm, cuneate or rounded at the base or decurrent into the petiole, acuminate at the apex (acumen 2–10 mm long, obtuse), sometime undulate or recurved at the margin, papyraceous or less often thinly coriaceous, glabrous or exceptionally sparsely puberulous, with translucent dots; 4–6(–8) pairs of curved secondary veins at an angle of 45–55° with the midrib; tertiary venation conspicuous, especially beneath. *Inflorescence* on long or short branches or in the forks, 1–2(–4)-flowered (1(–3) flowers open at a time), sessile or pedunculate, glabrous or occasionally puberulous in all parts; peduncle – if present – up to 6 mm long; branches 0–10 mm long; pedicels 3.5–11 mm long; bracts deciduous, erect or spreading, linear or narrowly elliptic, 2.5–11 × 1–3 mm, acute, sepal-like or subscarious. *Flowers* fragrant. *Calyx:* sepals erect or spreading, rather unequal, green and often suffused with purple, ovate or narrowly elliptic, (1.5–)3–6(–8) × as long as wide, 5–21 × 2–5.5 mm, acute, glabrous or exceptionally puberulous; with 2–4 colleters per sepal. *Corolla*: tube 1.2–4 × as long as the calyx, white and turning yellow near the base and maroon-purple near the mouth outside, white and maroon-purple-streaked inside, the white turning yellow, (13–)15–37 mm long and widening at 18–41% of its length into a cup-shaped upper part, at the mouth 10–29 mm wide, glabrous outside and puberulous inside; corona lobes white, with a maroon-purple line all over its length in the middle, the white turning yellow, narrowly triangular and often undulate, 6–15 × 1.7–4 mm, acute, glabrous; corolla lobes dark maroon-violet outside, white and turning yellow on the inside, tails maroon-violet outside, yellow inside; lobes ovate, 9–16 × 6–15 mm, gradually narrowing into the 1–2 mm wide pendulous tails; lobes including the tails 90–205 mm long, glabrous on both sides. *Stamens* included for 1.5–11 mm, rarely 0–1.5 mm exserted; filaments inserted at 6–12 mm from the base of the tube, straight or nearly so, 2.6–5.2 mm long, pubescent inside, with inconspicuous ridges; anthers 6–10 × 1.1–2 mm, glabrous; tails 0.3–1 mm long; acumen 1–4 mm long. *Pistil:* ovary 0.8–2.6 × 1.5–2.8 mm, glabrous; style 7.5–14.5 mm long; clavuncula 1.8–2.8 × 1.3–2.3 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180°, tapering towards the apex and ending in a narrow obtuse tip or in a small knob, 20–37 cm long and 2.2–3.5 cm in diameter; exocarp dark brown, thick and hard, smooth, glabrous, sparsely or densely lenticellate, rarely not lenticellate.

Seeds: grain 10–18 × 2.8–4 × 1 mm, densely pubescent; beak glabrous for (20–)35–65 mm and bearing a coma for 10–52 mm; coma (38–)60–90 mm long.

FIG. 33. *Strophanthus petersianus* Klotzsch: 1. flowering branches, $\frac{2}{3}\times$; 2. branch node with corky protuberances, $\frac{2}{3}\times$; 3. flower, $\frac{2}{3}\times$; 4. opened flower, 2 ×; 5. fruit, one follicle removed, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1. *Barbosa 8108 & 8673*; 2. *Chase 2211*; 3. *Barbosa 7968*; 4. *Neves Rosa 79*; 5–6. *Chase 3539*).



MAP 30. *Strophanthus petersianus* Klotzsch

Distribution: East and Southern Central Africa.

Ecology: coastal forest and woodland, often on rocky places; alt. 0–1100 m.

Flowers and leaves towards the end of the dry and the beginning of the rainy season; mature fruits in the dry season.

Local uses: used for arrow poison in Zimbabwe and S. Africa.

A selection of the ca. 150 specimens examined:

KENYA, K7: Kilifi Distr., Arabuko, *Graham* 1712 (K, NY); Sokoke, *St. Barbe Baker* 1102 (EA); Kwale, *Greenway* 21064 (K).

TANZANIA, T3: Amboni, 5 km on the road from Tanga to Mombasa, *Brass et al.* 20966 (K, NY); Pangani Distr., Msubugwe For. Res., *Mgaza* 552 (FI, K). T6: Dar es Salaam, *Goetze* 2 (K); Kisarawe Distr., Mogo For. Res., *Mgaza* 722 (K); Mafia Isl., Kilindoni, *Greenway* 5261 (K). T8: Lake Lutamta, 40 km W of Lindi, *Schlieben* 5211 (B, BM, BR, G, HBG, LISC, M, P, PRE, S, Z); 104 km W of Mtwara, *A. M.* 185 (EA); Kitangari, *Gillman* 1074 (K).

MOÇAMBIQUE, CABO DELGADO: Tunguè, between Pundanhar and Nangade, *Barbosa* 2188 (BM, LISC); Mocimboa de Praia, between Rio Messalo and Mocimboa, *Pedro & Pedrogao* 5191 (PRE); Quissanga, between Biliza and Muaguide, *Barbosa* 2329 (BM, LISC). MOÇAMBIQUE: Ribaué Road near Malema, *Andrada* 1399 (BM); Antonio Enes, Matangula Praia, *Mogg* 32421 (LISC, SRGH). TETE: Cabora Bassa, Zambesi R. right bank, Posto de Milicias Rio, *Correia et al.* 3833 (WAG); middle Zambesi R., Boroma, *Menyhart* 501 (A, UPS, W, WU, Z); Tete, *Kirk* s.n. (K). MANICA E SOFALA: Sena, between Tesse and Murema, *Pedro & Pedrogao* 8556 (NY, PRE); lower slopes of Mt. Zembe, *Leach* 9126 (K, PRE, SRGH); Dundo-Inhaminga, near Derundi, *Gomes e Sousa* 4723 (K); Mucheve, *Carvalho* 670 (K). INHAMBANE: 15 km S of Cheline on the road from Maxixe to Mambone, *Leach & Bayliss* 11836 (K, SRGH); Inhambane, *Gomes e Sousa* 1898 (BR, COI, FI, K, LISC). GAZA: Chibuto, on the road to Manjacaze, *Barbosa & de Lemos* 8006 (BR, COI, K, LISC, P); Magude, Uanetze area, *Mendonça* 3200 (BM, LISC). MAPUTO: Moamba area, *P. Jansen et al.* 7553 (WAG); Maputo, *Schlechter* 11624 (BM, BR, COI, E, G, HBG, K, LE, P, Z).

MALAWI: Shire Highlands, Chiromo, *Scott Elliot* 2793 (BM, K); Chikwakwa, *Topham* 1802 (MO, NY).

ZAMBIA: Lomagundi Distr., Chirundu, *Leach* 9831 (MO, SRGH); Mazabuka, 32 km from the road between Chirundu and Lusaka, *Drummond* 5447 (SRGH).

FIG. 34. *Strophanthus preussii* Engl. & Pax: 1. flowering branch, $\frac{2}{3}\times$; 2. leaf, $\frac{2}{3}\times$; 3. section of flower, 2 ×; 4. outermost sepal, 2 ×; 5. innermost sepal, 2 ×; 6. side view of stamen, 4 ×; 7. fruit, $\frac{2}{3}\times$; 8, seed, $\frac{2}{3}\times$. (1. *Leeuwenberg 2892*; 2–6. *Beentje 182*; 7. *Gerard 2698*; 8. *Brass & Woodward 20951*).

ZIMBABWE: Kariba Gorge slopes, *Goldsmith* 46/59 (BR, K, L, MO, PRE, SRGH); Mtoko, Mkota land, *Whellan* 494 (K, SRGH); Wankie, *Levy* 1008 (E, PRE, SRGH); Victoria Falls, *Schwarz* BH 31919 (BOL); Marchuru, 4 km S of Runga, *Canell* 526 (K, LISC, SRGH); Melsetter, Haroni Makarupini Forest, *Wild c.s.* 6627 (BR, K, LISC, SRGH); Chiturupadzi Dip Camp, 88 km E of Beitbridge, *Mavi* 236 (BR, K, SRGH).

S. AFRICA, TRANSVAAL: Soutpansberg Distr., Punda Maria, *Codd & Dyer* 4543 (BM, K, LD, NY, PRE). NATAL: km 26 on Ndumu-Ingwavuma Road, *Moll* 4358 (K, MO, NH, PRE); Hlabisa Distr., False Bay Park, *Ward* 3842 (K, NH, PRE).

Cultivated: GREAT BRITAIN, Kew, *anonym.* 9 May 1969 (K); INDONESIA, Bogor, *Woerjantoro* 15 (L); U.S.A., Mayaguez (PR), *Winters* 2230 (NY).

Notes: plants of this species from the interior have smaller leaves and flowers than those from the coastal region; the latter were distinguished under the name *S. grandiflorus* or *S. petersianus* var. *grandiflorus* up to 1963.

S. petersianus is closely allied to *S. sarmentosus* from West Africa.

Without flowers, plants of *S. petersianus* and *S. courmontii* are very difficult to distinguish.

28. S. preussii Engl. & Pax 1892: 369 (partly, except for *Welwitsch* 5999); Franchet 1893b: 279; Stapf 1902: 176; Gilg 1903: 24, pl. 4; Stapf 1909: t. 8250; Hutchinson & Dalziel 1931: 49; Staner & Michotte 1934: 41; Krukoff & Letouzey 1950: 134; Huber 1963: 70; Hall & Swaine 1981: 295. **Fig. 34; Map 31**

Type: Cameroun, W. end of Barombi Ravine, *Preuss* 116 (lectotype destroyed in B; new lectotype: K; isotypes: HBG, M, PRE).

Heterotypic synonyms: *S. bracteatus* Franch. 1893a: 302; Franchet 1893b: 280, pl. 12; Stapf 1902: 177. Type: Gabon, Ogooué R., above Obombi, *Thollon* 745 (P, lectotype; isotype: P).

S. preussii var. *brevifolius* De Wild. 1908: 249; Th. Durand 1909: 348. Type: Zaïre, Bandundu: Bena-Dibele, *Flamigni* 190 (BR, holotype).

S. preussii var. *scabridulus* Monach. 1951: 478, syn. nov. Type: Zaïre, Haute Zaïre: Epulu area, *Putman* 118 (A, holotype, not seen; isotype: BR).

S. preussii var. *scabridulus* forma *multinervis* Monach. 1951: 478, syn. nov. Type: Zaïre, Haute Zaïre: Yangambi, 9 km N of Zaïre R., Louis 2865 (BR, holotype).

S. preussii var. *scabridulus* forma *paucinervis* Monach. 1951: 478, syn. nov. Type: Zaïre, Haute Zaïre: Yangambi, *Louis* 4333 (BR, holotype).

S. preussii var. *scabridulus* forma *crebrinervis* Monach. 1951: 479, syn. nov. Type: Zaïre, Haute Zaïre: Yalibwa, along Lubilaya R., *Louis* 1351 (BR, holotype).

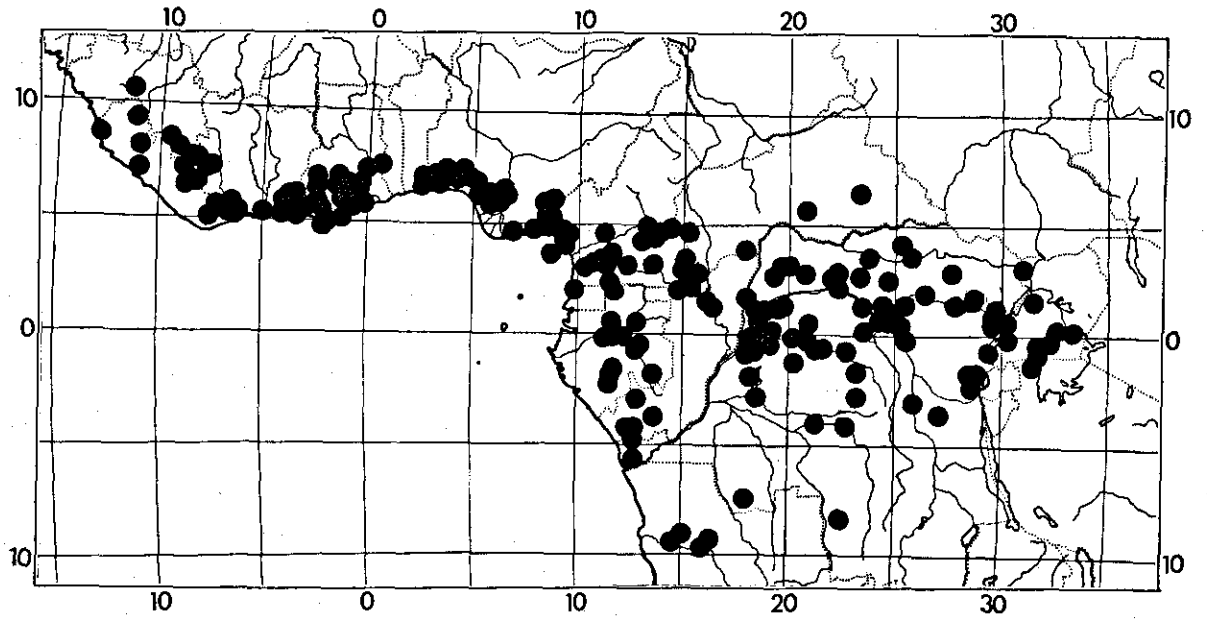
Sarmentose *shrub,* 0.70–5 m high, or more frequently a *liana,* 1–12 m high, presumably evergreen; latex clear or white. *Trunk* up to 2.5 cm in diameter; branches dark, reddish, or purple-brown, sparsely or densely lenticellate; branchlets medium or dark brown, glabrous or rarely scabrous. *Leaves:* petiole 2–9(–14) mm long, with 2 outer and 2–4 inner axillary colleters; blade dull or glossy medium or dark green, paler beneath, ovate, elliptic, or slightly obovate, 1.2–3.2 × as long as wide, 2–18.5 × 1.5–7.5 cm, cuneate, rounded, or

rarely subcordate at the base, acuminate at the apex (acumen 2–12 mm long), rarely with a somewhat revolute margin, papyraceous or thinly coriaceous, glabrous or rarely scabrous, with minute translucent dots; 3–14 pairs of slightly curved secondary veins at an angle of 45–70° with the midrib; tertiary venation inconspicuous. *Inflorescence* on long or short branches or in the forks, 1–24(–48)-flowered (1–9(–13) flowers open at a time), sessile or pedunculate, lax, occasionally with reduced branches, minutely puberulous or rarely glabrous in all parts; peduncle – if present – up to 24(–35) mm long, lenticellate; branches 5–60(–80) mm long; pedicels 4–25 mm long; bracts sometimes deciduous, ovate, orbicular, or obovate, 4–20 × 1.5–11 mm, acute, apiculate, or rarely obtuse, sometimes undulate at the margin, sepal-like. *Flowers* fragrant. *Calyx:* sepals unequal, the outer ovate and 1.2–3 × as long as wide, the inner narrowly ovate or linear and 3–10 × as long as wide, brown or purplish-green, 4–25 × 1–14 mm, acute or obtuse, sometimes undulate at the margin, (sparsely) puberulous or rarely glabrous; eglandulose or with up to 4 glands per sepal. *Corolla:* tube 0.9–2.5 × as long as the calyx, white, turning reddish-orange via yellow on both sides, outside suffused with pink at the base and with red near the mouth, inside red-spotted and -streaked, 12–26 mm long and widening at 40–66% of its length into a cup-shaped upper part, at the mouth 7–17 mm wide, minutely puberulous on both sides except outside near the base; corona lobes yellow and turning orange, pink- or purple-streaked, lingulate, 0.8–2.3 × 1–2.6 mm, rounded, fleshy, minutely papillose or puberulous; corolla lobes white and with 3 pink lines, the white turning yellow; lobes ovate, 4–12 × 3.5–10 mm, abruptly narrowing into the 0.3–1 mm wide pendulous tails; lobes including the tails (70–)120–190 mm long, minutely puberulous, except for the apex. *Stamens* from 1.3 mm exserted to 5.2 mm included; filaments inserted at 8–14.5 mm from the base of the tube, curved, 0.2–1.6 mm high and 1.8–3 mm long, pubescent inside and puberulous or glabrous outside, with ridges nearly reaching the base of the tube; anthers 4.9–7.5 × 0.9–1.5 mm, densely pubescent; tails 0.6–1.4 mm long; acumen 0.5–2 mm long. *Pistil:* ovary 0.8–1.9 × 1.2–2.3 mm, densely puberulous or densely pubescent; style 7.4–13.5 mm long; clavuncula 1.3–2 × 1.2–1.8 mm; stigma 0.15–1.25 mm long. *Fruit:* follicles divergent at an angle of 160–190°, tapering towards a narrow apex and ending in an obtuse tip or a small or large knob, (13–)15.5–28.5 cm long and 0.9–3 cm in diameter; exocarp rather thick and hard, slightly or conspicuously sulcate, glabrous, densely lenticellate; lenticels elongate. *Seeds:* grain 12–20 × 2.2–3.5 mm, densely puberulous or densely short-pubescent; beak glabrous for 3–8 mm and bearing a coma for 30–50 mm; coma 57–100 mm long.

Distribution: Western and Central Africa.

Ecology: primary and secondary forest, gallery forest, forest margins, and clearings; alt. 0–1400 m.

Flowering in Ghana in the driest season and with a peak in the first half of the long rainy season; in Uganda with a peak in the first half of the main rainy season. Mature fruits probably in the driest season.



MAP 31. *Strophanthus preussii* Engl. & Pax

Local names: *Libobo li fufow, libobo li baina* (Zaïre, Turumbu language; *libobo* is a generic name); *Lofandja, lofondja moke* (Zaïre, Kundu language; *lofondja* is a generic name); *Tiki, molo tiki* (République Centrafricaine, Lissongo language).

Local uses: the latex is used for making arrow-poison in Zaïre; stem fibres are used for making fish lines, nets, and ropes in the République Centrafricaine.

A selection of the ca. 550 specimens examined:

GUINÉE: between Mamou and Dabola, *Adam* 4633 (MO); Macenta, Seredou, *Adam* 12023 (MO); Nimba Mts., *Schnell* 4902 (K).

SIERRA LEONE: Loma Mts. base, path from Kondembaia, *Morton & Gledhill* SL 1013 (GC, K, WAG); Freetown, *Burbridge* 520 (K).

LIBERIA: Mano R. near MMAL settlement, *H. Jansen* 1845 (WAG); Sanokwele, *Baldwin* 14189 (K, NY).

CÔTE D'IVOIRE: 25 km WSW of Man on road to Danané, *Beentje* 352 (UCJ, WAG); 66 km WNW of Sassandra along the road to San Pedro, *Leeuwenberg* 4039 (B, BR, G, K, L, MO, P, PRE, UC, WAG); Banco Forest, *Leeuwenberg* 3344 (BR, FHO, GC, K, L, P, UC, WAG); Aboisso, Sanvi, *Chevalier* 17773 (P).

GHANA: Bia Tano For. Res., *Adams* 5325 (GC); Kade A. R. S., *Hossain & Agyakwa* GC 38252 (GC, K, US); Assuantsi, *Irvine* 1571 (E, GC, K, MO); Esiama W. P., *Williams* 437 (K).

TOGO: Tomegbé, Itim, *Brunel* 375 (B).

BÉNIN: Adja Ouéré, *Le Testu* 275 (BM, P).

NIGERIA, OGUN: Agege, *Foster* 216 (P, Z). OYO: Badeku, 20 km from Ibadan, *Meikle & Keay* 1457 (B, BR, K, P). BENDEL: km 6, Ugo-Usonigbe Road, *Okeke* FHI 30144 (FHO, K). CROSS RIVER: Eket Distr., *Talbot* s.n. (BM); Obubra Distr., Iyamoyong For. Res., *Binuyo* FHI 41284 (BR, GC, K, WAG).

CAMEROUN: Butu, 20 km NW of Kumba, *Satabié* 236 (P, WAG, YA); Mt. Ngolep base, 38 km N of Bafia, *Ngameni Kamga* 157 (P, WAG, YA); km 6, Bertoua-Bétaré Oya Road, *Breteler* 1325 (K, P, WAG, YA); N'Kolbisson, 8 km W of Yaoundé, *W. de Wilde* 2305 (B, BR, K, MO, P, PRE, WAG, YA, Z); SW of Lomié, *Letouzey* 3651 (P, YA); between Song and Gribe, 65 km SSW of Yokadouma, *Letouzey* 12243 (P, YA); Nginda, 2 km N of Moloundou, *Mildbraed* 4131 (HBG).

RÉPUBLIQUE CENTRAFRICAINE: Dimi R., 45 km NE of Besson, *Tisserant* 60 (P); Boukoko, *Tisserant* 56 (P, BM); near Bambari, *Tisserant* 1359 (P); upper Kotto R., Yalinga, *Le Testu* 4640 (BM, LISC, MO, P).

EQUATORIAL GUINÉE, FERNANDO PÓO: *Mann* 177 (K, P). RIO MUNI: Campo area, *Tessmann* 554 (K).

GABON: Woleu-Ntem, Jeauneau, *Le Testu* 9050 (BM, P); 20 km SW of Makokou, *N. Hallé* 2697 (P); Ogooué R., Apingi, *Thollon* 139 (A, BR, K, P); Booué, *Thollon* 744 (P; paratype of *S. bracteatus*); Moubana, *Le Testu* 5480 (BM, LISC, MO, P); Lepaka, *Le Testu* 30 Sept. 1929 (BM).

CONGO: Sangha R. bank, Ouesso, *Pobéguin* 176 (P); path to Mohitu, *Bouquet* 2068 (P); Mayombe, 3 km from Dimonika, *Makany* 2041 (P).

ZAÏRE, EQUATEUR: near Likimi, *Malchair* 99 (A, BR, US); Yambata, *de Giorgi* 1360 (BR, K); Wangate, near Mbandaka, *Lebrun* 899 (A, BR, NY, P); Bokondji, *De Wanckel* 15 (BR); Belo, *Jespersen* Nov. 1910 (BR), HAUTE ZAÏRE: Itimbiri R., Bili, *Lebrun* 2857 (BR, US); near Mobwasa, *Reygaert* 1308 (BR, US); Yangambi, *Germain* 4666 (BR, MO, P); ibid., Yalutcha Isl., *Louis* 15809 (B, BR, K, MO, P); Ituri R., Penghe, *Bequaert* 2209 (BR); Albert Nat. Park, Yolohafiri Cave, *De Witte* 12642 (BR). BAS-ZAÏRE: Kizu, *Wellens* 194 (BR). BANDUNDU: between Selenge and Rukoleki, *Goossens* 6007 (BR, K); Kwango R., Panzi, *Vanderijst* 14909 (BR). W KASAI: downstream from Bolombo, *E. and M. Laurent* 2 Jan. 1903/4 (BR). E KASAI: Lomela Terr., Mukumari, *Gillardin* 607 (BR). KIVU: km 109, Kavumu-Walikale Road, *Troupin* 3355 (BR, K); between Kama and Lunsuna, *Lebrun* 5849 (BR). SHABA: Kapanga,*Overlaet* 1113 (BR).

UGANDA, U1: Mingoro Forest, *Maitland* 11/1925 (K). U2: Toro Distr., Bwamba Forest, *Greenway & Eggeling* 7067 (K, PRE). U4: Mukono, *Dümmer* 2734 (BM, K, PRE, SAM).

TANZANIA, T1: Bukoba, Mingiso For. Res., *Watkins* 521 (EA).

ANGOLA, CABINDA: Maiombe, Buco Zan, *Gossweiler* 6823 (BM, LISJC, LISU). CUANZA NORTE: Cazengo, Loanda, *Gossweiler* 583 (BM, K, P); Pungo Andongo, *Welwitsch* 5995 (BM, G, K, LISU, P; paratype).

Cultivated: FRANCE, Nogent, *Anonym.* Aug. 1908 (P); GREAT BRITAIN, Kew, *K* 11.00 (K); SRI LANKA, Peradeniya, *Tirvergadum et al.* 188 (P); INDONESIA, Bogor, *Woerjantoro* 4 (L, WAG); U.S.A., Florida, Coconut Grove, *Margraff* PI 185115 (MO, NY).

Notes: one of the paratypes of the original description, *Welwitsch* 5999, is a *S. amboensis*.

A number of specimens, nearly all from the vicinity of Yangambi (Zaïre), show densely scabrous stems and leaves, while a few of them also show only 2–3 pairs of secondary veins. MONACHINO (1951) based a variety and 3 formae on these specimens, but they are reduced to synonyms here.

29. S. puberulus Pax 1892: 378; Franchet 1893b: 269; Gilg 1903: 17.

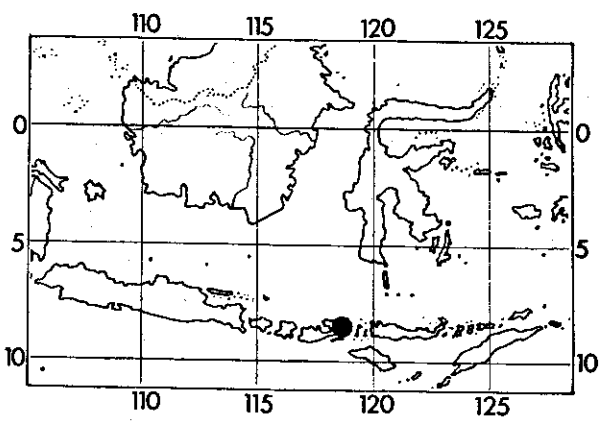
Fig. 35; Map 32

Type: Indonesia, Sumbawa Isl.: between Wiera and Bima, *Zollinger* 3416 (holotype destroyed in B; lectotype: P; isotypes: BM, FI-W, G, L, LE, MPU, NY).

Branches medium or dark brown, densely lenticellate; branchlets medium or dark brown, glabrous. *Leaves:* petiole 3–9 mm long, with 2 outer and 4–6 inner axillary colleters; blade elliptic, 2–2.5 × as long as wide, 4–11 × 2–5 cm, cuneate at the base, obtuse or acuminate at the apex (acumen 5–8 mm long), papyraceous, glabrous; 6–9 pairs of curved secondary veins at an angle of 45–50° with the midrib; tertiary venation conspicuous. *Inflorescence* on long or short branches or in the forks, 6–20-flowered (1–3 flowers open at a time), sessile or pedunculate, lax, sparsely to densely puberulous in all parts, or rarely with glabrous branches; pedicel – if present – up to 60 mm long; branches 15–60 mm long; pedicels 4–6 mm long; bracts linear, 2.5–8 × 1–1.5 mm, acute, sepal-

FIG. 35. *Strophanthus puberulus* Pax: 1. flowering branch, $\frac{2}{3}\times$; 2. section of flower, 2 ×. (1. *Warburg 17193*; 2. *Colfs 303*).

like. *Calyx:* sepals equal, light brown, 3–6 × as long as wide, 4–8 × 1–1.5 mm, acute, puberulous; with 2 colleters per sepal. *Corolla:* tube 1.5–2.3 × as long as the calyx, pink-suffused white outside, 11–15 mm long and widening at 50–60% of its length into a cup-shaped upper part, at the mouth 6–8 mm wide, puberulous on both sides; corona lobes narrowly triangular, 4–4.2 × 1 mm, acute, puberulous; corolla lobes pink-suffused white on both sides, colour of tails unknown; lobes ovate, 6–8 × 3–4 mm, abruptly narrowing into the 1 mm wide tails; lobes including the tails 30–58 mm long, puberulous on both sides. *Stamens* from 3 mm exserted to 0.2 mm included; filaments inserted at 8 mm from the base of the tube, straight, 2.3–3 mm long, pubescent, with 2.5–3 mm long ridges ending in an obtuse spur at the base; anthers 8.5–11.5 × 0.8 mm, sparsely puberulous; tails 0.3 mm long; acumen 5.5–7.5 mm long. *Pistil:* ovary 1.2–1.7 mm high, puberulous; style 6–8 mm long; clavuncula 1–1.3 mm high; stigma minute. *Fruit* not known.



MAP 32. *Strophanthus puberulus* Pax

Distribution: Indonesia, restricted to Sumbawa.
Ecology: the type comes from 'valleys'.
All flowering material has been collected between October and December.

Specimens examined:
INDONESIA, SUMBAWA: between Wiera and Bima, *Zollinger* 3416 (BM, FI-W, G, L, LE, MPU, NY, P; type); Bima, *Warburg* 17193 (E); Doror Kedobei, *Elbert* 3892 (G, K. L); sin. loc., *Colfs* 303 (L).

Notes: the specimens cited above bear a striking resemblance to each other and are quite distinct from *S. caudatus,* which grows in neighbouring islands; *S. puberulus* differs from *S. caudatus* in its puberulous ovary, the shorter style, the puberulous acumen of the anther, and the general appearance of the flowers, which are smaller than those of *S. caudatus,* including the length of the tails; in all these respects *S. puberulus* resembles *S. wallichii,* but is distinguished from this species by the size of the anther and its acumen and by the position, shape, and size of the bracts and sepals; the tertiary venation of the leaves is also different.

30. S. sarmentosus DC.
For literature, synonyms, and typification see under the varieties.

Sarmentose *shrub* or *liana,* deciduous, flowers appearing before or with the leaves; latex clear or white. *Trunk* up to 17 cm in diameter, with a pale brown, corky, and deeply fissured bark; branches dark or reddish-brown, with many up to 1 cm high corky protuberances, densely lenticellate; branchlets dark brown or reddish-brown, glabrous or rarely minutely puberulous. *Leaves* opposite, ternate, or rarely quaternate; petiole 2–17(–21) mm long, with 2 outer and 4–10 inner axillary colleters; blade elliptic or ovate, 2–15 × 1.5–7 cm, rounded or cuneate at the base, acuminate at the apex (acumen (2–)4–20 mm long, acute), often with an undulate or slightly revolute margin, glabrous; 3–7(–9) pairs of curved secondary veins at an angle of 35–55° with the midrib. *Inflorescence* on short branches or less often on long branches or in the forks, 1–5(–11)-flowered (1–3(–7) flowers open at a time), sessile or pedunculate, congested, often with reduced branches; peduncle – if present – up to 6(–10) mm long; branches 0–20(–30) mm long; pedicels 2.5–12 mm long; bracts pale green, suffused with purple or brown, ovate, 4.5–13.5 × 1.7–6.5 mm, acute, sepal-like. *Flowers* fragrant. *Calyx:* sepals subequal, the outer often wider than the inner, purple-suffused green, ovate, elliptic, or rarely obovate, 1.5–4(–8) × as long as wide, 5–20 × 2–10.5 mm, acute; with 1–8 colleters per sepal. *Corolla:* tube white and turning yellow in the lower part outside, pink and turning purple in the upper part outside, white and red- or purple-streaked inside, the white turning yellow, (14–)17–40 mm long and widening at 22–36% of its length into a cup-shaped upper part, at the mouth (8–)15–30 mm wide; corona lobes white, pink- or purple-streaked, the white turning yellow, narrowly triangular and often undulate, 5–22 × 2–5 mm, acute, minutely papillose; corolla lobes white and turning yellow on both sides, outside near the base pink or purple, tails pale yellow; lobes ovate, 7–20 × 6–18 mm, gradually or rather abruptly narrowing into the 1–2.5 mm wide pendulous tails; lobes including the tails 40–135 mm long. *Stamens* included for (0–)3–12.5 mm; filaments inserted at 7–13.5 mm from the base of the tube, straight or only slightly curved near the base, 3–5.5 mm long, densely pubescent inside, with inconspicuous ridges reaching the base of the tube; anthers 6.2–11.2 × 1.2–2.2 mm, glabrous; tails 0.6–1 mm long; acumen 1–4 mm long. *Pistil:* ovary 1.2–2.7 × 1.6–4 mm, darker and minutely puberulous in the upper half; style 9–17.5 mm long; clavuncula 1.9–3.7 × 1.3–2.7 mm; stigma minute. *Fruit:* follicles divergent at an angle of 180°, 10–28 cm long and 1.4–4.4 cm in diameter; exocarp brown or purple-brown, thick and hard, slightly sulcate, glabrous, sparsely to densely lenticellate. *Seeds:* grain 8–20 × 2–4 mm, densely pubescent; beak glabrous for 0–40 mm and bearing a coma for 11–40 mm; coma 22–105 mm long.

Distribution: Western and Central Africa.

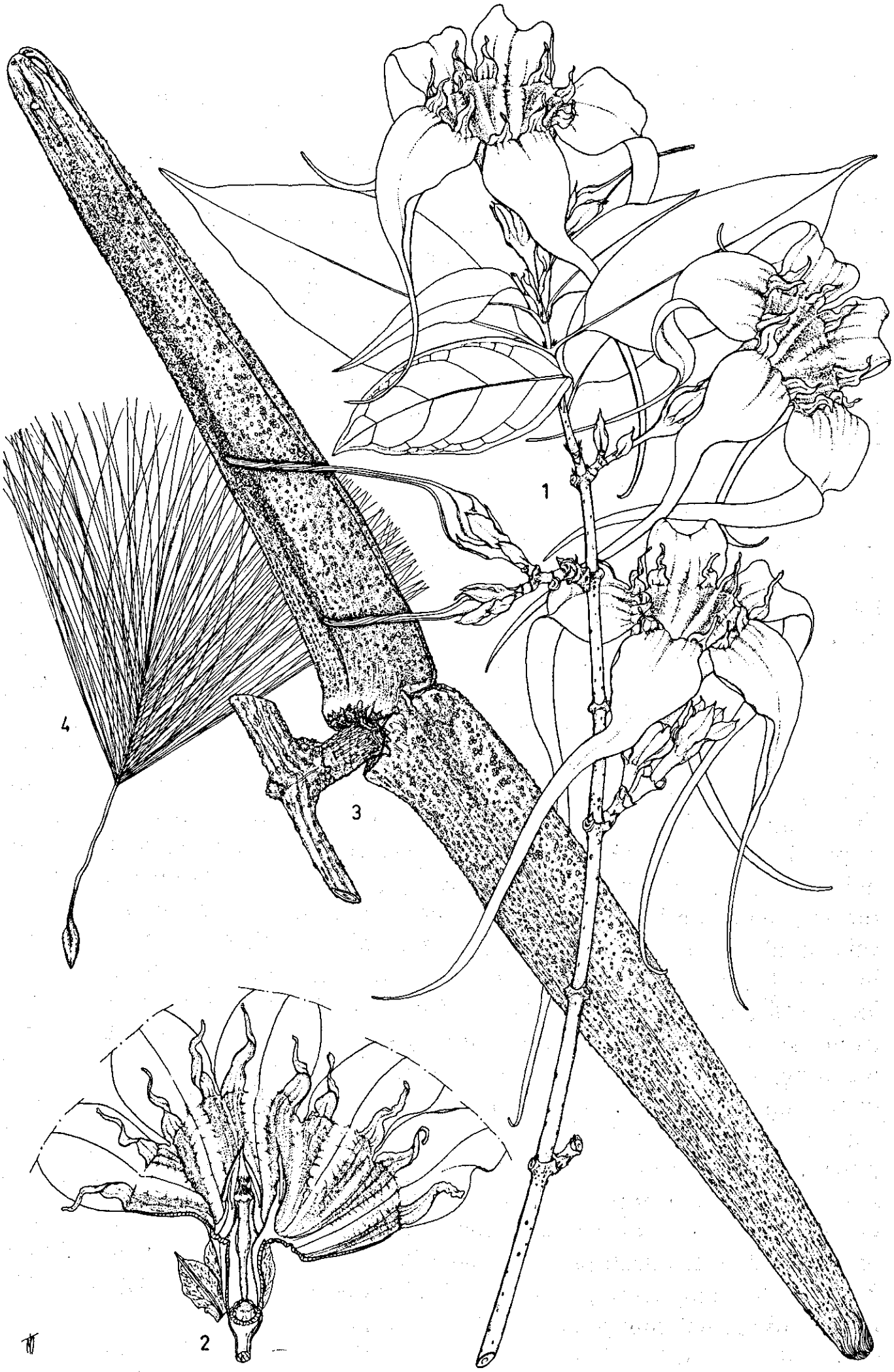


FIG. 36. *Strophanthus sarmentosus* DC. var. *sarmentosus*: 1. flowering branch, $\frac{2}{3}\times$; 2. opened flower, 1 ×; 3. fruit, $\frac{1}{2}\times$; 4. seed, $\frac{2}{3}\times$. (1. *de Gier 129*; 2. *de Koning 5390*; 3. *W. de Wilde* 494; 4. *W. de Wilde 673*).

Key to the varieties:

Leaf blade 1.2–2.5 (in long shoots up to 3.5) × as long as wide, rounded or cuneate at the base, papyraceous or thinly coriaceous; 3–6 pairs of secondary veins; tertiary venation very conspicuous beneath, densely reticulate; inflorescence, calyx, and at least the corolla lobes outside minutely puberulous; sepals 6.5–20 mm long; tube 1.3–3(–4) × as long as the calyx; follicle with a broad, obtuse apex, and 2.2–4 cm in diameter; beak of seed glabrous for 10–62 mm . . . . . var. **sarmentosus**

Leaf blade 1.9–4.3 (in long shoots up to 4.8) × as long as wide, cuneate at the base or decurrent into the petiole, coriaceous; 5–7(–9) pairs of secondary veins; tertiary venation conspicuous or not, loosely reticulate; inflorescence, calyx, and corolla outside glabrous; sepals 5–9 mm long; tube 3.2–5 × as long as the calyx; follicle with a narrow apex, and 1.4–1.9 cm in diameter; beak of seed glabrous for 0–2(–6) mm . . . . . var. **glabriflorus**

S. sarmentosus DC. var. **sarmentosus** **Fig. 36; Photo 5; Map 33**

S. sarmentosus DC. 1802: 123, fig. 1; A. P. De Candolle 1804: 3, fig. 1; G. Don 1837: 84; A. De Candolle 1844: 418; Franchet 1893b: 282; Stapf 1902: 180; Gilg 1903: 29; De Wildeman 1907: pl. 146; Hutchinson & Dalziel 1931: 49; Staner & Michotte 1934: 50; Chevalier 1950a: 1, Pl. 1 & 2; Krukoff & Letouzey 1950: 132; Schnell 1950: 588, pl. 24 & 25; 1960: nr. 119; Huber 1963: 70, fig. 215; Berhaut 1971: 439.

Type: Sierra Leone, sin. loc., *Smeathman* s.n. (G-DC, holotype; isotypes: BM, FI-W, P-JU, UPS).

Heterotypic synonyms: *S. laurifolius* DC. 1802: 123; 1804: 4, fig. 2; G. Don 1837: 85; A. De Candolle 1844: 418; Franchet 1893b: 285. Type: Senegal, sin. loc., *Sparrman* s.n. (G-DC, holotype).

S. pendulus Kumm. & Hook. 1825: 392, pl. C; A. De Candolle 1844: 419. Lectotype: icon. cit. Homotypic synonym: *S. sarmentosus* var. *pendulus* (Kumm. & Hook.) Pax 1892: 374 (partly, except for *Mann* 2241).

S. senegambiae A. DC. 1844: 418. Type: 'Senegambia', Heudelot s.n. (P, holotype; isotypes G, G-DC, FI-W, K, P). Homotypic synonyms: *S. sarmentosus* forma *senegambiae* (A. DC.) Chev. 1950a: 7, pl. 2; Monachino 1950: 281, syn. nov.

S. ogovensis Franch. 1893a: 319; 1893b: 284, pl. 15; Stapf 1902: 181. Type: Gabon, Ogooué R., Booué, *Thollon* 144 (P, lectotype; isotype: P).

S. paroissei Franch. 1893a: 320; 1893b: 290, pl. 15; Planchon 1894: 58. Type: Guinée, Labaya, *Paroisse* 95 (P, holotype; isotype: P). Homotypic synonym: *S. sarmentosus* forma *paroissei* (Franch.) Chev. 1950a: 7.

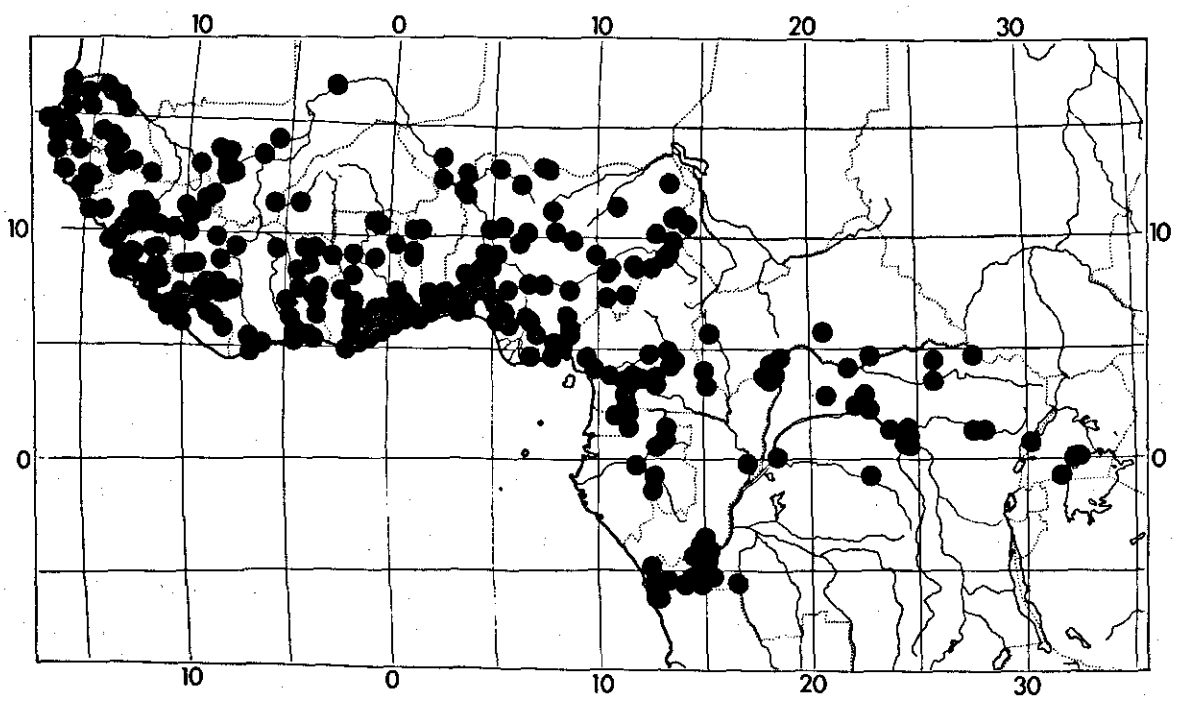
S. sarmentosus var. *major* Dewèvre 1894: 428. Type: Zaïre, Bas-Zaïre: Congo di Vanga along the railroad, *Laurent* s.n. (BR, holotype, not seen, presumably lost); neotype: Zaïre, Haute Zaïre: Yangambi, Isalowe For. Res., *Louis* 13648 (BR, neotype; isoneotypes: B, K, LISC, P).

S. sarmentosus var. *pubescens* Staner & Michotte 1934: 52 (except for the

leaves). Type: Zaïre, Haute Zaïre: Avakubi, *Bequaert* 2062 (BR, holotype).

S. punctiferus Chev. 1950b: 481, syn. nov. Type: Côte d'Ivoire, Vridi, *Miège & Aké Assi* 938 (UCJ, holotype; isotypes: NY, WAG).

Sarmentose *shrub*, 0.50–4 m high, or *liana*, 0.50–40 m long. *Leaves:* petiole 2–17(–21) mm long; blade dull or glossy and medium or dark green above, paler beneath, elliptic or ovate, 1.2–2.5 (or in long shoots up to 3.5) × as long as wide, 2–15 × 1.5–7 cm, acuminate at the apex (acumen 2–20 mm long), papyraceous or thinly coriaceous, with pellucid dots in the axils of the veins; 3–6 pairs of secondary veins; tertiary venation conspicuous, especially beneath. *Inflorescence* on long or short branches or in the forks, minutely puberulous in all parts; pedicels 2.5–12 mm long. *Calyx:* sepals 6.5–20 × 2–10.6 mm, minutely puberulous. *Corolla:* tube 1.3–3(–4) × as long as the calyx, minutely puberulous near the mouth inside (and sometimes near the mouth outside); lobes including the tails (40–)55–135 mm long, minutely puberulous on both sides. *Fruit:* follicles tapering into a broad and obtuse apex, (10–)13–28 cm long and 2.2–4.4 cm in diameter. *Seeds:* beak glabrous for 10–50(–62) mm and bearing a coma for 11–40 mm; coma (25–)33–105 mm long.



MAP 33. *Strophanthus sarmentosus* DC. var. *sarmentosus*

Distribution: Western and Central Africa.

Ecology: rain forest and gallery forest; in woodland confined to gallery forest and thickets; alt. 0–1400 m.

Flowers in Ghana and Cameroun from December to April; mature fruits mostly in December and January.

Local names: *Kouna(m)kala* (Guinée, Gambia); *Mamfohan* (Ghana: Twi and Ashanti languages); *Isha kekere, Ako isha* (Nigeria: Yoruba language); *Libobo li fufow* (Zaïre: Turumbu language; also used for other species).

PHOTO 5. *Strophanthus sarmentosus* DC. var. *sarmentosus*, part of stem with small flowering branchlets. (photograph H. C. D. DE WIT).

Local uses: seeds used for arrow poison in Togo, Nigeria, and the République Centrafricaine.

A selection of the ca. 700 specimens examined:

SÉNÉGAL: Mahan Vendou Waterhole, *Boudet* 3520 (P); Senegal R., Kouma, *Perrotet* 457 (BM, G, P, W); Sangalkam, *Berhaut* 3654 (P); between Linguere and Labgar, *Trochain* 924 (P); Ouri Sebo, *Fotius* 101 (P); Mare de Sill, *Trochain* 3679 (P); Djibonker, *Vandenberghen* 2061 (WAG); Kedougou, *Fotius* K 782 (P).

GAMBIA: Genieri, *Fox* 96 (K); sin. loc., Mungo Park s.n. (BM).

GUINÉE BISSAU: Bafata, between Banjara and Geba, Espíritu Santo 2979 (LISC, LISJC, WAG); Bissau, *Traun* anno 1908 (HBG).

GUINÉE: Tristao Isls., *Paroisse* 60 (P); Dubreka R., *Dybowski* 11 (P); Fouta Djallon, near Pita, *Langdale-Brown* 2580 (BR, K, WAG); Sigviri, *Chevalier* 288 (BM, BR, G, K, P); Faranna area, Sambadougou, *Chevalier* 20544 (P); between Macenta and Guekédou, *Roberty* 7169 (G, Z); Diaragouéla, *Chevalier* 482 (P, W); Banan, *Chevalier 523* (MPU, P).

MALI: Timbouctou area, Chimini-Banda, *Chudeau* 20 May 1909 (P); Nono, *Chevalier* 439 (P); Niametigeda, *Dekker* 412 (WAG); Sikasso Distr., Missirikoro Rocks, *Laferrere* 14 (K).

SIERRA LEONE: between Bandakarafaia and Sinekoro, *Jaeger* 4301 (K); Peninsula, Hastings, *Morton & Sesay* SL 675 (K, MO, WAG); Mano Bunjema, *Adames* 2 (K).

LIBERIA: Yéképa Div., old Mine Road, *Adam* 29958 (MO); Duport, 13 km E of Monrovia, *Bos* 2169 (BR, K, P, PRE, WAG); Grand Gedeh Country, Tchien, *Bos* 2824 (BR, K, P, WAG).

CÔTE D'IVOIRE: km 36, Odienné-Touba Road, *Katz & Schmutz* H 73 (K); 40 km SE of Korhogo, on the road to Ngolodougou, *Versteegh & den Outer* 491 (WAG); Comoé Nat. Park, Kakpin, *Geerling & Bokdam* 2125 (BR, LD, MO, PRE, WAG); km 17, Danané-Gbapleu Road, *Bamps* 2347 (BR, WAG); Ybel, *Roberty* 16663 (G); Bouroukrou, *Chevalier* 16919 (P); 5 km N of Sassandra, *Leeuwenberg* 2263 (K, WAG); Brafouedi, *Leeuwenberg* 2297 (BR, GC, K, LISC, MO, P, WAG).

HAUTE VOLTA: Bobo Dioulasso, *Bognounou* 246 (P).

GHANA: Tonga Plains of hilly Zuarungu, *Morton* GC 8927 (K, GC); N Ashanti country, Kintampo, *Dalziel* s.n. (C, E, M, PRE); Worawora, *Gati* 12 (GC); km 18, Kumasi-Bibiani Road, *Enti* FHI 7858 (BR, K, LISC, P); Dodowah, Aburi Road junction, *Irvine* 1500 (E, GC, K, MO); Essiama, *Morton* A 2495 (GC).

TOGO: Aledjo-Kadara, *Ern* 2787 (B); Lomé, near Badja, *Warnecke* 476 (BM, EA, K, P, PRE).

BÉNIN: near Boukombé, trail to Kundi, *Sanford* 6908 (MO); Adja Ouéré, *Le Testu* 266 (BM, P).

NIGER: Djerma, Dono, *Chevalier* 43242 (P); Sabou Birni, *Virgo* 7 (K).

NIGERIA, SOKOTO: Sokoto, *Lely* 825 (K). KADUNA: Daddara, near Katsina, *Meikle* 1479 (K); culvert 8/2 in Kaduna-Jos Road, *Meikle* 1211 (B, BR, K, P). BORNO: near Bida, *Lamb* 91 (K). NIGER: Kontagora, *Dalziel* 10 (K). GONGOLA: Muvi Div., Gangoro For. Res., *Chatman* 4263 (BM, FHO). OYO: km 28, Ibadan-Ife Road, *Meikle* 934 (B, BR, K, P). KWARA: Lokoja, *Lugard* 29 July 1907 (K); ANAMBRA: Nnewi, *Kitson* 5 Jan. 1909 (BM, K, MO). CROSS R.: Old Calabar, *Mann* 2241 (A, LE, U, W).

CAMEROUN: 17 km N of Mokolo, *Geerling & Nene* 4981 (WAG, YA); Mts. Alantika, Saptou, *Letouzey* 3230 (P, YA); Kumba, *Krukoff* 046 (NY); 9 km SW of Yaoundé, *Breteler* 901 (BR, K, LISC, M, P, WAG, YA); Ndjangané, NE of Nanga-Eboko, *Leeuwenberg* 7421 (BR, L, MO, P, WAG); Yola, *Baldwin* 13965 (K, MO, NY, UC); Ambam, near Medjunu, *Krukoff & Letouzey* 147 (NY, P, YA).

RÉPUBLIQUE CENTRAFRICAINE: Bewiti, *Descoings* 12688 (P); Boukoko, *Tisserant* 1600 (BM, P); Ngerongu R., 15 km N of Bambari, *Tisserant* 978 (BM, P).

EQUATORIAL GUINEA, RIO MUNI: Nkolentanga, *Tessmann* 149 (K).

GABON: Oyem, *Le Testu* 9482 (BM, LISC, P); Belinga, *N. Hallé & le Thomas* 427 (P); Counda or Konda, Le Testu 8735 (BM, LISC, P); Booué, *Thollon* 746 (P; paratype of *S. ogovensis*).

CONGO: Bouenza R. Forest, near M'Bamou, *Bouquet* 754 (P); Sangha R. bank, *Pobeguin* 177 (P).

ANGOLA, CABINDA: Buco Zan, *Gossweiler* 6791 (BM, LISJC, LISU); Sumba, Peco, *Gossweiler*

9103 (A, BM, K, US).

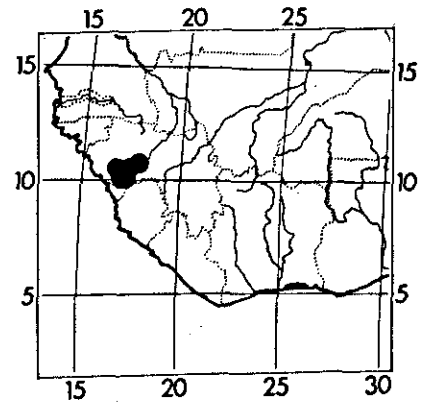
ZAIRE, EQUATEUR: Yambata, *de Giorgi* 1668 (BR, K, NY); Eala, *Laurent* 2840 (BR); Mondombe-sector, *Jespersen* 34 (BR). HAUTE ZAÏRE: Bambesa, *Gérard* 5397 (BR); Isalowe For. Res., Yangambi, *Louis* 13648 (B, BR, K, LISC, P; neotype of *S. sarmentosus* var. *major*); Ituri R., *Bequaert* 2355 (BR). BAS-ZAÏRE: Mvuazi, Mankondo Forest, *Devred* 846 (BR, K). BANDUNDU: Popokabaka Terr., Tsaka, *Pauwels* 4194 (WAG).

UGANDA, U2: Toro Distr., Bwamba Forest, *Greenway & Eggeling 7061* (K, PRE); Mawokoto, Kionsozi forest, *Dawe* 20 (K).

Cultivated: KENYA, Nairobi, *Garden B.* 2451 (EA); TANZANIA, Amboni near Tanga, *Markwalder* B 11337 (EA); SWITZERLAND, Genève, *Zaipoh Do* 666 (G); THE NETHERLANDS, Wageningen, *Beentje* 1621 (WAG); INDONESIA, Bogor, *Schuurman* 132H (L); U.S.A., Mayaguez (PR), *PI* 199225 (MO, NY); PANAMA, Summit Gardens, *Nee* 11385 (AAU, MO, NY); CUBA, Cienfuegos, *Jack* 7639 (NY, S); JAMAICA, Kingston, *Gagzo* anno 1905 (HBG); TRINIDAD, St. Clair, *Broadway* April 1908 (L).

S. sarmentosus var. glabriflorus Monach. 1951: 479. **Fig. 37; Map 34**
Type: Guinée, near Kindia, *Pobeguin* 1288 (P, holotype; isotypes: P).
Homotypic synonym: *S. glabriflorus* (Monach.) Monach. 1953: 412, syn. nov.

Sarmentose *shrub*. *Leaves:* petiole 3–9 mm long; blade elliptic or rarely slightly obovate, 1.9–4.3 (in long shoots up to 4.8) × as long as wide, 4.5–10 × 1.5–4 cm, acuminate at the apex (acumen 3–7 mm long), coriaceous, without pellucid dots; 5–7(–9) pairs of secondary veins; tertiary venation sometimes conspicuous. *Inflorescence* on long branches or in the forks, glabrous in all parts; pedicels 10–12 mm long. *Calyx:* sepals 5–9 × 2.2–3.3 mm, glabrous. *Corolla:* tube 3.2–5 × as long as the calyx, glabrous outside and pubescent inside; lobes including the tails 40–54 mm long, glabrous outside and puberulous or pubescent near the base inside. *Fruit:* follicles tapering towards a narrow apex and ending in an obtuse tip, 12.5–17.5 cm long and 1.4–1.9 cm in diameter. *Seeds:* beak glabrous for 0–2(–6) mm and bearing a coma for 15–18 mm; coma 22–30 mm long.



MAP 34. *Strophanthus sarmentosus* var. *glabriflorus* Monach.

Distribution: Guinée, Fouta Djallon.

Specimens examined:

GUINÉE: Kindia, *Pobeguin* 1288 (P; type); Kaffima R. bridge on the road from Télimélé to Kindia, *Pitot* 762 (NY), 763 (NY); Poredaka, *Maclaud* 6 March 1902 (P); between Friguiagbé and Bambaya, *Pobeguin* 28 (P); Friguiagbé, *Chillon* 462 (P); Kolé, *Lisowski* 51555 (BR); sin. loc., *Pobeguin* s.n. (P); unknown loc.: Gare de la Lanfofomé, *Pobeguin* 905 (P).

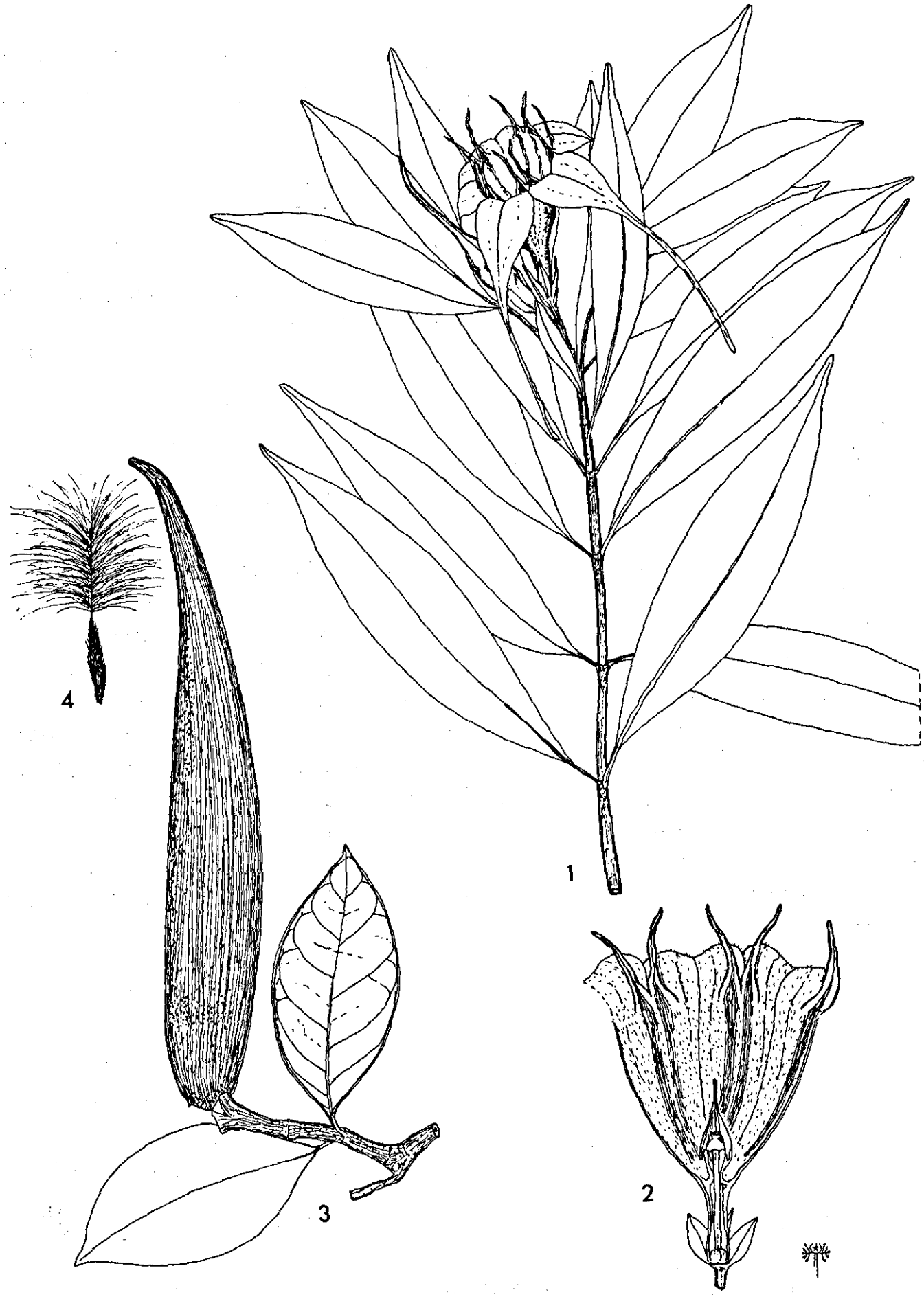


FIG. 37. *Strophanthus sarmentosus* var. *glabriflorus* Monach.: 1. flowering branch, $\frac{2}{3}\times$; 2. section of flower, 2 ×; 3. fruit, one follicle removed, $\frac{2}{3}\times$; 4. seed, $\frac{2}{3}\times$. (1. *Pobeguin 1288*; 2. *Maclaud s.n.*; 3. *Pobeguin 905*; 4. *Pitot 763*).

Notes: the type of *S. punctiferus* is a *S. sarmentosus* with very short corolla lobes, and is reduced here to a synonym. *S. sarmentosus* forma *senegambiae* can also not be maintained; and *S. glabriflorus* is reduced to its former status of variety, as the differences with *S. sarmentosus* proper are too slight to warrant specific status, but enough to distinguish it as a related variety.

Cultivated *S. sarmentosus* specimens have reached ages of over 55 years.

31. S. singaporianus (Wall. ex G. Don) Gilg 1903: 11. **Fig. 38; Map 35**

Basionym: *Cercocoma singaporiana* Wall. ex G. Don 1837: 83; A. De Candolle 1844: 432; Miquel 1856: 445.

Type: Singapore, *Wallich* 1623 (K-WALL, holotype).

Heterotypic synonyms: *S. brevicaudatus* Wight 1848: pl. 1302; Kurz 1877b: 191; Hooker f. 1882: 656; Reber 1887: 295; Franchet 1893b: 259; Ridley 1923: 356. Type: locality not certain, possibly Burma: Mergui, *Wight* s.n. (K, holotype).

S. singaporianus var. *singaporianus* forma *hirtellus* Monach. 1951: 479, syn. nov. Type: Malaysia, Sarawak: Bangarmassing, *Motley* 760 (K, holotype).

Shrub or small *liana*, 2–3.5 m high. *Branches* dark brown, (very) densely lenticellate; branchlets medium brown, glabrous. *Leaves:* petiole 5–13 mm long, with 2 outer and 2–4 inner axillary colleters; blade ovate or elliptic, 1.7–2.8 × as long as wide, 3.5–13 × 1.2–6.2 cm, rounded or cuneate at the base, abruptly acuminate at the apex (acumen 7–16 mm long, acute), sometimes undulate at the margin, papyraceous, glabrous or rarely minutely puberulous; 5–9 pairs of curved secondary veins at an angle of 45–65° with the midrib; tertiary venation sometimes conspicuous. *Inflorescence* on long or short branches or in the forks, 3–80-flowered (1–10 flowers open at a time), pedunculate, lax, sometimes with reduced branches, glabrous or rarely puberulous in all parts; peduncle (4–)13–38 mm long, densely lenticellate; branches 9–75 mm long; pedicels 2–4.5 mm long; bracts erect or spreading, ovate, 1.5–5 × 1–2 mm, acute, sepal-like. *Calyx:* sepals equal, purple-maroon, ovate, 1.1–1.3 × as long as wide, 1.5–3.2 × 1.5–2.5 mm, acute or shortly acuminate, subscarious, glabrous or rarely sparsely puberulous; with 10 colleters per calyx, equally distributed over all sepals or concentrated on the inner. *Corolla:* tube 1.7–4.3 × as long as the calyx, yellow at the base and reddish, turning purple, at the mouth outside, 5–10 mm long and widening at 60–90% of its length into a shallowly cup-shaped upper part, at the mouth 3.5–6 mm wide, glabrous outside and puberulous inside; corona lobes presumably white, narrowly triangular, 1.8–4 × 0.6 mm, acute, glabrous; corolla lobes reddish or purple on both sides, often with the left margin yellow; lobes presumably spreading, ovate, 4–8.5 × 2.6–4 mm, acuminate or apiculate, glabrous. *Stamens* 1.5–4.5 mm exserted; filaments inserted at 3.2–6.5 mm from the base of the tube, straight, with a small abaxial swelling near the base, 0.6–1.2 mm long, pubescent, with 1.4–3 mm long fleshy ridges ending at base in an obtuse spur; anthers 4.3–4.8 × 0.8–0.9 mm, glabrous; tails 0.2–0.8 mm long; acumen 1.8–2 mm long. *Pistil:* ovary 0.8–1.5 mm high,

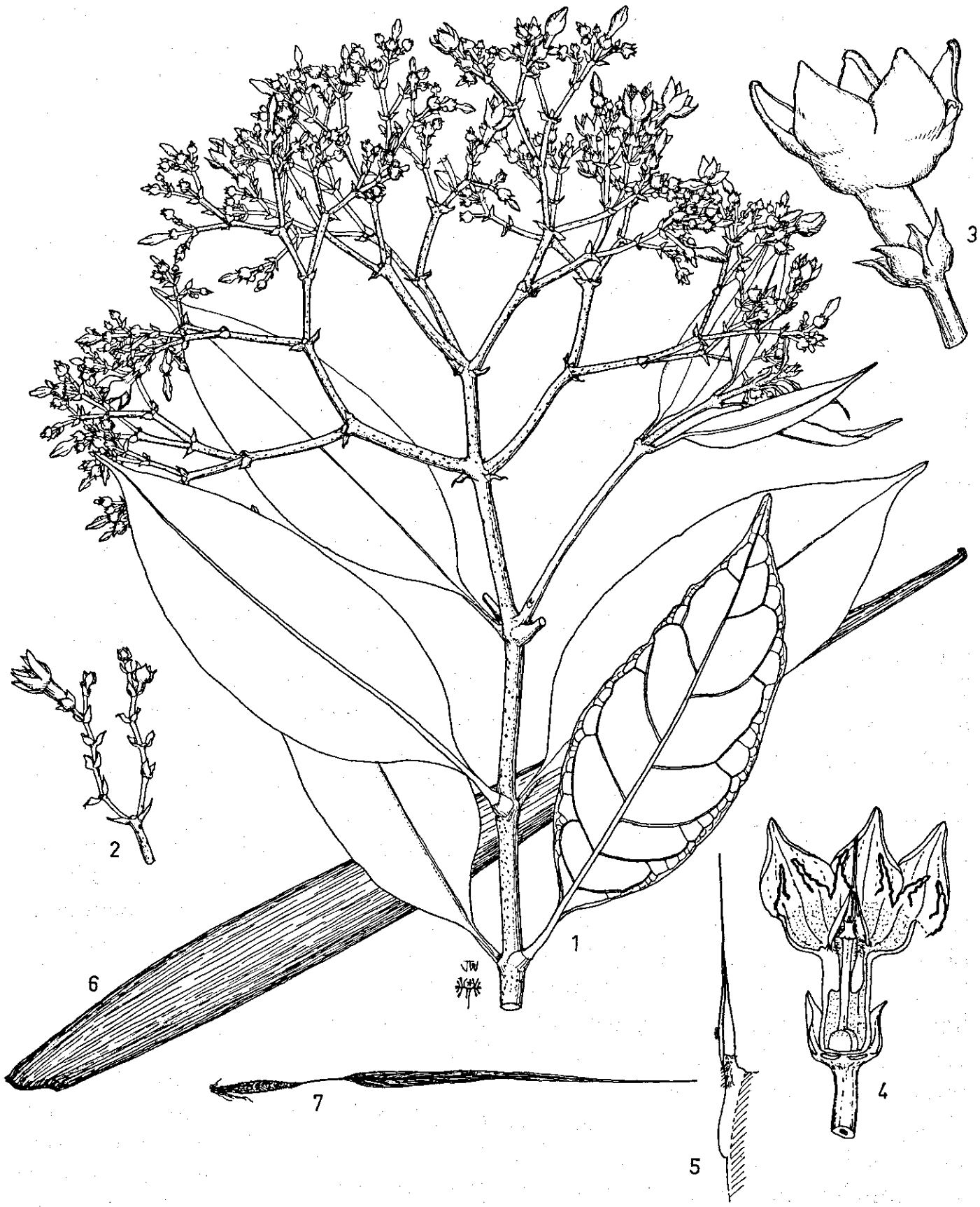
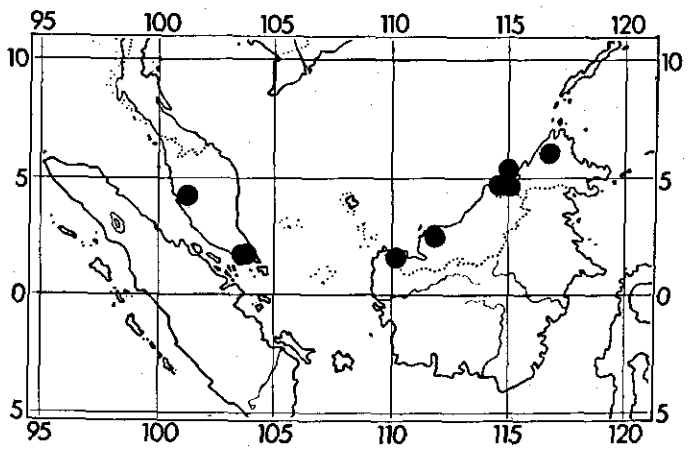


FIG. 38. *Strophanthus singaporianus* (Wall. ex G. Don) Gilg: 1. flowering branch, $\frac{2}{3}$ ×; 2. inflorescence with reduced branches, $\frac{2}{3}$ ×; 3. flower, 3 ×; 4. section of flower, 3 ×; 5. side view of stamen, 6 ×; 6. follicle, $\frac{2}{3}$ ×; 7. immature seed, $\frac{2}{3}$ ×. (1. *Motley 25*; 2. *van Niel* 4637; 3–5. *Motley 25*; 6–7. *Maingay 1072*).

glabrous or rarely minutely puberulous; style 3.4–6.8 mm long; clavuncula 0.6–1 mm high; stigma 0.5 mm long. *Fruit:* follicles divergent at an angle of 180°, long-tapering into a narrow apex and curved inwards at the tip, 15–21 cm long and 1.5–2.3 cm in diameter; exocarp rather thin, slightly sulcate, glabrous, not or sparsely lenticellate. *Seeds:* grain 15–20 × 1.5–3 mm, densely puberulous or pubescent; beak glabrous for 3–12 mm and bearing a coma for 15–38 mm; coma 58–70 mm long.



MAP 35. *Strophanthus singaporianus* (Wall. ex G. Don) Gilg

Distribution: Malacca, Singapore, and NW Borneo.
Ecology: not clear, possibly associated with rivers.

Specimens examined:

MALAYSIA, MALACCA PENINSULA: sin. loc., *Maingay* 1072/1838 (K, L); sin. loc., *Griffith in herb. Martius* anno 1845 (BR); Bruang, *anonym.* 528 (CAL, SING). SARAWAK: Kampong Bundu, *Goklin For. Dept.* 2731 (A, K, L); Labuan Isl., *Motley* 25 (K); Belait Distr., Belait R., *van Niel* 4637 (HBG, L, Z); Bangarmassing, *Motley* 760 (K; type of *S. singaporianus* forma *hirtellus*); Rejang, Sibu, Kalong, *Haviland* 134/1770 (A, BM, K, L); Kuching, *Haviland & Hose* 22992 (K); ibid., Batu Kinyang, Batu Lintang, *Sinclair* 5639 (E, K); sin. loc., *Beccari* 797 (K, LE).

SINGAPORE: Sungei Pandan, km 14 on West Coast Road, *Sinclair* 6826 (E, L, P); Punggol, *Ridley* s.n. (BM); Holland Road, *Ridley* 6702 (SING); Balestier Plain, *Ridley* 9149 (BM, CAL); sin. loc., *Ridley* 1830 (Z), 6040 (K); sin. loc., *Cantley* 1830 (SING), 2675 (SING), s.n. (SING); sin. loc., *Kurz* s.n. (CAL); sin. loc., *Kings coll.* 1191 (K); sin. loc., *Dorward in herb. Wight* s.n. (K); sin. loc., *Wallich herb.* 1623 (K-WALL; type).

Loc. incert.: ? Mergui, *Herb. Wight* s.n. (K; type of *S. brevicaudatus*)

Notes: MONACHINO (1951) described a new forma based on a single specimen showing some indumentum on the inflorescence. This forma is here reduced to a synonym.

WIGHT (1848) is unsure about the location of the type of *S. brevicaudatus*; Mergui would be rather far from the presently known distribution area, but not improbably so.

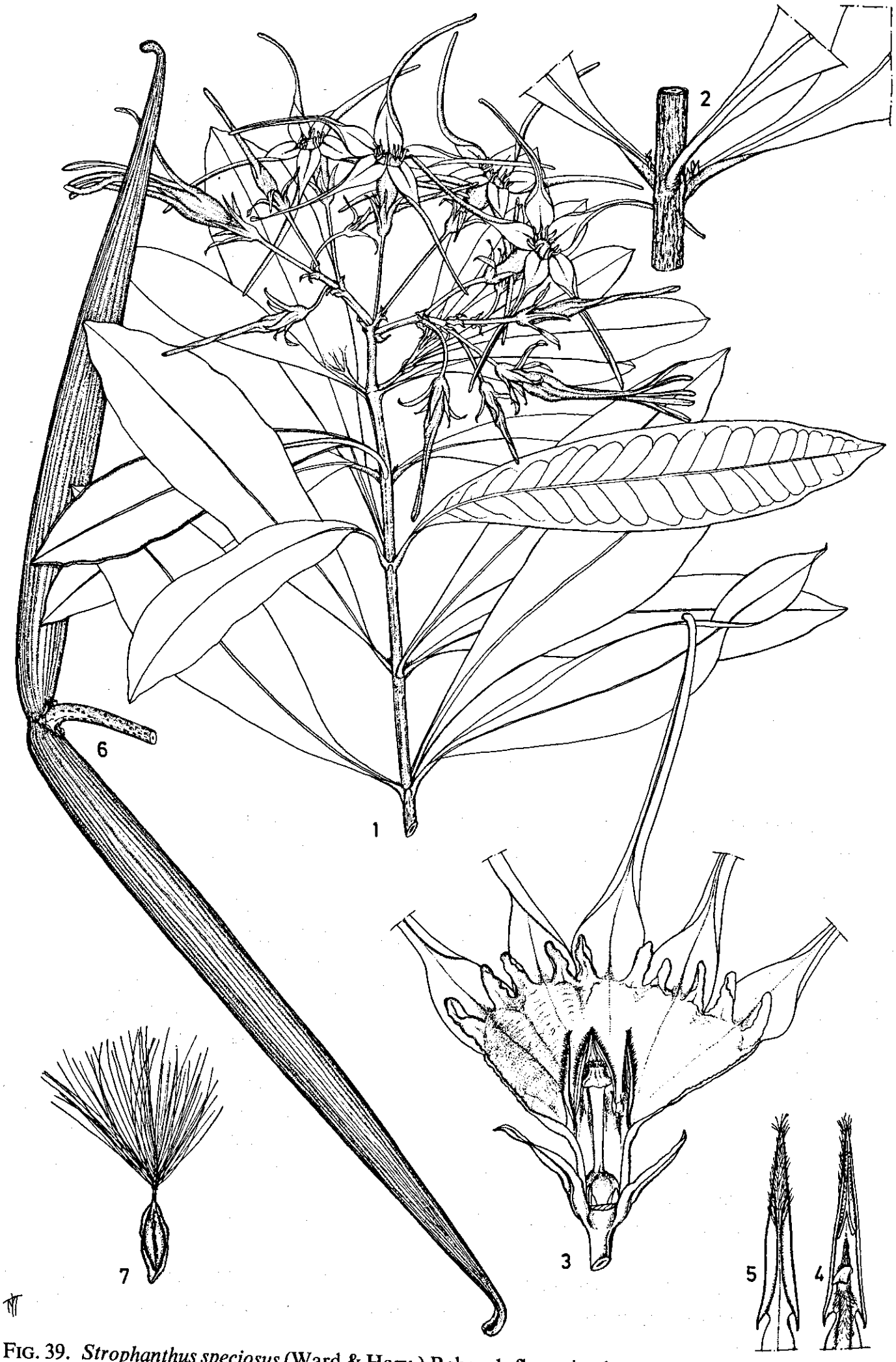


FIG. 39. *Strophanthus speciosus* (Ward & Harv.) Reber: 1. flowering branch, $\frac{2}{3}\times$; 2. node of branch with petioles showing colleters, 2 ×; 3. opened flower, 2 ×; 4. adaxial side of stamen, 6 ×; 5. abaxial side of stamen, 6 ×; 6. fruit, $\frac{2}{3}\times$; 7. seed, $\frac{2}{3}\times$. (1. *Pegler 915*; 2. *Strey 5920*; 3–5. *Phillips s.n.*; 6. *Moll 3540*; 7. *Jones 50*).

32. S. speciosus (Ward & Harvey) Reber 1887: 299; Pax 1892: 376; Franchet 1893b: 287; Gilg 1903: 34 (excl. herb. *Ecklon & Zeyher*); Stapf 1907: 511; Wood 1911: pl. 555; Marloth 1932: pl. 18; Codd 1963: 293, fig. 42; Palgrave 1977: 797. **Fig. 39; Photo 6; Map 36**

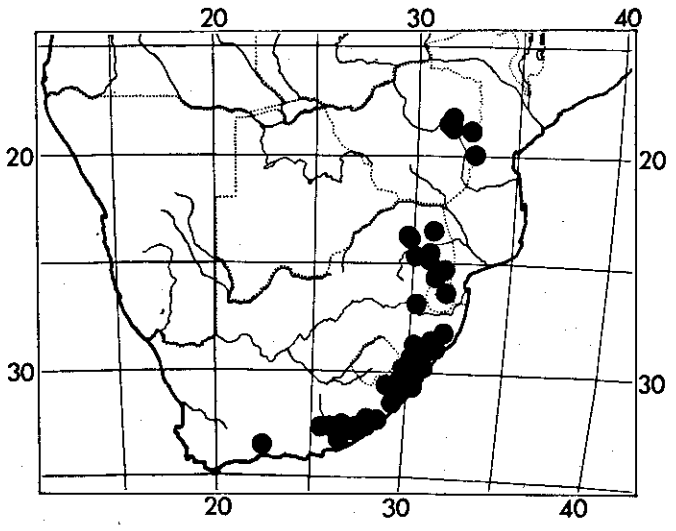
Basionym: *Christya speciosa* Ward & Harvey 1842: 134, pl. 21 (excl. herb. *Ecklon & Zeyher*); A. De Candolle 1844: 416; Pichon 1949: 62; Pichon 1950: 62.

Type: S. Africa, E Cape: Katrivier, *Bartels* s.n. (TCD, holotype; isotype: SAM).

Heterotypic synonym: *S. capensis* A. DC. 1844: 419; Hooker f. 1868: pl. 5713; Reber 1887: 299. Type: S. Africa, E Cape, *Krebs* 236 (G-DC, holotype; isotypes: G, HAL, LE, OXF, Z).

Shrub, 1–4 m high, or *liana*, up to 16 m high, presumably evergreen; latex clear or white. *Trunk* up to 3 cm in diameter, branching trichotomously; branches rather densely lenticellate; branchlets glabrous. *Leaves* ternate, rarely opposite or quaternate; petiole 2–12 mm long, with 5 colleters adaxially near the base; blade glossy and medium or dark green above, dull and paler beneath, narrowly elliptic or slightly obovate, 2.5–6 (–9) × as long as wide, 2.2–11.5 × 0.6–3.4 cm, decurrent into the petiole, acute, acuminate, or rarely rounded at the apex (acumen 1–6 mm long), often with a slightly revolute margin, coriaceous or thinly so, glabrous; 6–19 pairs of straight secondary veins at an angle of 60–80° with the midrib; tertiary venation sometimes conspicuous. *Inflorescence* on long branches or in the trichotomous forks, 3–26-flowered (1–2 flowers open at a time), pedunculate, congested, glabrous in all parts or puberulous in some; peduncle 3–16(–23) mm long, lenticellate; branches 2–30(–60) mm long; pedicels 6–21 mm long; bracts soon deciduous, narrowly ovate, 1.5–10.5 × 1–2.2 mm, acute, sepal-like. *Calyx:* sepals subequal, the outer ones wider than the inner, pale green, narrowly ovate, 2.5–8.5 × as long as wide, 3–14.5 × 1.2–2(–2.7) mm, acute, with some hairs near the apex or puberulous all over; with 2–4 colleters per sepal, colleters sometimes forked. *Corolla:* tube (0.8–)1–3 × as long as the calyx, yellow and turning orange on both sides, outside white near the base, inside red-streaked, (6.5–)9–14 mm long and widening at 30–50% of its length into a cup-shaped upper part, at the mouth 5.5–11 mm wide, minutely puberulous near the apex outside, minutely papillose inside; corona lobes white, subulate, 1.8–4.9 × 1–2.2 mm, acute or obtuse, fleshy, minutely papillose; corolla lobes yellow on both sides and with a red spot near the base, tails yellow; lobes ovate, 2–6 × 3–5 mm, gradually narrowing into the 1–1.5 mm wide spreading tails; lobes including the tails 19–50 mm long, puberulous outside and sometimes also near the base inside. *Stamens* included for 0–3.5 mm; filaments inserted at 4–6.5 mm from the base of the tube, straight, 0.5–0.8 mm long, pubescent inside, with (0.6–)1.2–2 mm long fleshy ridges obtuse at their base; anthers 3.4–6 × 0.4–1 mm, pubescent in the upper third or for more than half of their length; tails 0.2–0.7 mm long; acumen 0.9–2.5 mm long. *Pistil:* ovary 0.8–1.8 × 1.2–2.1 mm, puberulous; style 3.9–5.5 mm long; clavuncula

0.8–1.6 × 0.7–1.9 mm, pubescent at the apex; stigma minute. *Fruit* 1, or occasionally 2, in a single infrutescence; follicles divergent at an angle of (60–)100–230°, tapering towards the narrow apex and ending in a minute knob, with the extreme tip sometimes curved inwards, (7–)10–22 cm long and 0.7–1.5 cm in diameter; exocarp rather thin, hard, smooth or slightly sulcate, glabrous, not lenticellate. *Seeds:* grain 13–22 × 2–4.5 mm, densely puberulous; beak glabrous for 0–2 mm and bearing a coma for 7–15 mm; coma 22–43 mm long.



MAP 36. *Strophanthus speciosus* (Ward & Harvey) Reber

Distribution: Zimbabwe, S. Africa, Swaziland.

Ecology: forest, often on margins; alt. (300–)900–1500(–1800) m.

Flowers: towards the end of the dry and the beginning of the rainy season; mature fruits throughout the year, with a peak in the dry season.

A selection of the ca. 150 specimens examined:

ZIMBABWE: Wedza Mt., *Wild* 6340 (K, LISC, PRE, SRGH); Vumba Mts. near Umtali, *Obermeyer* 2038 (PRE); Tarka For. Res., Mt. Peni Gwasha, *Goldsmith* 1/72 (SRGH).

S. AFRICA, TRANSVAAL: Letabe Distr., de Hock Forest, *Schweickert* 1671 (B, K); Pietersburg Distr., Haenertsburg, *Pott* 4582 (PRE); Soutpansberg Distr., Houtboschberg, *Burtt-Davy* 5081 (FHO, PRE); Mariepskop Distr., Magalieskop For. Res., *van der Schijff* 6274 (PRE); Mt. Sheba Forest, *Jones* 50 (PRE); Pedlarsbush SE of Barberton, *Thorncroft* s.n. (PRE). NATAL: Dronk Vlei, *Fernando in herb. Medley-Wood* 9926 (BOL, NH, PRE); Indevu Forest, *Davis* 5 (CAL, K); Qudeni Forest, *Bayer* 828 (E, K, MO, PRE); Utrecht, Kaffir Drift, *Thode* A 238 (K, NH, PRE); Nkandhla Forest, *Codd* 6970 (K, PRE); Eshowe, *Thode* A 1249 (K, NH, PRE, US); Hlinza Forest, *Lawn* 1715 (NH); Umvoti Distr., Bachfontein, *Bayer* 1502 (E, MO); 24 km NW of New Hanover, *Codd* 1469 (PRE); Benvie, Karkloof, *Medley-Wood* 10048 (BOL, BP, K, M, NH, PRE, SAM); Piemburg Distr., Winterskloof, *Smith* 14 Okt. 1945 (K, PRE); Byrne, *Galpin* 11896 (PRE); Richmond, *Medley-Wood* 11740 (BOL, L, NH, PRE, SAM, W, Z); Evungu Kloof, *Strey* 5920 (K, NH, PRE). E CAPE: Flagstaff Distr., Ndindindi Forest, *Forest Dept.* 6119 (PRE); 1 km W of Weza turnoff on Umzionkulu-Kokstad Road, *Killick & Marais* 2019 (K, MO, NH, PRE); Isibosdo Forest, *Miller* 4079 (PRE); Alexandra Distr., Dumisa, *Rudatis* 1680 (BR, G, HBG, L, M, P, PRE, W, Z); between Flagstaff and Lusikisiki, *Acocks* 1934 (K, PRE, S); Port St. Johns area, *Strey* 10195 (K, NH, PRE, WAG); Kentani Distr., *Pegler* 915 (BOL, K, PRE, SAM, W, Z); near Fort Cunynghame, *Bolus* Jan. 1896 (MO); near Komgha, *Flanagan* 1375 (BOL, PRE, SAM); Stutterheim Distr., *Acocks* 9334 (K, PRE); Hogsback, *Bayliss* 5297 (A, BR, LD, MO, WAG); Stockenström Distr., Mt. Katberg, *Scully* 761 (A, BM, BOL, G, K, P, SAM, UPS, W, ZT); Kagaberg Forest, *Mrs. Wood* s.n. (PRE).

PHOTO 6. *Strophanthus speciosus* (Ward & Harvey) Reber, flowering branch. – *Leeuwenberg 10893* (photograph A. J. M. LEEUWENBERG).

SWAZILAND: Hlatikulu Distr., *Compton* 28160 (K, PRE, SAM); sin. loc., *Stewart* 8961 (BOL, L, PRE).

Cultivated: THE NETHERLANDS, Wageningen, *Beentje* 1619 (WAG); AUSTRALIA, Brisbane, *White* 8649 (K); U.S.A., New York, *Taylor* PI 11750 (NY).

Notes: PICHON (1949) reinstated the monotypic genus *Christya,* based on this species. I agree with CODD (1963) that this is not justified, and I can add to his remarks that the seed beak may be partly glabrous.

CODD also remarks that the plants collected in the Southern part of the area of this species show shorter leaves, while the sepals are longer, than those of plants collected in the Northern part of the distribution area. Moreover, the sepals of the former are pubescent, and those of the latter are nearly glabrous.

MARLOTH (1932) reports the butterfly *Danais chrysippus* as a pollinator on a *S. speciosus* cultivated at Cape Town; this butterfly also occurs in the distribution area of *S. speciosus.*

FIG. 40. *Strophanthus thollonii* Franch.: 1. flowering branches, $\frac{2}{3}\times$; 2. bud, 1 ×; 3. section of flower, 1 ×; 4. fruit, one follicle removed, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$. (1–3. *Beentje 1551*; 4–5. *Krukoff & Letouzey 175*).

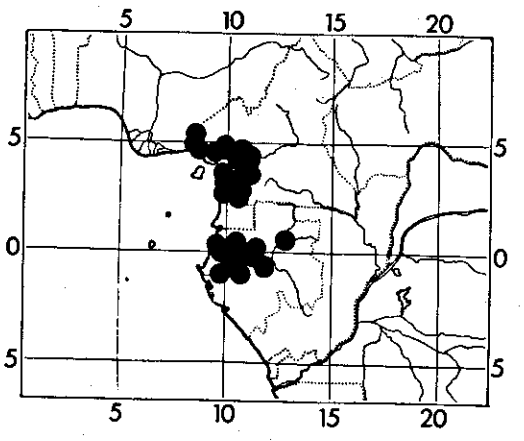
33. S. thollonii Franch. 1893a: 299 (partly, except for Thollon 1); 1893b: 257, pl. 8; Stapf 1902: 171; Gilg 1903: 19, pl. 9; Hutchinson & Dalziel 1931: 47; Krukoff & Letouzey 1950: 128; Huber 1963: 70. **Fig. 40; Map 37**

Type: Gabon, Ogooué R., between Apingi and Obombi, *Thollon* 762 (P, lectotype).

Heterotypic synonym: *S. pierreanus* De Wild. 1903: 102, pl. 30. Type: Gabon, Ogooué R., *Chalot* 18 (BR, holotype; isotype: P).

Liana, 3–20 m high, evergreen; latex clear or white. *Trunk* up to 5 cm in diameter, bark grey; branches dark maroon-brown or blackish, sparsely or densely lenticellate; branchlets pale or dark brown, glabrous. *Leaves:* petiole 2–13 mm long, with 2 outer and 2–4 inner axillary colleters; blade shiny and medium or dark green above, dull and pale yellowish-green beneath, narrowly elliptic or obovate, 1.5–4.6 × as long as wide, 3–17.5 × 1–7.5 cm, cuneate or rarely rounded at the base or decurrent into the petiole, acute or acuminate at the apex (acumen up to 13 mm long), with a slightly revolute margin, coriaceous, glabrous, with translucent dots; 4–9 pairs of more or less curved secondary veins at an angle of 35–45° with the midrib; tertiary venation inconspicuous. *Inflorescence* on long or short branches or in the forks, 1–2(–5)-flowered (1 flower open at a time), sessile or pedunculate, congested, glabrous in all parts; peduncle – if present – up to 4 mm long; branches 0–10(–18) mm long; pedicels 2–10 mm long; bracts often deciduous, ovate or narrowly triangular, 1.5–12 × 1–3 mm, acute, scarious. *Flowers* sometimes fragrant. *Calyx:* sepals unequal, the inner much larger than the outer, pale green and sometimes with a reddish margin and apex, elliptic or narrowly so, 1.8–3.1(–5) × as long as wide, (8–)10–26 × 3.5–9 mm, acute or acuminate, glabrous; with 2–8 colleters on each inner sepal. *Corolla:* tube 1.3–2.5 × as long as the calyx, white and turning yellow at the base outside, pink and turning purple in the upper part outside, white and red- or purple-streaked inside, the white turning yellow, 24–38 mm long and widening at 45–57% of its length into a cylindrical or cup-shaped upper part, at the mouth 11–22 mm wide, glabrous on both sides; corona lobes pink and turning purple in the centre, with white margins and apex, the white turning yellow, narrowly triangular and sometimes undulate, 10–27 × 2.3–4 mm, acute, somewhat fleshy, sparsely pubescent; corolla lobes dark pink or purple outside, white and turning yellow inside, ovate, 1.5–3 × as long as wide, 18–41 × 10–18.5 mm, acute or slightly acuminate, glabrous on both sides. *Stamens* 9.5–18 mm exserted; filaments inserted at 14.5–21 mm from the base of the tube, straight, 2.3–4.6 mm long, pubescent inside, with 6–9 mm long ridges; anthers 22–30 × 1.5–2.8 mm, glabrous; tails 1.5–1.8 mm long; acumen 12.5–19.5 mm long. *Pistil:* ovary (1.2–)2–3.2 × 1.8–3.2 mm, glabrous; style 17–23 mm long; clavuncula 2.5–3.3 × 1.4–2.5 mm; stigma 0.4–0.7 mm long. *Fruit:* follicles divergent at an angle of 140–180°, long-tapering into the narrow apex and sometimes curved inwards at the tip, 18–46.5 cm long and 1.6–2.6 cm in diameter; exocarp dark maroon-brown or blackish-purple, rather thin and hard, smooth or slightly sulcate, glabrous, rather densely lenticellate. *Seeds:*

grain 15–24 × 2–3 mm, densely short-pubuscent; beak glabrous for 1.5–15 mm and bearing a coma for 12–21 mm; coma erect, spreading, or reflexed, 22–42 mm long.



MAP 37. *Strophanthus thollonii* Franch.

Distribution: Nigeria (Cross River) to Gabon.

Ecology: on river banks in the forest; alt. 0–320 m.

Flowering all year, with a peak from November to January, mature fruits from December to January.

Local names: *Iné, Onayé* (Gabon, Fang language, as for *S. gratus*).

A selection of the ca. 100 specimens examined:

CAMEROUN: Massaka 1, Uve R., 20 km WNW of Kumba, *Letouzey* 14492 (P); Rio del Rey, *Johnston* 44 (K); Cameroun R., *Mann* 2222 (A, K, P; paratype); Dibombé R. left bank, near bridge in Loum-Solé Road, *Leeuwenberg* 9724 (WAG); Loum, *de Wit* 8125 (WAG); Eboné, km 11 on Nkongsamba-Douala Road, *Bamps* 1509 (BR, YA); Banouyé R. left bank near confluence with Fangué R., *Leeuwenberg* 9119 (WAG); Liwa R. near Keling, 60 km SSW of of Bafia, *Letouzey* 9817 (BR, K, P, WAG, YA); Nyong R. near Eséka, *Krukoff & Letouzey* 190 (NY, P, YA); Kélé R., 30 km WNW of Eseka, *W. de Wilde et al.* 1457 (B, BR, GENT, K, MO, P, PRE, WAG, YA, Z); Nbam R., 40 km from Ndikinimeki, *de Wit* 8124 (WAG); Lokoundje R. near Ebéa, 26 km N of Kribi, *Leeuwenberg* 5606 (BR, WAG); Kienke R. above Mboa-Manga bridge at Kribi, *Bos* 4843 (WAG, YA); Lobé R. ferry in Kribi-Campo Road, *Bates* 343 (BM, G, K, Z); ibid., *Beentje* 1551 (WAG, YA); Bipindi, *Zenker* 1148 (BM, E, G, GOET, HBG, K, L, LE, M, MO, P, PRE, S, W, WU, Z); ibid., near Mimfia, Lokoundje R., *Zenker* 2300 (BM, BR, E, G, GOET, HBG, K, L, M, P, W, WU, Z); Lolodorf, Lokoundje R., *Staudt* 14 (G, K, LE, P, S, Z); Maan Distr., Meyo Ntem, Ntem R., *Koufani* 88 (P, WAG, YA).

GABON: Ogooué R., *Chalot* 18 (BR, P; type of *S. pierreanus*); Ogooué R. at Nkogo, *Fleury in Chevalier* 26386 (P); Lake Ezanga, *N. Hallé* 2076 (P); Libreville, Como R., *Klaine* 19 (P), 2093 (P); Ogooué R. at Samkita, *Thollon* 183 (NY, P); Ogooué R. at Ndjolé, *Thollon* 180 (A, BR, FHO, K, P); ibid., *Brass & Woodward* 20909 (K, NY); Okano R. at Ottouma, 23 km SW of Lalara, *Brass & Woodward* 20906 (K, NY); Ogooué R. at Mougnyangui, *Le Testu* 8591 (BM); Makokou, Hekambo Road, A. Hladik 2604c (WAG); Lake Avanga, *unreadable* 123 (P); Ogooué R. near Dr. Schweitzer's hospital, *Brass & Woodward* 20915 (K, NY); Ngounié R. at Sindara, *Le Testu* 2203 (BM, P).

Notes: in FRANCHET's first description of *S. thollonii*, part of the description (viz., sepal shape and corolla lobes) refers to one of the paratypes (*Thollon* 1) that is a *S. gratus*. He also describes the leaves as sometimes being ternate, but neither in *S. thollonii* nor in *S. gratus* this was ever seen.

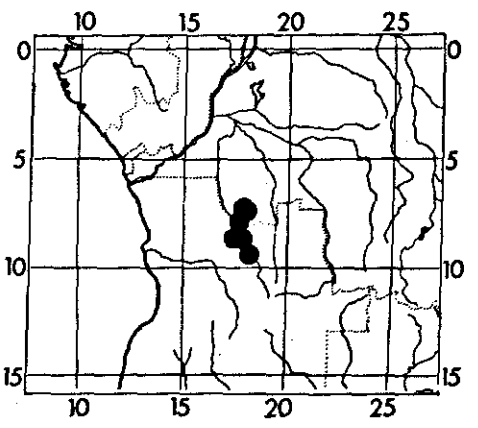
S. thollonii is closely related to *S. gardeniiflorus*; in the notes of the latter species a key is provided to distinguish the two species.

34. S. vanderijstii Staner 1932b: 329; Staner & Michotte 1934: 52.

Fig. 41; Map 38

Type: Zaïre, Bandundu: Panzi, *Vanderijst* 16123 (BR, holotype; isotypes: BR, NY).

Shrub, 10–30 cm high. *Branches* not, or only sparsely, lenticellate; branchlets densely puberulous. *Leaves:* petiole 1–3 mm long, with 2 outer and 2–4 inner axillary colleters; blade ovate or elliptic, (2–)2.5–4.5 × as long as wide, 0.5–5 × 0.3–1.4 cm, cuneate at the base, acute or acuminate at the apex (acumen 2–3 mm long), papyraceous, glabrous or ciliate, with translucent dots; 4–7 pairs of curved secondary veins at an angle of 30–60° with the midrib; tertiary venation inconspicuous. *Inflorescence* on short branches or in the forks, 1–3-flowered (1–2 flowers open at a time), sessile or nearly so, puberulous in all parts; branches 0–6 mm long; pedicels 9–15 mm long; bracts linear or narrowly elliptic, 3–4 × 1 mm, acute, subscarious. *Calyx:* sepals subequal, the outer shorter and wider than the inner, narrowly elliptic, 2–8 × as long as wide, 4.3–7(–10.5) × 1–2.5 mm, acute, puberulous near the base and margins; with 2 colleters per sepal. *Corolla:* tube 1.5–4 × as long as the calyx, white, turning pink outside, and red-streaked white inside, 15–19 mm long and widening at 25–38% of its length into a cylindrical or infundibuliform upper part, at the mouth 6.5–11 mm wide, puberulous on both sides; corona lobes subulate, 1.8–5 × 1.3–2 mm, obtuse at the tip, fleshy, minutely papillose or puberulous; corolla lobes white and turning pink outside, tails yellow; lobes spreading, ovate, 4–9 × 3.5–5.5 mm, gradually narrowing into the 2–3 mm wide spreading or pendulous tails; lobes including the tails 35–62 mm long, sparsely puberulous near the base on both sides. *Stamens* included for 5.8–7 mm; filaments inserted at 5.6–7.2 mm from the base of the tube, straight or nearly so, 1.4–1.5 mm long, pubescent inside, with inconspicuous ridges; anthers 4.2–4.4 × 0.8–1.2 mm, glabrous; tails 0.5–0.6 mm long; acumen 0.2–0.5 mm long. *Pistil:* ovary 0.7–1.2 × 1–2.1 mm, glabrous; style 6.2–7 mm long; clavuncula 1.2–1.6 × 1.2–1.3 mm; stigma 0.2 mm long. *Fruit:* follicles tapering into a rather broad obtuse apex, 8–12 cm long and 2 cm in diameter; exocarp thick and hard, slightly sulcate, glabrous, not lenticellate. *Seeds:* grain 13–20 × 3.5–5.2 mm, densely pubescent; beak glabrous for 0–2 mm and bearing a coma for 20 mm; coma 45–52 mm long.



MAP 38. *Strophanthus vanderijstii* Staner

FIG. 41. *Strophanthus vanderijstii* Staner: 1. habit, $\frac{2}{3}\times$; 2. section of flower, 2 ×; 3. follicle, $\frac{2}{3}\times$; 4. seed, $\frac{2}{3}\times$. (1–2. *Azancot de Menezes 2152*; 3–4. *Callens 3399*).

Distribution: Zaïre (Bandundu) and Angola (Malanje).
Ecology: geopyrophyte in grass steppe; alt. 800–1100 m.

Specimens examined:
ZAÏRE, BANDUNDU: Panzi, *Vanderijst* 16123 (BR, NY; type); ibid., *Callens* 1370 (NY); Lufuku R., *Callens* 3399 (NY).
ANGOLA, MALANJE: between Malanje and Mussuco, *Antunes* 3096 (LISC, P); Kituvico near Lui and Cuango Rs., *Gossweiler* 9602 (BM); Capenda Camulemba, *Azancot de Menezes* 2152 (LISC).

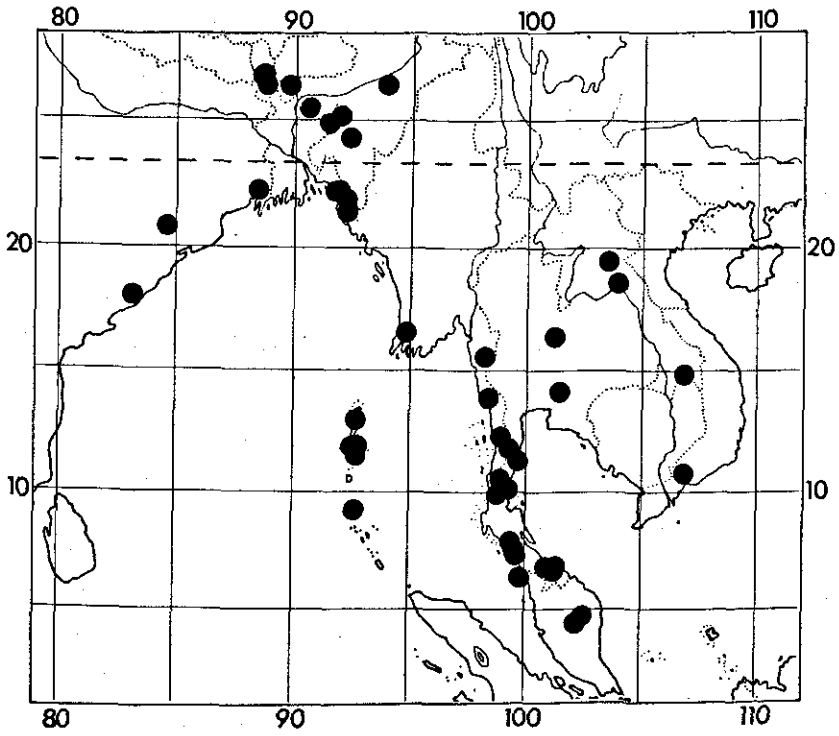
Notes: the roots were described as running horizontal just below the surface, sending out shoots at regular intervals, with a primary root 1–2 m long and up to 5 cm in diameter (teste Callens and Gossweiler).
S. vanderijstii is closely allied to *S. amboensis.*

35. S. wallichii A. DC. 1844: 418; Miquel 1856: 442; Hooker f. 1882: 655; Franchet 1893b: 268; Gilg 1903: 15; King & Gamble 1908: 469; Gamble 1921: 816; Haines 1922: 542; Ridley 1923: 355. **Fig. 42; Map 39**
Type: Bangla Desh, Pandua, *De Silva in herb. Wallich* 1641 (G-DC, holotype; isotypes BM, C, G, K, K-WALL, LE, M, NY, P, W).
Heterotypic synonyms: *S. dichotomus* var. *coromandelianus* Ker 1820: t. 469; Wight 1842: t. 599 (as *S. dichotomus*). Type: India, Circars Mts., *Roxburgh* s.n. (BM, holotype). Homotypic synonym: *Nerium caudatum* Roxburgh 1932: 9 (non (L.) Lam.).
S. caudatus Kurz 1877b: 192 (non (L.) Kurz 1877a: 257). Type: the first description (lectotype).
S. wallichii var. *robustus* Pierre ex Gilg 1903: 16. Type: Viêt-nam, Bienhoa: Ton Man, near Dongnai R., *Pierre* 4412 (P, holotype; isotypes: A, C, NY, P). Homotypic synonym: *S. robustus* (Pierre ex Gilg) Pitard 1933: 1198, fig. 133, syn. nov.

Shrub, 0.50–3 m high, or *liana*, up to 8 m high, presumably evergreen. *Trunk* up to 8 cm in diameter; branches sparsely or densely lenticellate; branchlets glabrous. *Leaves:* petiole 3–11 mm long, with 2 outer and 2–6 inner axillary colleters; blade elliptic or obovate, 1.4–3(–3.8) × as long as wide, 2–12.5 × 1–5.5 cm, cuneate or rarely rounded at the base, acuminate at the apex (acumen 1–12 mm long), sometimes undulate at the margin, papyraceous, glabrous, with or without translucent dots; 4–9 pairs of curved secondary veins at an angle of 45–70° with the midrib; tertiary venation conspicuous. *Inflorescence* on long or short branches or in the forks, 5–25-flowered (1–3 flowers open at a time), pedunculate, lax, sometimes with reduced branches, glabrous or puberulous but with the bracts always puberulous; peduncle 10–54(–75) mm long, lenticellate; branches 15–70(–140) mm long; pedicels 4–11(–16) mm long; bracts spreading or recurved, linear, 4–15(–19) × 1–2 mm, acute, sepal-like. *Calyx:* sepals spreading or recurved, equal, linear, 6–10 × as long as wide, 6–17.5 × 1–2.8 mm, acute, densely puberulous; with 2(–3) colleters per sepal. *Corolla:* tube (0.6–)0.9–1.6 × as long as the calyx, pinkish-white, turning yellow, with some

FIG. 42. *Strophanthus wallichii* A. DC.: 1. flowering branch, $\frac{2}{3}\times$; 2. opened flower, 4 ×; 3. adaxial side of stamen, 6 ×; 4. abaxial side of stamen, 6 ×; 5. fruit, one follicle removed, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1. *Kerr 20782*; 2–4. *Kerr 7247*; *Cowan 424*; 6. *Whitmore FRI 12958*).

red near the base outside, 9–15 mm long and widening at 42–69% of its length into a cup-shaped upper part, at the mouth 5–9.5 mm wide, glabrous outside and puberulous inside; corona lobes pink, narrowly triangular, 2.8–6.5 × 1–1.2 mm, acute, glabrous or puberulous inside; corolla lobes pinkish-white and red-streaked outside, with the white turning yellow, pink or pale purple inside, tails dark red or purple; lobes spreading, ovate, 5–9 × 3–6 mm, rather abruptly narrowing into the 1 mm wide spreading tails; lobes including the tails 18–55 mm long, glabrous on both sides or sparsely puberulous inside. *Stamens* 5–10.5 mm exserted; filaments inserted at 5–8 mm from the base of the tube, straight, with an abaxial swelling near the base, 0.8–1 mm long, pubescent, with 2.3–4 mm long ridges, ridges with an obtuse spur at the base; anthers 11–15.5 mm long, pubescent except for the tails; tails 0.2–0.6 mm long; acumen 8.5–12.5 mm long. *Pistil:* ovary 1–2 mm high, minutely puberulous; style 6–8.5 mm long; clavuncula 0.9–1.5 mm high; stigma 0.1–0.3 mm long. *Fruit:* follicles divergent at an angle of 180°, tapering into an obtuse apex or towards a narrow apex with an obtuse tip, 11–24.5 cm long and 2.5 cm in diameter; exocarp brown, thick and hard, nearly smooth or sulcate, densely lenticellate. *Seeds:* grains 10–18 × 3–4.3 mm, glabrous; beak glabrous for 8–15 mm and bearing a coma for 14–26 mm; coma 55–90 mm lomg.



MAP 39. *Strophanthus wallichii* A. DC.

Distribution: South-East Asia, from India (Orissa) to Viêt-nam and Malaysia.

Ecology: primary and secondary forest and clearings; alt. 0–800(–1500) m.

Flowering: on the Andaman Isls., where many specimens were collected, in every month of the year, with a peak in March and April. Not enough fruits are known to be certain about the main fruiting season.

A selection of the ca. 90 specimens examined:

INDIA: ANDRA PRADESH or ORISSA: Circars Mts., *Roxburgh* s.n. (BM; type of *S. dichotomus* var. *coromandelianus*). ORISSA: Athmallik State, Kutgaon Khol, *Mooney* 2872 (K). WEST BENGAL: Calcutta, *Gage* 1912 (K). BENGAL & BORDERS: Rangpo Road, *Santapau & Mukerjee* 243 (CAL); Jalpaiguri, *Haines* 2716 (E, K); Khasi Hills, *Simson* 59 (K); Fatikrai, *Biswas* 4910 (CAL); sin. loc., *Biswas* 1647 (A); sin. loc., *Haines* 664a (K). ASSAM: Golaghat Distr., King's coll. *May* 1891 (A, BM, CAL, HBG, K, P, Z); Tura, Garo Hills, *Thakur Rup Chand* 3038 (L, UC, W). ANDAMANS, S. Andaman: Hopetown, *Lace* 2829 (CAL, E, K); Goplakabang Valley, *Heinig* Jan. 1897 (CAL); Protheroepur, *Prain* April 1891 (CAL); Cadell Point, *King* 25 July 1891 (CAL); Corby's Cove, *King's coll.* 13 Feb. 1892 (CAL); Manpur, *King's coll.* 20 Aug. 1892 (CAL). Car Nicobar: Jambalu, *King's coll.* 10 June 1895 (CAL); sin. loc., *Parkinson* 367 (K).

BANGLA DESH: Pandua, *De Silva in herb. Wallich* 1641 (BM, C, G, G-DC, K, K-WALL, LE, M, NY, P, W; type); Chittagong, *Hooker & Thomson* 379 (A, K); ibid., Nidania, Rezu Range, *Cowan* 424 (E).

BIRMA: Bassein Distr., Mezali Res., *Lace* 3010 (E, K); Mergui, Tharabuin, *Meebold* 14495 (S); S. Tenasserim, Tavoy Distr., Thagyettaw Forest, *Distr. Off.* 7 (CAL); S. Tenasserim, Thebyu Chaung, *Parkinson* 1683 (K). loc. not found: Tenasserim, Kyanktatoon, *Meebold* 14605 (CAL).

THAILAND: Phetchabun, *Kerr* 5688 (BM, K, NY); Koh Chang, Klong Son, *Schmidt* 639 (C, K); Prachuap, Khiri Khan, *van Beusekom & Santisuk* 2816 (AAU, C, E, K, L); Ranong, Kao Taki, *Kerr* 11787 (AAU, BM, E, FHO, K, L, MO, P); Trang, Outong, *Phra Vanpruk* 659 (E, K); Ta Se R., *Kerr* 11627 (BM, K, NY); Pattani, *Kerr* 7247 (A, AAU, BM, E, K, L, P).

LAOS: Xiang Khoang, *Kerr* 20849 (BM, K, L, P); Borikhane, *Kerr* 20782 (BM, K, L, P); Attapu, *Harmand in herb. Pierre* 1414 (P; paratype of *S. wallichii* var. *robustus*).

VIÊT-NAM; Ho Chi Minh City, between Tuc-Tan and Tong-Yen, *Regnier* 335 (P); Ton Man, near Dongnai R., *Pierre* 4412 (A, C, NY, P; type of *S. wallichii* var. *robustus*).

MALAYSIA, MALACCA PENINSULA: Langkawi Isl., Tanjong Ru Road, *Whitmore* FRI 12958 (K, L); Perlis, *Ridley* 14947 (K); Perlis, Chupung, anonym. 14947 (CAL).

Cultivated: INDIA, SIKKIM: Jitilya, *Hooker* s.n. (K, P, W); GREAT BRITAIN, Chelsea, *Moore* April 1851 (K).

Notes: this species was often confused with *S. caudatus,* especially by ROXBURGH's use of the name *Nerium caudatum*, not the same as the *Nerium caudatum* of LAMARCK! KURZ (1877a) described *S. caudatus,* and (1877b) *S. wallichii*, both under the name *S. caudatus*.

The two species are most easily distinguished by the position, shape, and size of sepals and bracts, and by the indumentum of the ovary and the anthers.

The type of *S. wallichii* var. *robustus* agrees with that of *S. wallichii* proper; I am unable to find corolla lobes more than 50 mm long, and so the distinguishing character according to GILG (1903) and PITARD (1933) appears to be a mistake.

36. S. welwitschii (Baill.) K. Schum. 1900: 59; Gilg 1903: 21, pl. 8; Staner & Michotte 1934: 45; Watt & Breyer-Brandwyck 1962: fig. 38; White 1962: 352; Verdcourt & Trump 1969: 135. **Fig. 43; Photo 7; Map 40**

Basionym: *Zygonerion welwitschii* Baill. 1888: 758.

Type: Angola, Cuanza Norte: between Pungo Andongo and the Cuanza R., *Welwitsch* 5991 (P, holotype; isotypes BM, BR, C, G, K, LE, LISU, MO, P).

Heterotypic synonyms: *S. ecaudatus* Rolfe 1893: 85; Stapf 1902: 183. Type: Angola, Malanje: Malanje area, Sisenando Marques 28 (LISU, holotype; isotype: Z).

S. parvifolius K. Schum. 1895: 182. Type: the description (lectotype).

S. verdickii De Wild. 1903: 103, pl. 21. Type: Zaïre, Shaba: Lukafu, *Verdick* 84 (BR, holotype).

S. verdickii var. *latisepalus* De Wild. 1903: 104, pl. 21. Type: Zaïre, Shaba: Lukafu, *Verdick* 146 (BR, holotype).

S. gilletii De Wild. 1903: 105, pl. 21. Type: Zaïre, Bas Zaïre: Kimuenza, *Gillet* 2129 (BR, holotype).

S. katangensis Staner 1932a: 94. Type: Zaïre, Shaba: Dilolo, *De Witte* 607 (BR, holotype; isotypes: BR, NY).

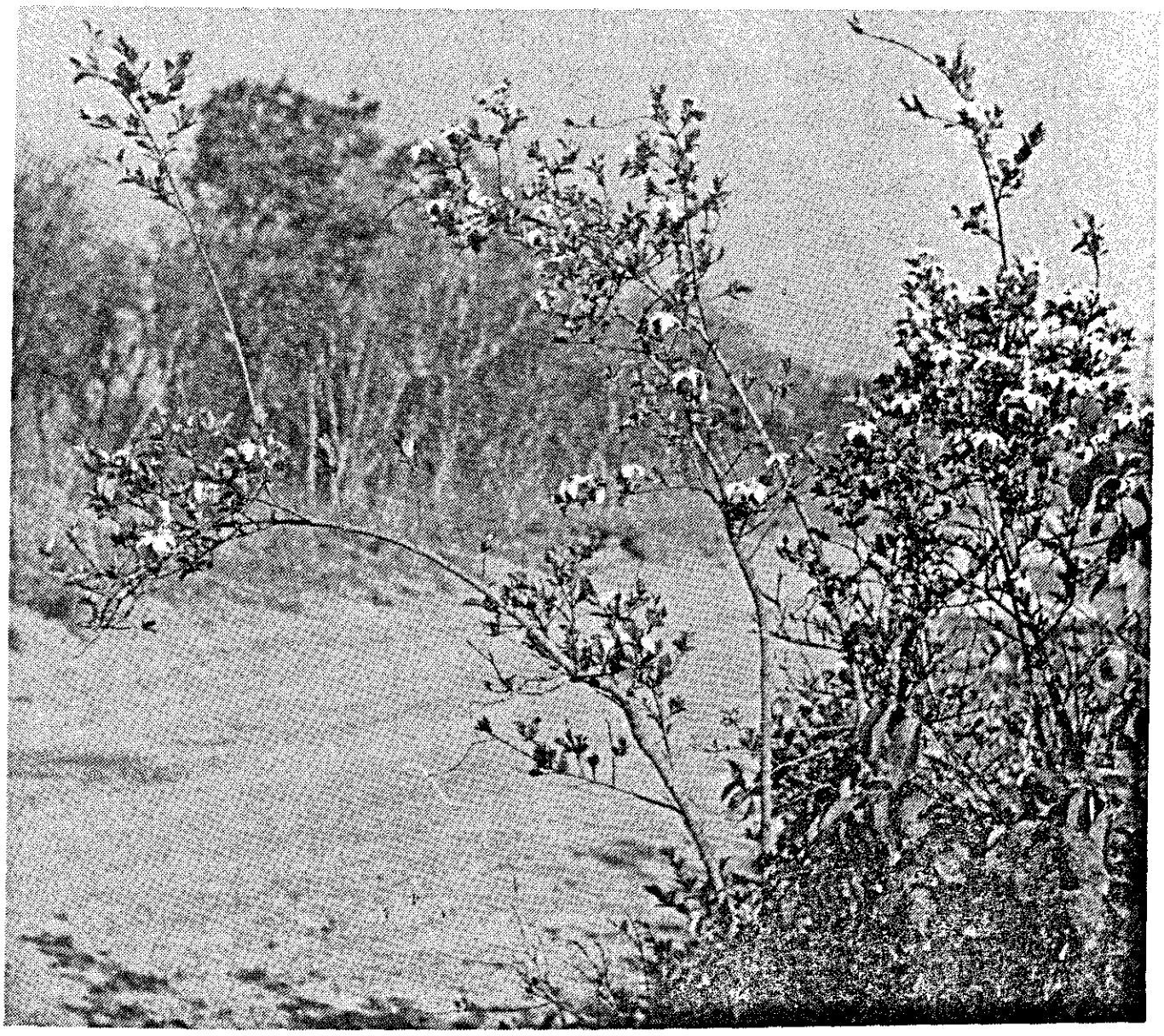
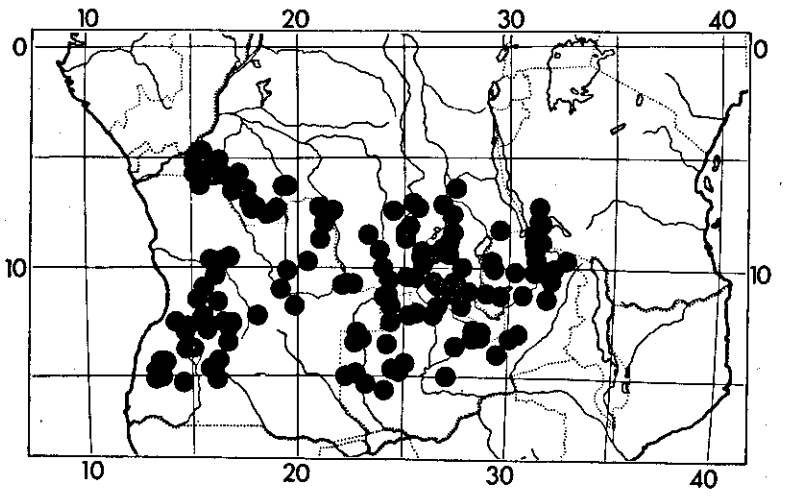


PHOTO 7. *Strophanthus welwitschii* (Baill.) K. Schum., habit (photograph I. B. POLE EVANS).

Sarmentose *shrub* or small *tree*, 0.60–5 m high, or *liana*, up to 8 m high, deciduous; latex clear or white. *Trunk* up to 10(–40) cm in diameter, dark brown or grey; branches medium or dark brown, densely lenticellate; branchlets reddish-brown, minutely puberulous. *Leaves* opposite or rarely in some branches ternate or quaternate; petiole 1–5 mm long, with 2 outer and 4–12 inner axillary

FIG. 43. *Strophanthus welwitschii* (Baill.) K. Schum.: 1. flowering branches, $\frac{2}{3}\times$; 2. leaf, $\frac{2}{3}\times$; 3. section of flower, 1 ×; 4. fruit, one follicle removed, $\frac{2}{3}\times$; 5. seed, $\frac{2}{3}\times$. (1. *Richards 27287*; 2. *Dubois 1461*; 3. *De Witte 2881*; 4. *Brass & Woodward* 20943; 5. *Callens 2684*).

colleters; blade dull and medium or dark green above, pale yellowish- or whitish-green beneath, ovate, narrowly elliptic, or rarely slightly obovate, 1.2–4 (on long shoots up to 6) × as long as wide, mature leaves up to 8.5 × 4.2 cm, cuneate or nearly rounded at the base, rounded, acute, or acuminate at the apex (acumen up to 8 mm long), undulate or slightly revolute at the margin and there often reddish beneath, thinly coriaceous, glabrous or sparsely puberulous, especially on the midrib and near the margins, with a line of translucent dots near the midrib; 3–8(–10) pairs of nearly straight secondary veins at an angle of 40–65° with the midrib; tertiary venation sometimes conspicuous beneath. *Inflorescence* on long or short branches or in the forks, 1–2(–5)-flowered (1 or rarely 2 flowers open at a time), sessile or pedunculate, glabrous or puberulous; peduncle – if present – up to 6(–17) mm long, lenticellate; branches 0–6 mm long; pedicels 3–9(–17) mm long; bracts sometimes deciduous, linear or narrowly ovate, 2–8 × 0.5–1.5 mm, acute, subscarious. *Flowers* fragrant. *Calyx:* sepals erect or with the upper half recurved, subequal, the inner slightly longer than the outer, green and with a purple base, ovate or narrowly ovate, 1.9–6 × as long as wide, 5–19 × 2–5.5(–7) mm, acute, puberulous near the base or less often glabrous or puberulous all over; with (1–)2(–3) colleters per sepal. *Corolla:* tube 1.6–3.4(–6) × as long as the calyx, white and sometimes suffused with pink near the base, pale or reddish-purple in the upper part outside, creamy and red- or purple-streaked inside, the creamy turning yellow, (13.5–)17–38 mm long and widening gradually at 20–40% of its length into a cup-shaped upper part, at the mouth (11–)15–27(–37) mm wide, puberulous outside near the base, minutely pubescent or puberulous inside; corona lobes red or purple-red, narrowly triangular, 5–23 × 1.5–5 mm, acute, not fleshy, minutely papillose or puberulous; corolla lobes white, turning pale pink on left side and pale purple, turning purple-red on the right side outside, white and turning dark pink inside; lobes spreading or recurved, ovate, 1.1–2.5 × as long as wide, (10–)14–38(–48) × (7.5–)10–24(–29) mm, acute, minutely puberulous inside. *Stamens* included for 2–12 mm; filaments inserted at 5.5–10.5 mm from the base of the tube, straight or nearly so, 3–5.5 mm long, with faint, at least 3 mm long ridges which may reach the base; anthers 5–8.2 × 1.2–1.9(–2.5) mm, glabrous; tails 0.4–1.2 mm long; acumen 0.2–1.7 mm long. *Pistil:* ovary 0.9–2.5 × 1.4–2.9 mm, glabrous; style 8–14.5 mm long; clavuncula (1.3–)2–3.1 × 1.5–2.3 mm; stigma minute. *Fruit:* follicles divergent at an angle of 160–240°, long-tapering towards a narrow apex and ending in an obtuse tip, or rarely in a small knob, with the extreme apex sometimes curved inwards, 10.5–33.5 cm long and 1–2.5 cm in diameter; exocarp dark brown or purple-brown, thick and hard, slightly sulcate, glabrous, densely lenticellate. *Seeds:* 8.5–19.5 × 2.5–4 × 1 mm, densely pubescent; beak glabrous for 17–54 mm and bearing a coma for 22–55 mm; coma 32–95 mm long.



MAP 40. *Strophanthus welwitschii* (Baill.) K. Schum.

Distribution: Central Africa.

Ecology: miombo woodland, often on rocky places and in gallery forest; alt. 300–1800 m.

Flowering towards the end of the dry and the beginning of the rainy season; mature fruits in the dry season.

Local names: *Mateke* (Zaïre: Lumumbashi area); *Bulembe, Mulembelembe* (Zaïre and Angola: Baluba language; also used for other *Strophanthus* species); *Kalimbori, Kalimboli* (Zaïre and Angola: Kitshokwe language); *Chimbingabinga* (Angola: Handa language).

Local uses: arrow poison (Zaïre and Zambia).

A selection of the ca. 325 specimens examined:

ZAÏRE, BAS ZAÏRE: 8 km SSW of Ngidinga, *Brass & Woodward* 20922 (K, NY). BANDUNDU: Mvulu-lu, *Nsiowndeve* 575 (BR, WAG); near Lubizi sector, *Callens* 2685 (MO, NY); Dibulu, near Kasongo-lunda, *Callens* 4325 (BR, NY); Kisantu-Kwango, Panzi, *Vanderijst* 16447 (BR); Kahemba, *Dubois* 1461 (BR); Kwango-Lukwila Escarpments, *Devred* 2477 (BR). SHABA: between Lubile and Lukuga Rs., *Vandermeren* anno 1910 (BR); 30 km N of Kabongo, *Pole Evans & Erens* 1860 (BR, E, K, P, PRE, S); Kapanga Terr., Tschibalaka, *Liben* 3753 (BR); upper Lomani R., 60 km ENE of Kamina, *Leistner* 1466 (M, PRE); source of Kadidiki R., near Lusinga, *De Witte* 7598 (BR, K, LISC, PRE, WAG); Tschoma and Mwero-Wantipa region, *Bredo* 3405 (BR); Katoto, near Bukama, *Lukuesa* 957 (K); Kundelungu Plateau, *Schwetz* Sept. 1925 (BR); 72 km E of Dilolo on Lumumbashi Road, *Brass & Woodward* 20945 (NY); Kayoyo, *Amiral Lynes* 46 (BR); Fungurume, *Malaisse & Gregoire* 115 (BR, WAG); Lumumbashi, *Rogers* 10066 (BM, K, S, SAM).

TANZANIA, T4: Urungu: Kitungu, *Hoffmann in herb. Peter* 58200 (B); Ngorotwa Sumbawanga Distr., *Carmichael* 1001 (EA).

ANGOLA, CONGO: Zembo Plateau, *Dawe* 159 (K). LUNDA: between Tchimboma R. and Alto Chicapa, *Barros Machado* 332 (LISC); Saurino R., tributary of Chicapa R., *Young* 400 (BM, LISC); near Nordeste, *Gossweiler* 13596 (B, BM, K, P, US). CUANZA NORTE: Pungo Andongo, between Cazella and Luxillo, *Welwitsch* 5926 (BM, LISU). MALANJE: Quessua, *Brass & Woodward* 20940 (K, NY). MOXICO: Teixeira de Sousa, near Luao R., *Gossweiler* 12226 (BM, LISJC, LISC). CUANZA SUL: Cela, *Murta & Silva* 590 (LISC). BENGUELA: 3 km W of Quinjenje, *Bamps et al.* 4466 (BR, WAG). HUAMBO: near Huambo, Cruzeiro, *De Silva* 3300 (BM, BR, K, LISC, M). BIÉ-CUANDO-CUBANGO: Calossinga, on Mussende-Kuito Road, *Brass & Woodward* 20943 (K, NY); between Cuiva R. and Samena, *Santos* 1675 (LISC). HUILA: between Caluquembe and Bomba, *Wild et al.* 10843 (LISC); Lubango, Jau, *Henriques* 761 (BM, K, LISC, LISU, PRE); Gangueles, Cassinga, *Azancot de Menezes* 1293 (BM, LISC, P).

ZAMBIA: Mbala, *Bullock* 1006 (B, BR, G, FI, K, LISC, MO, P, S); Lake Chila, *Johnsen* 173 (AAU);

Kalambo Falls, *Richards* 27287 (MO, NY); Kawambwa, Tumnalushi Falls, *Richards* April 1957 (K); Issoka Distr., Issoka Boma, *Burtt* 6286 (BM, BR, K); Lake Bangweulu, *Fries* 1075 (UPS, Z); Mwenge, Shiwa Ngandu, *Greenway & Trapnell* 5745 (FHO, K); km 133, Solwezi-Mwinilunga Road, *White* 3258 (BR, FHO, K, MO, WAG); Balovale Distr., *Gilges* 131 (BR, K, PRE, SRGH); Kabompo, *Angus* 618 (BR, FHO, K, MO); Kafulafuta Junction, *Linley* 196 (BR, K, M, SRGH); between Serenje Corner and Mpika, *Hutchinson & Gillett* 3766 (BM, K); Kalabo Boma, *White* 2068 (BR, FHO, K, MO); Mumbwa, *Macauley* 974 (K).

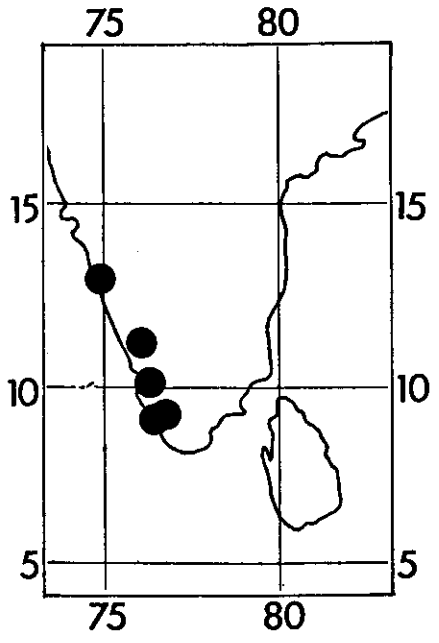
Cultivated: INDONESIA, Bogor, *Forman* 556 (K); U.S.A., Mayaguez (P. R.), *Usher* PI 190640 (NY).

37. S. wightianus Wall. ex Wight 1848: pl. 1301; Walpers 1852: 40; Hooker f. 1882: 656; Reber 1887: 295; Franchet 1893: 261; Gilg 1903: 11; Gamble 1921: 817. **Fig. 44; Map 41**

Type: India, Kerala: Travancore, *Wight in herb. Wallich* 4459 (K-WALL, holotype; isotypes: G, LE).

Presumably a small *liana. Branches* densely lenticellate; branchlets glabrous or sparsely puberulous. *Leaves:* petiole 4–9 mm long, with 2 outer and 4 inner axillary colleters; blade ovate or elliptic, 1.8–3 × as long as wide, 2.5–11 × 1–4.7 cm, cuneate at the base, acuminate at the apex (acumen 4–12 mm long, obtuse), with a slightly revolute margin, chartaceous or thinly coriaceous, glabrous; 6–12 pairs of straight secondary veins at an angle of 65–85° with the midrib; tertiary venation inconspicuous. *Inflorescence* on long or short branches or in the forks, 6–24(–72)-flowered (1–4 flowers open at a time), pedunculate, lax, puberulous or rarely glabrous in all parts; peduncle 7–30 mm long, lenticellate; branches 28–40 mm long; pedicels 2–4.5 mm long; bracts erect or spreading, ovate, 1.5–3.8 × 1–1.5 mm, acute, sepal-like. *Calyx:* sepals equal, ovate, 1.7–2.2 × as long as wide, 2–3.7 × 1.2–2.2 mm, acute, puberulous all over or only at the apex and margins; with altogether 5 colleters, concentrated on the inner sepals. *Corolla:* tube 2.5–4 × as long as the calyx, yellow and with some red near the mouth outside, 5–10 mm long and widening at 55–75% of its length into a cup-shaped upper part, at the mouth 5–7 mm wide, puberulous in the upper part on both sides, or only outside at the level where the tube widens; corona lobes presumably red, narrowly triangular, 2.2–3.4 × 1 mm, acute, minutely papillose; corolla lobes and tails yellow, lobes ovate, 2–4 × 2.5–4.5 mm, gradually narrowing into the 2–2.5 mm wide spreading tails; lobes including the tails 8–15 mm long, puberulous inside near the base. *Stamens* 0.2–1.5 mm exserted; filaments inserted at 5–5.3 mm from the base of the tube, straight, with an abaxial swelling outside near the base, 0.6–0.9 mm long, pubescent, with 2–2.3 mm long fleshy ridges, ridges with a short obtuse spur at the base; anthers 3.5–3.9 × 0.7–0.8 mm, glabrous; tails 0.2–0.3 mm long; acumen 1.4–1.5 mm long. *Pistil:* ovary 1–1.3 mm high, glabrous; style 4.4–5.5 mm long; clavuncula 1–1.3 × 0.6–0.7 mm; stigma minute. *Fruit:* only 3 immature fruits are known at present. The follicles are divergent at an angle of 180°, tapering into a broad and obtuse apex; the exocarp is presumably thick and hard.

FIG. 44. *Strophanthus wightianus* Wall. ex Wight: 1. flowering branches, $\frac{2}{3}\times$; 2. section of flower, 3 ×; 3. stamen, 6 ×; 4. immature fruit, $\frac{2}{3}\times$. (1. *Wight 2546*; 2–3. *Calder & Ramaswami 1696*; 4. *Wight 1878*).



MAP 41. *Strophanthus wightianus* Wall. ex Wight

Distribution: India (Kerala).
Ecology: 'in low bushy jungle' (teste Wight).

Specimens examined:
INDIA, KERALA: Malabar, *herb. Rottler* Feb. 1817 (K); Travancore, *herb. Wight in herb.* Wallich 4459 (E, G, K, LE; type); ibid., *Korah in herb. Krukoff* 20500 (NY); ibid., *Calder & Ramaswami* 1696 (CAL); Quilon, *Wight* 634/2546 (E, LE, NY, UC); ibid., Poonawny, *Wight* 1878 (A, C, GOET, K, L, LE, M, NY, P, S, W).

Notes: herb. *Wight* 1878 and 2546 are composite numbers, consisting of several collections, apparently from the same locality. Possibly the type number is identical to part of *Wight* 2546.

The seed illustrated in *Wight* (1848) appears to be glabrous, with a short glabrous part of the beak; but I have not seen any seeds at all.

38. S. zimmermannianus Monach. 1951: 477.

Type: Tanzania, T3: Ngonya MT., *Zimmermann* 1496 (EA, holotype; isotypes: K, NY). **Fig. 45; Map 42**

Shrub or *liana*; latex white. *Branches* densely lenticellate; branchlets glabrous. *Leaves:* petiole 3–6 mm long, with 2 outer and 2–8 inner axillary colleters; blade ovate or elliptic, 1.6–3 × as long as wide, 8–17.5 × 3–7.5 cm, rounded or subcordate at the base (and cuneate in young leaves), acuminate or less often obtuse at the apex (acumen 5–10 mm long), papyraceous, glabrous, with large translucent dots in the axils of the secondary veins, and smaller ones all over the leaf; 5–8 pairs of curved secondary veins at an angle of 45–55° with the midrib; tertiary venation sometimes conspicuous beneath. *Inflorescence* on long branches or in the forks, 1–7-flowered (1–2 flowers open at a time), sessile or pedunculate, lax, puberulous in all parts except for the bracts, which are only puberulous at the base; peduncle – if present – up to 25 mm long, lenticellate;

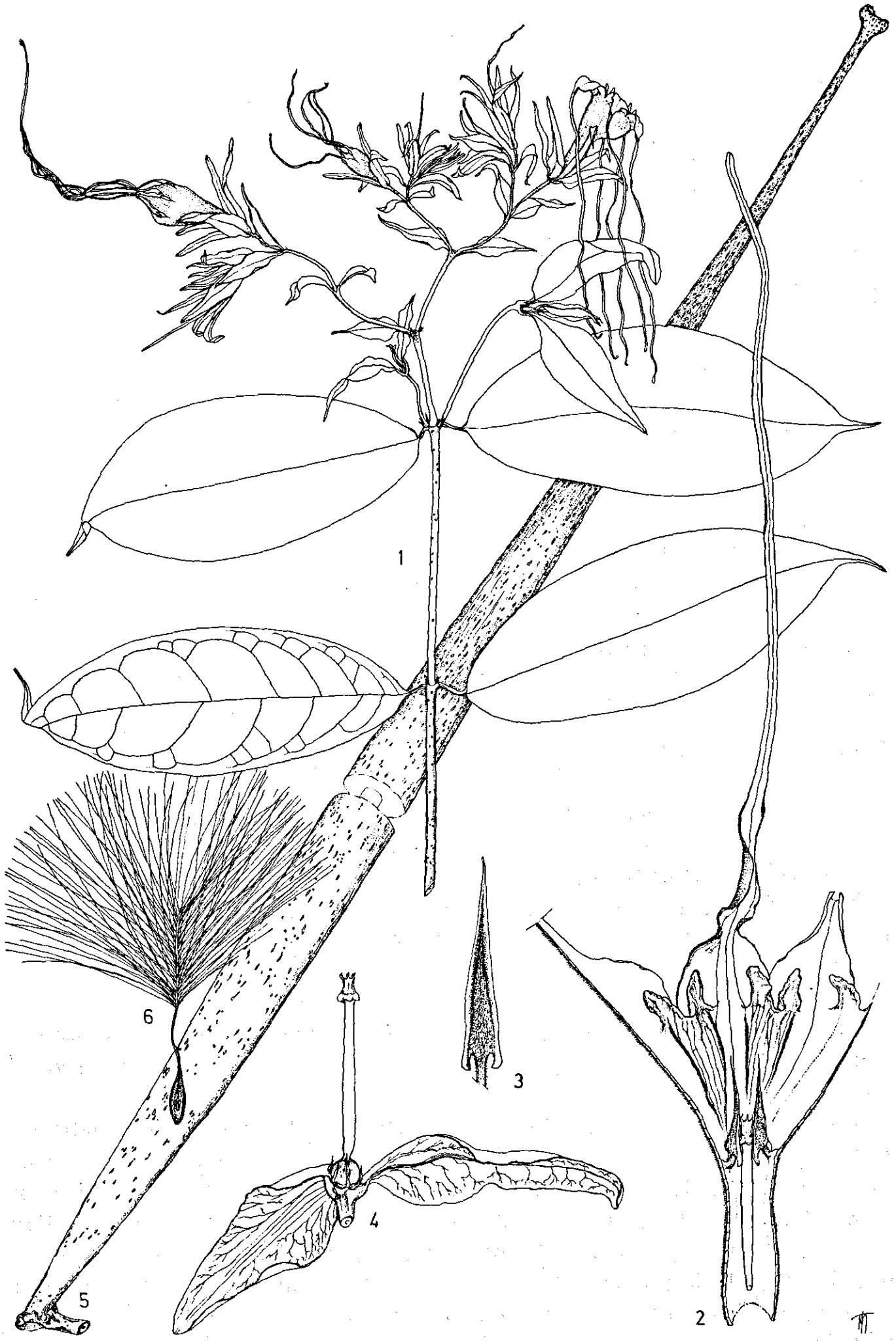
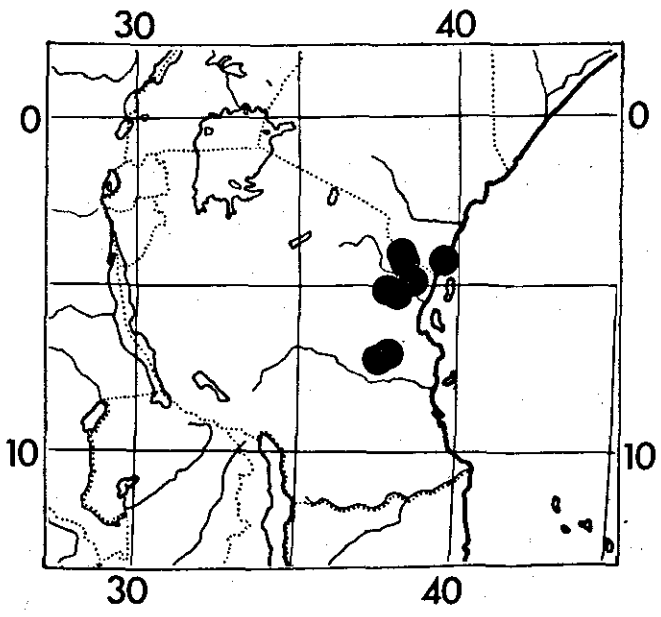


FIG. 45. *Strophanthus zimmermannianus* Monach.: 1. flowering branch, $\frac{2}{3}\times$; 2. section of corolla, 2 ×; 3. abaxial side of stamen, 4 ×; 4. part of calyx with gynoecium, 2 ×; 5. fruit, one follicle removed, the other with a section removed, $\frac{2}{3}\times$; 6. seed, $\frac{2}{3}\times$. (1. *Peter 58259*; 2–4. *Harris & Mwasubi 2673*; 5–6. *Omari ben Bakari AH 9787*).

branches 1–27 mm long; pedicels 7–12 mm long; bracts ovate, 7–16 × 3–6(–8) mm, acute, sepal-like. *Calyx:* sepals erect or recurved for half of their length, unequal, the outer wider and shorter than the inner, ovate or narrowly ovate, 2.5(outer)–11(inner) × as long as wide, 14–21 × 1.5–8 mm, acute, puberulous all over or only near the base; with 2 colleters per sepal. *Corolla:* tube 1–1.4 × as long as the calyx, creamy-white and turning yellow outside, 18–26 mm long and widening at 33–50% of its length into a cup-shaped upper part, at the mouth 8–13 mm wide, puberulous on both sides; corona lobes presumably purple and turning brown, lingulate, 2.5–4.3 × 1.9–2.6 mm, rounded, fleshy, minutely papillose or puberulous; corolla lobes and tails creamy-white and turning yellow; lobes ovate, 6–8 × 4–7 mm, abruptly narrowing into the 0.5–1 mm wide pendulous tails; lobes including the tails 52–62 mm long, puberulous on both sides. *Stamens* included for 2.6–3 mm; filaments inserted at 9.5–13 mm from the base of the tube, curved, 0.4–1.5 mm high, 1.6–2.8 mm long, pubescent, with ridges nearly reaching the base of the tube; anthers 7.2–7.5 × 1.1–1.2 mm, puberulous; tails 0.6–1 mm long; acumen 2.2–2.4 mm long. *Pistil:* ovary 1.1–1.5 × 2–2.2 mm, puberulous; style 9–13 mm long; clavuncula 1.5–1.8 × 1.2 mm; stigma minute. *Fruit:* follicles divergent at an unknown angle, long-tapering towards the apex and ending in a small knob, 32–40 cm long and 1.2 cm in diameter; exocarp reddish-brown, thin and brittle, slightly sulcate, puberulous when young and glabrescent in older fruits, densely lenticellate. *Seeds:* grain 10–15 × 3–3.2 mm, densely puberulous or short-pubescent; beak glabrous for 8–12 mm and bearing a coma for 17–25 mm; coma 40–72 mm long.



MAP 42. *Strophanthus zimmermannianus* Monach.

Distribution: North-East Tanzania.
Ecology: forest; alt. 275–800 m.
Flowering seasons could not be deduced from the few data available.

Specimens examined:

TANZANIA, T3: Usambara Mts.: Sigi-Kisiwani, *Omari bin Bakari* AH 9787(EA, K); Ngonya Mt., *Zimmermann* 1496 (EA, K, NY; type); Pengo Hill area, *Magogo & Glover* 491 (BR, PRE); Handei, Langusa, *Peter* 58246 (B, WAG), 58259 (B); saw mill above Mnyusi, *Peter* 58284 (B). T6: Uluguru Mts.: Kimboza For. Res., km 51 on Morogoro-Matombo Road, *Mwasuba & Harris* 2420 (EA); ibid., *Harris & Mwasuba* 2673 (EA); Kimboza For. Res., S of Mkuyini, *Pocs et al.* 6466c (EA).

INTERMEDIATES (POSSIBLE HYBRIDS)

Some specimens collected in the wild seem to be intermediate between *S. gratus* and *S. thollonii*:

CAMEROUN: Eséka, *Vaillant* 1120 (P).

GABON: Samkita, *Thollon* 183 (P).

DOUBTFUL SPECIES

S. angusii F. White 1962: 351. Neither the type (Zambia: Chikundulu stream, *Angus* 601) nor the paratype (Zambia: 16 km S of Chavuma, *Holmes* 1045) were found, although according to WHITE they should be at FHO and K. The description suggests *S. welwitschii* (Baill.) K. Schum., although the habit (rhizomatous suffrutex, stems herbaceous, 12 cm high) is different, the corolla lobes are less wide than in *S. welwitschii*, and the corona lobes are shorter.

NOMINA NUDA

Apocynum florirostratum Norona 1790: 68. No specimens are mentioned, but the plant is said to be from Java. Presumably *S. caudatus* (L.) Kurz.

Cameraria zeylanica Wall. 1828: 4459 (non Retz.). Type: India, Madras, *Johnstone in herb. Wallich* 4459 (BM, G, K, LE). = *S. wightianus* Wall. ex Wight.

Cercocoma macrantha Teysm. & Binn. 1866: 126. According to BOERLAAGE 1899: 388, this is a *Chonemorpha*.

Faskia divaricata Lour. ex Franchet 1893b: 266. This is a second Loureiro name based on the same type as *Pergularia divaricata* Lour. = *S. divaricatus* (Lour.) Hook. & Arn.

Nerium guineense Brongn. ex Payrau 1900: 113. Only a cultivated specimen is mentioned, but according to FRANCHET 1893b this is identical to *S. gratus* (Wall. & Hook.) Baill.

Strophanthus arboreus Boiv. ex Franch. 1893b: 252. Fide Franchet l. c. = *S. boivinii* Baill.

S. asper Oliv. ex Planchon 1894: 61, fig. 9. Type: seed collections by *Elborne* and *Christy* (not seen). According to the illustration = *S. nicholsonii* Holmes. The name *S. asper* is not accepted by PLANCHON.

S. aurantiacus Hort. ex Duncun 1863: 88. No specimens were cited, but presumably *S. boivinii* Baill.

S. divaricatus Wall. 1828: 1642. Type: *Amherst in herb. Wallich* 1642 (K-WALL) = *Cryptolepis sinensis* (Lour.) Merrill (*Asclepiadaceae*).

S. fischeri Asch. & K. Schum. ex Holmes 1893: 868. Type: Tanzania, Iringa, Fischer s.n. (K; also the type of *S. eminii* Asch. & Pax).

S. giganteus Pierre in Planchon 1894: 297. = *S. caudatus* (L.) Kurz.

S. glaber Hort. ex Gentil 1907: 182. Cultivated; no material extant.

S. letei Merrill ex Wells & Garcia 1925: 9. = *S. caudatus* (L.) Kurz.

S. maingayi Hook. f. ex Ridley 1916: 555. Mentioned by RIDLEY as an example of a species found only a few times in a single locality, which was supposed to have disappeared later. RIDLEY 1923, in his Flora of Malaya, does not mention it under *Strophanthus*. Both collections cited (Singapore, *Maingay*; Changi, *Hullett*) are without numbers, but Maingay collected *S. caudatus* (L.) Kurz under the numbers 1073 and 3303, though the label only states 'Malaya'; and *Hullett* 468 is *S. caudatus* (L.) Kurz, collected in Singapore.

S. minor Blondel 1888b: 558–559. A provisional name for a collection of seed grains from Sierra Leone. Possibly no *Strophanthus*.

S. niger Blondel ex Pax 1892: 381. Presumably = *S. hispidus* DC.

S. ouabaio Holmes 1890: 234. = *S. gratus* (Wall. & Hook.) Baill.

S. perrottii Chev. 1920: 412. Type: Côte d'Ivoire, between Yébouakro and Tingouéla, *Chevalier* 22569 (P). = *S. gratus* (Wall. & Hook.) Baill.

S. rigali Hort. ex Pax 1892: 381. A cultivated specimen; seedlings of this plant, according to PAX l.c., seemed to belong to another genus.

S. sacleuxi Hort. ex Gentil 1907: 182. A cultivated specimen of which no herbarium is known.

S. schultzei Mildbr. 1922: 89. Type: Cameroun, just E of the curve of the Dja R., *Mildbraed* 5470 (probably destroyed at B).

S. stanleyanus Hort. ex Wall. & Hook. 1849: t. 4466. = *S. gratus* (Wall. & Hook.) Baill.

S. stuhlmannii Pax 1893: 44. Type: Tanzania, *Stuhlmann* 263 & 354 (presumably destroyed at B). Probably *S. eminii* Asch. & Pax.

EXCLUDED SPECIES

S. aambe Warb. 1891: 407. = *Anodendron aambe* Warb. 1891: 454.

S. alterniflorus (Lour.) Sprengel 1825: 638. = *Gymnema sylvestre* (Retz.) Schultes (*Asclepiadaceae*).

S. balansae Franchet 1893b: 262, pl. 17. Type: Viêt-Nam, Tu Phap, Balansa 2128 (P). Possibly a *Parsonsia*.

S. chinensis G. Don 1837: 85. No specimens are mentioned, but Don reports that Roxburgh could not find any scales (corona lobes) in the throat, so this is no *Strophanthus*.

S. divaricatus G. Don 1837: 85, non (Lour.) Hook. & Arn. = *Cryptolepis*

sinensis (Lour.) Merrill (*Asclepiadaceae*).

S. jackianus G. Don 1837: 85. = *Wrightia dubia* (Sims) Sprengel. Type: *Wallich* 1643 (K, holotype).

S. pentaphyllus Griffith 1854: 78. The description may be of a *Wrightia,* but no specimen was cited.

S. radcliffei S. Moore 1905: 180. = *Cryptolepis sanguinolenta* (Lindley) Schltr. (*Asclepiadaceae*).

OLD COMMERCIAL NAMES

S. glabre du Gabon = *S. gratus* (Wall. & Hook.) Baill.

S. laineux du Zambèse = *S. eminii* Asch. & Pax and *S. nicholsonii* Holmes.

S. du Niger = *S. hispidus* DC.

NAMES OR SYNONYMS NOT CITED ELSEWHERE IN THIS REVISION

Cercocoma wallichii Miq. 1856: 445. = *Rhynchodia wallichii* (Miq.) Benth.

Strophanthus hildebrandtii Palacky 1907: 31. Lapsu, = *Plectanèia hildebrandtii* K. Schun.

S. pervillei Palacky 1907: 31. Lapsu, = *Plectaneia pervillei* K. Schum.

INDEX OF EXSICCATAE

The letters in parentheses are the first letters of the species epithet. Only *S. gracilis* and *S. gratus* have the same first letters, and are distinguished as follows: grl = *S. gracilis*, gra = *S. gratus*. Only numbered collections have been listed. If a collector gathered a part of his collection together with others, using a single number series, only his name is cited in this list: e.g. Torre & Correia is cited as Torre.

Braun, K. P. G. J. 3642 (kom), 5378 (emi), 7737 (cau), 7739 & 7740 (gra), 7742 & 7743 (his).
Brayne, H. C. 2 (nic).
Brazza, see de Brazza
Brédo, H. J. A. E. R.6a-613-1011-1051-1142-1177 (pre), 3405-4813-5780-5822 (wel), 5849 (gra).
Brenan, J. P. M. 8444 & 8447 (pre), 8692 & 9133 (sar).
Breteler, F. J. 745 (gra), 901 (sar), 936 (gra), 1291 (sar), 1325 & 1407 (pre), 2068 (mor), 2134-5978-6175 (gra).
Breteler & de Wilde, J. J. F. E. 493 (tho).
Breyne, H. 591 (wel), 680 (his), 857 (wel), 1886 (pre), 2314 & 3439 (bul), 3756 (wel).
Brichetti, R. 316 (mir).
Bridson, D. 362 (beq.)
Brigada de Estudos Florestais de Guiné 255 (his), 404 (sar).
— de Maiombe 193 (sar).
Brinkman 614 (gra).
Brito see de Brito Lial or Teixeira
Britton 38 (gra).
Broadway, W. E. 4405 (gra).
Broun, A. F. 242? (pre).
Brown, E. 162 (sar).
Brown-Lester, J. 36 (sar).
Bruneel 131 (pre).
Brunel 375 (pre), 376 (sar), 4550 (his).
Buchanan, J. 40 (pet), 41 (cou), 1121 (kom), 1219-1291-1355 (cou), in herb. Wood 6915 (cou) & 6917 (pet).
Bullock, A. A. 1006 (wel), 1393 (gar), 2633 (wel), 2854 (hol), 2918 (emi), 2994 (wel), 3003 (emi), 3004 (hol), 3037 (emi), 3332 (gar).
Bunting, R. H. 5 & 26 (sar), 40 (his).
Burbridge, K. 425 (gra), 520 (pre), 585 (his).
Burroughs, Welcome & Co. 1 (nic & kom), 2 (kom).
Burtt, B. D. 288 (emi), 417 (his), 789-1665-1778 (emi), 2247 (pet), 2397 (emi), 4846 (pet), 6068 (emi), 6071 (cou), 6236 & 6286 (wel), 6304 (gar), 6381 (wel).
Burtt-Davy, J. 1161-2588-5081-5560 (spe).
Büsgen 487 (gra).
Busse, W. 211 (emi), 503 (kom), 599 & 2952 (cou).
Buswell, K. 6409 (div).
Butaye, R. P. 1213 & 1470 (wel).

Cabra-Michel 32 (wel), 66 (arn).
Cabu, D. 140 (wel).
Cadet, T. 1766b & 1817 (boi).
Caille in herb. Chevalier 14743 (sar).
Calder, C. C. & Ramaswami 1696 (wig).
Callens, H. 1370 (van), 2114 (arn), 2116 & 2118 (sar), 2684 & 2685 (wel), 2686 (his), 2801 (arn), 3226 & 3289 (wel), 3399 (van), 3668 (arn), 4256 (wel), 4315 (his), 4316 & 4325 (wel), 4328 (amb), 4470 (his), 4470b (con), 4630 (wel), 4768 (arn).
Calléry, M. 103-130-187 (div).
Canicosa, E. 465 (cau).
Cannell, I. 2 (kom), 526 (pet).
Cantley, N. 1830 & 2675 (sin).
Capuron, R. see Serv. For. Madagascar
Carles, W. R. 77 (div).
Carlier, A. 45 (wel).
Carmichael, W. 233-575-775 (emi), 1001 (wel).
Carnochan, F. G. 104 (emi).
Carrey 47 (sar).
Carrington, J. F. 189 (his).
Carvalho, see de Carvalho
Cavaco, A. 1266 (wel).
Cecil, E. 275 (spe).
Cedro, G. 361 (pet).
Celestino, M. 180 (cau).
Chalot 18 (tho).
Chan, K. 1069 (div).
Chandler, P. 2493 (his), 2747 (pre).
Chapman, J. D. 4263 (sar).
Chase, N. C. 937-938-1480 (kom), 2211 (pet), 2210-2213-3090 (kom).
Chatman, J. D. 4263 = 11/76 (sar).
Chen, L. 18 (div).
Chevalier, A. 288-373-380-430-482 (sar), 522 (his), 523 (sar), 669-719-859 (his), 916 (sar), 927 & 964 (his), 2677 (sar), 2678 & 2679 (his), 4379 & 4413 (gra), 4509 (sar), 12498-12511-12577 (his), 12619-13211-13311-13314-13331-13576 (sar), 15544 (gra), 15736 & 16042 (gra), 16101 (pre), 16342 (sar), 16410 & 16411b (pre), 16684 & 16919 (sar), 16988 (pre), 17224 (sar), 17261 (gra), 17315 (sar), 17321 & 17773 (pre), 17853 (gra), 17983 (pre), 18026 & 18193 (his), 19198 (pre), 19475 (his), 20304 & 20544 (sar), 21042 (pre), 21246 (his), 21393 (pre), 21252 & 21556 (bar), 22500 & 22553 (sar), 22583b (gra), 22584 & 22626 (sar), 22857 (pre), 23035 & 23265 (sar), 23656 & 23971 (his), 23975 (sar), 24136 (his), 26054 (sar), 28015 (his), 28035 (arn), 28218 (pre), 28418 (arn), 31353 (cau), 31402 (boi), 31952-32418-36876 (cau), 43242 (sar).
Chillon 462 (sar, var. gla), 2518 (sar).
Ching, R. C. 6385 (div).
Chipp, T. F. 139 (pre), 150 (sar).
Chizea see FHI
Christiaensen, A. R. 400 (pre).
Chuang, T. I. 4569 (div).

Chun, W. Y. 301-3073-4771-5231-6348 (div).
Chung, H. H. 1471 & 5990 (div).
Cissé, A. 237c (sar).
Claessens, J. 642-644-1248 (pre).
Clemens, M. S. 4266 (div), 9500 (gra), 22456 (his).
Clements, J. B. 153 (cou).
Codd, L. E. 1469 (spe), 2054 (ger), 4543 (pet), 5338 & 5970 (kom), 6099 (ger), 6970 (spe), PRE 29003 (spe).
Coetzer & van Greuning 208 (amb).
Coleman 574 (spe).
Colfs, A. 303 (pub).
Collenette 19 (pre), 58 (his).
Collins, D. J. 503 (cau).
Colville, O. 14 (wel).
Comins, D. M. 1947 (spe).
Comité Special Katanga 14 (wel).
Compère, P. 659 (bul), 685 (arn), 699 & 926 (amb), 984 (sar).
Compton, R. H. 28160 (spe).
Connolly 50/40 (gra).
Cons. Res. Nat. Parc. Nat. Madagascar 1368-2006-2191-2715-3294-3885-4211-4627-5613-5635-6717-7228-8127 (boi).
Conservator of Forests 4 & 16 (sar), 21 (gra), 22 (his), 142 (pre).
Contest-Lacour, M. 169 (cau).
Cook 76 (sar).
Coombe 132 (sar).
Corbisier Baland, A. 164-890-1519 (his), 1857 (arn & pre), 1858 (his), 2005 (arn).
Corby, H. D. L. 1415 (nic).
Correia, M. F. 874 & 1248 (pet), 1827 (lut), 1835-2684-3283-3570 (pet), 3640 & 3645 (kom), 3661 (pet), 3768 (cou), 3780 & 3833 (pet), 3912 (kom), 3923 (pet), 4156 (kom), 4207 (pet).
Cours, G. 5274 (boi).
Coûteaux, G. 143 (his).
Cowan 106 & 424 (wal).
Cremers, G. 491-546-599-599a-557 (gra), 795a & b & 805 (his).
Culverwell, J. 944 & 971 (ger).
Cuming, H. 1218 (partly) & 1228 (cau).
Cummins, H. A. 23 (sar), 44/55 (gra).
Curtis, A. G. 379 & 382 (wel).
Curtis, C. 2431 (wal).
Cusker, A. M. C. 114 (emi).
Cusset, G. 625b (pre).
Cuzner, H. 48 (cau).

Dacremont, A. 296 (led).
Dahlström, E. 315 (div).
Dale, I. R. SKF339 (spe), T872 (emi), U873 (pre), 1055 (cou).
Dalziel, J. M. 10 (sar), 11 (his), 158 (gra), 1106 (bar).
D'Anchieta, J. 8 & 12 (wel), 40 (amb), 61 & 63 (wel).
Daniel, P. M. 436 (sar).
Daramola see FHI
Darcis 256 & 299 (wel).
Darko, K. 445 (his), 485 (sar), 497 (pre), 518 (sar), 632 (pre), 579 (bar), 1065 (gra), 1118 (pre).
Da Silva, M. 220 (wel), 2120 (amb), 2158-3300-3803 (wel).
Davies 244 (pre), 1407 (pet), 1566-1650-2220 (kom), 2518 (nic), SRGH 166.081 (cou).
Dawe, M. T. 20 & 58 (sar), 141 (his), 159 (wel), 195 (amb), 286 (par), 474 (cou).
De Brazza, J. 1 (tho).
Decary, M. R. 60-1078-3574-8037-8155-9509-14492-15566-15567-15756-15796-15844-15971-16258-16298 (boi).
De Carvalho, M. F. 646 (ger), 657 (pet), 659 (lut), 660 & 662 (kom), 670 & 930 (pet), 932 (cou), 936 & 1036 (pet).
De Caters 127 (wel).
Dechamps, R. 1259-1456-1516 (amb), 1798 & 1862 (wel).
De Gier & Goll 129 & 176 (sar).
De Giorgi 108 (pre), 260 & 440 (his), 696 & 755 (pre), 851 (mor), 977-1216-1360-1489 (pre), 1668 (sar).
De Graer, P. A. M. 777 (sar).
Deighton, F. C. 275 (gra), 492-1048-1928 (sar), 2472-2811-2865 (his), 3684 (pre), 3698 (his), 3943 (pre), 5758 (his).
De Kindt 143 (wel), 353 (amb), 1540 (wel).
Dekker, L. 344 (pre), 412 (sar).
De Koning, J. 54 (sar), 323-895-1674 (pre), 2608 & 2713 (gra), 4681 & 5390 (sar), 5400 (pre), 5509 (his), 6315 (gra), 6884 (sar), 6892 (pre).
De Kruif, A. 20 (pre), 58 (gra).
Delvaux, J. 269 & 343 (wel), 378 (emi), 397 (wel).
Demeuse 194 (sar), 518 (amb).
Den Outer & Versteegh 492 (his).
De Pirey, M. 42 (div), 43 (cau), 95 (div).
Dequaire, J. 27288 & 27358 (boi).
De Saeger, H. 83 (emi).
Descamps 30 (hol).
Descoings 3507 (boi), 12688 (sar).
De Sigaldi 361 (gra).
De Troyer 85 (emi), 137 (wel).
Devred, R. 846 (sar), 934 (arn), 1016 (his), 1267 (arn), 2367 (par), 2437 (his), 2477 & 3546 (wel), 4054 (pre).
De Wailly, M. 4444-4599-4656 (sar).

De Wanckel 15 (pre).
Dewèvre, A. 809 (pre), 866 (his), 1058 (par).
De Wilde, J. 577 (pre), 709 (wel), 749 (gar), 751 (emi), 761 (wel).
De Wilde, J. J. F. E. 38 & 75 (pre), 621 (his), 771 (sar), 797 (his), 798 (gra), 799 (sar), 813 (gra), 1006 (pre), 3405 (sar), 3739 (pre), 7752 (gra), 7807a (bul), 7825 (tho), 7921 (sar), 8208 (pre).
De Wilde, W. J. J. O. 223 (gra), 240 (pre), 349 (gra), 360 (pre), 427 & 494 (sar), 582 (pre), 636 (his), 673 (sar), 1457 (tho), 1669 (sar), 2305 (pre).
De Winter, B. 7791 (spe), 8479 (ger), 9380 (spe).
De Wit, H. C. D. 2949 (gra), 5763 & 7124 (sar), 8124 & 8125 (tho), 9174 (gra).
De Witte, G. F. 280 (emi), 572 (gar), 607 & 2881 (wel), 3883 (emi), 4163 (wel), 5795 (emi), 6102-6399-7598 (wel), 12642 (pre).
Diauwi 546 (sar).
Didrichsen, F. 3227 (div).
Dinklage, M. 355 (tho), 841 (bul), 888 (tho), 1401 (bul), 1959 & 2157 (sar), 2425 & 2797 (gra).
Dinter, K. 2550-2795-4598-6888 (amb).
District Forst. Off. 6657 (spe).
Distr. Officer, S. Tenasserim 7 (wal).
Djoemadi 46 (his).
Donis, C. 2098 (sar).
Doorn see van Doorn
Drummond, R. B. 1792 (cou), 4580 (pre), 5447 (pet), 6235-6301-7320-8295 (wel).
Dubois, L. 160 (pre), 338 (his), 1315 (emi), 1318 (gar), 1461 (wel).
Dubois, R. 28 (sar).
Duff, C. E. 7/32 (wel).
Dumas in herb. Chevalier 18193 (his).
Dümmer, R. 2430 & 2734 (pre).
Dunster 17/06 (kom).
Durand 188 (sar).
Duss 889 (gra).
Du Toit, P. C. V. 2370 (gra).
Dybowski, J. 11 (sar), 25 & 29 (his), 190 (gra).
Dyer, R. A. 4346 (ger).
Dyson, W. G. 344 (cou).

Eaux, Fôrets & Chasses R. C. A. 2026 (gra).
Eberhardt, P. A. 2522 (div), 4920 (cau).
Edano, G. E. 6191 (= PNH 18139) (cau).
Edwards, D. 640-761-821 (wel), 1834 (ger), 2315 (spe).
Eggeling, W. J. 588 & 1282 (pre), 3210 (his), 6048 & 6078 (emi), 6388 (hyp), 6742 (kom), 6743 & 6756 (cou).
Eimunjeze see FHI
Ejiofor see FHI
Ekman H3242 (gra).
Elbert, J. 2648 & 2736 (cau), 3892 (pub), 6235 & 6236 (cau).
Elizabeth, J. 116 (gra).
Ellenbeck 2205 (mir).
Ellenberger, F. 1083 & 1092 (sar).
Elliott, W. R. 233-236-254 (his).
Elmer, A. D. E. 12302-13081-15637 (cau).
Elmi & Hansen 4021 (mir).
Emwiogbon see FHI
Enti, A. A. 15 (= FH6089) & SP417 (pre), SP514 (gra), SP594 & R1069 (pre), FE1388 (his), FE1408 & 1622 (sar), 1695 (pre), 1710 (gra), 1722 (his), FH7504 & FH7858 (sar). see also GC.
Ern, H. 2000-2732-2787-2941 (sar), 2945 & 3239 (his).
Ernst, A. 274 (cau).
Escritor, L. BS20908 (cau).
Espirito Santo, J. V. G. 53 (sar), 501 & 853 (his), 1163 (sar), 1481 (his), 1865 & 2979 (sar), 2991 (his).
Esquirol 1190 & 1253 (div).
Esteves de Sousa, A. 111 (ger).
Evrard, C. 118 (pre), 361 (his), 2712 (pre), 2854 (par), 3136 (pre), 3443 (sar), 3507 & 3650 (mor), 4073 & 5567 (pre), 5653 (his), 5954 & 5992 (pre), 6026 (his), 6208 (con), 6947 (bar).
Exell, A. W. 3109 (amb).
Eyles, F. 6410 & 7648 (spe), 7976 (nic).
Eynatten, see van Eynatten.

Faden, R. B. & A. J. 74/301 (cou), 74/1018 (mir).
Fanshawe, D. B. 1142 & 2134 (wel), 2315 (kom), 2701 (wel), 3585 (gar), 3687 & 3869 (hol), 4054 (wel), 4807 (gar), 4902 (emi), 5016 & 5275 (gar), 6028 & 9839 (nic), 10465 (cou).
Farmer, L. 166 (sar), 269 (his), 336 (sar), 382 (pre), 383 (bar & sar), 418 (pre), 505 (his).
Farquhar, J. H. J. 19 (pre).
Farron, C. 4359 & 4689 (bul), 4702 (sar), 4932 (con).
Faulkner, H. 239 (wel), 417(D)15 (cou), 3912 (kom), in herb. Krukoff 20461 (cou); see also SRGH.
Fernando, H. 4653-NH10047-NH10482 (spe).
Ferriera 459 (amb).
Ferris, R. S. 11966 (div).
FHI 4401-7504-7858-8221 (sar), 8257 & 15544 (pre), 16070 & 16386 (his), 16387 (sar), 17540 (his), 18462 (gra), 19832 & 19840 (sar), 19905 (his), 21007-21700-22483 (bar), 22538 (pre), 24021 (sar), 25480 (gra), 25584 (pre), 25678 (sar), 26898 & 27304 (his), 27415 (pre), 27693

(bar), 28166 (gra), 30144 (pre), 30529 (his), 30699 (pre), 31752 (sar), 31798 (bul), 31820 (pre), 31925 & 34457 (sar), 35617 (his), 36026 (sar), 36655 (pre), 38021 & 38471 (his), 40901 (tho), 41044-41284-43859 (pre), 45452 (his), 47227 (bar), 48094 (his), 54209 (pre), 56014 (sar), 56843 & 60103 (pre), 60158 (gra), 61626-62203-67644 (pre), 67654 (sar), 67670 (pre), 68171 & 69364 (sar), 69931 (bar), 70168 (pre), 70305 (gra), 70688 (sar), 71063 (gra), 76317 (pre), 86414 (his).
Fischer 198 (cou), 382 (emi).
Flamigni, F. 188a (sar), 189 (arn), 190a & 6165 (pre), 10043 & 10160 (par), 10161 (pre).
Flanagan, H. G. 1375 (spe).
Fleury, F. in herb. Chevalier 26334 & 26386 (tho), 31745-32114-32412-32418 (cau), 33285 (his).
Flora of Mauritius 1878 & 1879 (boi).
Florence, J. 723 (bar), 874b (bul).
Foote, V. J. 37 (pre).
Forbes, F. B. 285 (div).
Forbes, M. 88 (pre).
Forman 550 (boi), 551 (amb), 552 (pre), 553 & 554 (amb), 555 (con), 556 (wel), 557 (tho), 558 (hyp), 559 (wal).
Fortune, A. 120 (div).
Foster, E. W. 8 (his), 18 (sar), 139 (gra), 161 (sar), 198 & 216 (pre).
Fotius, G. 101 & K782 (sar).
Fox, R. H. 96 (sar).
Foxworthy 896 (cau).
Fredoux, A. 45 (his), 449 (sar), 500 (gra).
Fries, R. E. 1075 (wel).
Fritzsche, B. 252 (wel), 253 (amb).
Froment 1151 (sar).
Fung Hom A505 & A639 (div).
Furtado, C. X. SF34899 (cau).

Galpin, E. E. 1634-7809-11869 (spe), 13341 & BH31929 (ger).
Gamble, J. S. 16302 (boi).
Gamwell, A. H. 82 (wel), 158 (emi).
Gane 22 (emi).
Garden, H. M. B2451 (sar), 12237 (cou).
Gati, F. B. 12 (sar).
Gaudichaud, M. 32 & 58 (cau), 105-130-131 (div).
Gbile 20562 (sar).
GC 6349 (sar), 6445 (his), 7225 (pre), 7403 (sar), 8226 (gra), 8229 (pre), 8432 (his), 8511 (pre), 8593 (bar), 8927-25065-37501 (sar), 37505 (gra), 37527 (bar), 37531 & 37967 (sar), 38209 (his), 38252 (pre), 39431 (gra), 39463 & 40127 (pre), 40209 (gra), 40238 & 42740 (his), 43646 (sar), 44106 (pre), 44189 (gra), 46416 (his), 46707 (pre), 47077 (his).
Geerling & Bokdam 305 (pre), 1431 (sar), 1518 (pre), 1905 (gra), 2007 & 2062 (sar), 2079 (his), 2102 (pre), 2125 (sar), 2278 (his), 2415 (gra), 2503 (pre).
Geerling, C. 4981 & 5486 (sar).
Geilinger, W. 1760 (emi).
Geoffray, M. 22 (cau).
Gérard, P. 2490-2698-3224 (pre), 3523 (sar), 3814 (pre), 5397 (sar), 5403 (mor).
Germain, R. 135 (sar), 2682 (wel), 4666 & 4686 (pre), 4751 (mor), 5145 (con), 5381-5383-5384-5385-5386-5387 (his), 5395 (sar), 7226 (mor).
Gerrard, W. T. 1795 (ger).
Gerstner, J. 2744 (ger), 4785 (pet), 6430 (spe), 6432 (ger), 6550 (spe), 6575 (ger), 6577 (spe), 6578 & 6629 (pet), 6630 (kom), 6632 (ger), 6633 (spe), 6983 & 6984 (pet), 7018 (spe), 7046 (pet), 7063 (kom), 7078 (cou), 7131 & 7185 (hyp), 7186 (kom).
Ghesquière, J. 2819 (pre).
Gibson 77/51 (= SRGH 34956)(kom).
Giess, W. 3982-9035-10210-11516 (amb).
Gilbert, G. 13 (his), 566 (pre), 1101 & 7897 (his), 8673 & 10137 (sar).
Gilbert, V. C. 1266 (emi), 1642 (mir).
Gilges, W. 131 (wel), 663 (kom).
Gillardin, J. 295-335-500-524 (par), 607 (pre).
Gillet, J. 46 (gra), 83 (his), 1616 (wel), 2083 (bul), 2129 & 3017 (wel), 3388 (sar).
Gillett, J. B. 13322 & 16388 (mir), 17365 (emi), 17920 (hyp), 18103 (cou), 19195 & 19742 (mir), 21064 (pet), 21065 (kom), 21235 (mir).
Gillis, W. T. 11254 (div).
Gillman, H. H7/42 (hyp), H7/42K (kom), 242 (kom), 438 (pre), 1074 (pet), 1206 (hyp), 1242 (kom).
Giorgi see De Giorgi
Glanis 184 (pet & kom), 185 (kom).
Gledhill, D. 894 (bar), 896 (pre).
Glover, P. E. 17 (wel).
Gocker, M. 16 (pre), 56 (gra).
Goetze, W. 2 (pet), 24 (kom), 453 (cou), 455 & 1016 (emi).
Goklin FD 2731 (sin).
Goldsmith, B. 43/59 (kom), 46/59 (pet), 85/66 (cou), 1/72 (spe).
Goll 23 (sar).
Gomes e Sousa, A. F. 103 (sar), 759 & 1586 (hyp), 1898 & 2165 (pet), 2168 & 3688 (kom), 4431 (cou), 4515 (kom), 4714 (cou), 4723 & 4725 (pet), 4843 & 4844 (kom), 4967 (pet).
Gomes Pedro & Pedrogao 3319 & 4300 (cou),

Humbert, H. 3954-5365-6753-11277-11428-20228-20236 (boi).
Hunter, C. B. 9 (his).
Hutchinson, J. & Gillett 3766 (wel), 3938 (gar), 3943 (emi), 3996 (wel).

Irvine, F. R. 80-258-455 (his), 499 (pre), 1057 (gra), 1500 (sar), 1571 (pre), 1681 & 1863 (gra), 1915 (sar), 2053 & 2729 (his), 2821 (pre).
Irving 188 (his).
Ismail 3813 (cau).
Itani, J. 49 (his).
Ivens, G. W. 2314 (mir).

Jack, J. G. 7639 (sar).
Jackson 1380 (cou).
Jacobsen, W. B. G. 282 (nic), 3389 (kom), 3581 (nic).
Jacot-Guillarmod, A. 5522 (spe).
Jaeger, P. 935 (his), 4310 & 9060 (sar).
Jans, E. 283 (arn), 483 (bul), 920 (pre), 1073 (his).
Jansen, H. 1325-1406-1528-1584 (sar), 1696 (gra), 1729 (sar), 1845 (pre), 1966 & 2295 (sar).
Jansen, P. 7553 (pet).
Jansen, de Koning & de Wilde 4 (lut), 48 (hyp).
Jaques-Félix, H. 691 (his), 1144 (gra), 2553 (tho), 3189 & 3614 (sar).
Jarman 313 (kom).
Jefferey, G. W. K567 (his), K724 (gra).
Jelinek 4 (cau).
Jespersen 8 (his), 14 or 33 (sar), 27 (pre), 34 (sar), 55b (pre).
Jex-Blake, A. J. & M. B2977 (pet), B9464 (gra).
Johnsen, P. 173 (wel).
Johnson, W. H. 150 (pre), 288 (sar), 594 (his).
Johnston, H. H. 44 (tho).
Johnstone in herb. Wallich 4459 (wig).
Jolly, A. 142 (gra).
Jones, A. C. 50 (spe), 1432 (bar). see also FHI.
Jordan 247 (sar).
Junod, H. A. 153 & 2914 (pet).
Jussieu herb. 7123 (his).

Kahurananga, J. 2888 (cou), 3090 (gra).
Kalbreyer 70 (grl).
Kässner 154 (cou).
Katz & Schmutz, H-series: 10 & 22 (sar), 42 (pre), 44 & 63 (sar), 64 (his), 65 (bar), 66a & b (his), 66c (pre), 69-70-71-72-73-74-75 (sar), 76-78-81-83 (bar).
Katz & Speiser, P-series: 1 (sar), 9 (his), 11 (sar), 13 (pre), 16 & 19 (mor), 24 (sar).
Kaudern, W. 468 (cau).
Keay, R. W. J. K53 (pre), 540 (grl); see also FHI.
Keet, J. D. 1178 (spe).
Kennedy, J. D. 35 (his), 201 & 211 (pre), 1973 (sar), 2190 (his), 2205 (sar), 2206 (pre), 2518 (gra).
Keraudren 578 & 25499 (boi).
Kerr, A. F. G. 4173 (per), 5688-7247-11627--11787-14674-15063-15602/3-16724-17828 (wal), 17935 (cau), 19243-20782-20849 (wal), 21820 (cau).
Killock, D. J. B. 98 (sar), 665-2019-2236 (spe).
Kindt see De Kindt
King, E. L. 115b (pre), 207b (sar).
King, J. M. 16 (mir).
Kings collector 438 (wal), 1191 (sin), 1387 & 1397 (wal), 3896 (cau), 8628 (cau).
King-Chung 950 (his).
Kinloch, D. 3233 (gra).
Kirk, J. 39 (sar).
Kirrika 65 (mir).
Kitson, A. E. 894 (his).
Kjellberg, G. 1151-2019-2378 (cau).
Klaine, R. P. 19 (tho), 294 (gra), 412 (grl), 1124 & 1125 (grl), 1216 (gra), 1519/20-1826-1996 (pre), 2093 (tho), 2375-2466-2557 (grl), 3418 & 3474 (bul).
Kleinhof 23 (cau).
Kloss 6689 (wal), 6762 & 6924 (cau), 6971 (per).
Koning see de Koning
Konneh, P. V. 151 (gra).
Koritschoner, H. 1649 (emi).
Koufani, A. 15 (sar), 88 (tho).
Kräusel, R. 686 (amb).
Kruif see de Kruif
Krukoff, B. A. (1949 series) 1-2-3-4 (sar), 6 (gra), 9 (his), 11 (pre), 12 & 18 (sar); (00 series) 001 (sar), 002 (pre), 003 & 004 (sar), 005 & 006 (pre), 008 (sar), 009 (his), 010-011-013 (sar), 014 (gra), 015 & 016 (his), 018 (sar), 019-021-022 (his), 023 (bar), 025-026-027 (sar), 028 & 029 (pre), 030 (his), 031 (sar), 032 (his), 046 (sar), 049 (gra), 050 & 051 (his), 064 (bul); (1950 series) 226-227-228 (his), 231 (arn), 232 (mor), 233 (sar), 234 & 235 (mor), 236 & 245 (pre), 246 (sar), 247-248-249 (con); 4432 (cau), 20501 (his), 20502 & 20503 (sar).
Krukoff & Letouzey 101 (tho), 102 (his), 103-104-105-106-107 (tho), 108 (his), 109 (bul), 110 (gra), 111 (his), 112-113-114-115-116 (gra), 118 (his), 119 (tho), 120 (his), 122 (pre?), 125 (pre), 130 (tho), 132 (his), 133-134-135 (sar), 137 (bul), 139 & 140 (sar), 141-142-143-144 (gra), 145 (tho), 146 (gra), 147 (sar), 152 (gra), 153-155-156 (sar), 157 (gra), 158 (his), 159 & 160 (gra), 161 (his), 162

(mor), 12131 (sar), 13567 (pre), 13588 (sar), 13599 (mor), 13648 (sar), 13837 (his), 14355 (con), 14503 & 14707 (his), 15190 & 15692 (sar), 15809 (pre), 16444 & 16684 (sar), 17002 (his).
Lovemore, D. F. 126 (kom), 285 (cou), 492 (kom), 561 (pet).
Loveridge, J. 1806 (kom).
Lovi, N. K. WACRI 3953 (gra), 3955 (pre).
Lowe, J. 3138 (mor), 3214 (tho), 3734 (sar).
Ludanga, R. I. 1573 (emi).
Lukuesa, M. 950 (emi), 957 (wel).
Lutendeck 79 (sar).
Lynes, H. 39 & 46 (wel), 340 & 1340 (emi).
Lyon, F. J. 108 & 2866 (gra).

Macauley 974 (wel),
MacDonald, I. W. 5 (ger).
Macêdo, A. 4825 (pet), 5382 (nic), 5433 (pet).
Macgregor, W. R74 (gra), R118 (sar), 180 (his).
Maclaud 92-356-381 (his), 386 & 454 (sar).
MacOwan 2023 (spe).
Magani 51 (sar).
Magogo, F. 491 (zim), 385 (pet), 345 (cou).
Maingay, A. C. 1072-1073-1838-3303 (cau).
Mailand, T. D. 3 (pre), 20 (his), 56 (bul), 511 (his), 1891 (bar).
Makany, L. 2041 (pre),
Malaisse, F. 6484 & 6702 (wel), 9127 (emi), 9267 & 9945 (wel).
Malaisse & Gregoire 57 & 115 (wel).
Malchair 99 (pre).
Malzy 132 (sar).
Mann, G. 177 (pre), 499 (grl), 743 (tho), 793 (his), 1444 (bul), 1843 (his), 2222 (tho), 2102 & 2248 (his), 2241 & 2246 (sar).
Manning 78 (cou).
Maputoland Expedition anno 1914: 77 & 14460 (lut).
Marko, J. M. 31 (wel).
Markwalder B8827-11332-11333 (sar), 11334 (his), 11335 (sar), 11336 (cou), 11337 (sar).
Marloth, R. 4408 & 11022 (spe).
Marmo, V. 170 (pre), 181 & 190 (sar).
Marques, S. 14-25-28-252 (wel).
Martin, J. D. 45/31 (kom), 91/31 (wel), 335 (kom), 338/32 (nic), 888/38 & 903/38 (wel).
Martin, M. 258 (cau).
Martins, V. 69 (wel).
Masheti & Mumiukha 23 (mir).
Maudoux, E. 1202 (sar).
Mavi, S. 236 (pet).
Maxwell, J. F. 72/160-75/175-75/500 (per).
McClure, F. A. CCC8815 (div).
McGregor, G. M. 82/51 (kom).
McKee 10281 (spe).
Meebold, A. 12582 (kom), 12583-12584-12585 (spe), 14495 & 14605 (wal), 15423 (per), BH31917 (kom).
Meer see van Meer
Meikle, R. D. 505 (sar), 534 (his), 540 (grl), 665 & 716 (sar), 789 (his), 838 & 852 (sar), 927 (his), 929 & 934 (sar), 985 (bar), 1032 & 1035 (his), 1046 (sar), 1050-1051-1052-1053-1054-1055 (his), 1129 (bar), 1159 (gra), 1167 (sar), 1192 (pre), 1200-1211-1222-1238 (sar), 1297 (bar), 1457 (pre), 1479 (sar).
Menavanza, F. 112 (pre).
Mendes, E. J. 119 (amb), 180 (wel), 260 & 610 (amb), 3440 (wel), 3878 (amb).
Mendonça, F. A. 31 & 144 (pet), 897 & 906 (hyp), 1087 (pet), 1243 (hyp), 1584 (kom), 1656 (ger), 2556 (cou), 2707 (kom), 3062 (ger), 3200 & 3935 (pet), 4629 (amb).
Menyhart 133 (pet), 140 (kom), 501 (pet), 1068 (kom).
Menzelaar SA16024 (emi).
Merrill, E. D. 695 & 9570 (cau).
Methuen, Lord 281 (kom), 292 (pet).
Meyer, W. 7157 (cau).
Mgaza, C. D. 347 (cou), 552 & 722 (pet).
Mhoro 1150 (emi).
Michelmore, A. P. G. 361 (emi).
Miège, J. 934 (sar).
Mildbraed, J. 2782 (pre), 3724 (his), 3738 (sar), 3824 & 4131 (pre), 7552 (gra), 7577 (tho).
Miles, A. C. 22 (pre), 24 (sar), 25 (pre).
Millard, A. H. KL177 (cau).
Millen, H. 24 (pre), 25 (sar), 1174 (gra).
Miller, O. B. D128 & 101/30 (emi), B25 & B46 (kom), 10/38 (wel), 1123 (kom).
Milne-Redhead, E. 850 & 1039 (wel), 3646 (gar), 7100 & 7621 (cou), 11261 (emi).
Mitchell, B. L. 25/86 & 25/77 (nic), 2837 (kom), 2956 (pet).
Mogg, A. O. D. 32421 & 32653 (pet).
Moggs, D. H. OK11 (his).
Moll, E. J. 812-2683-3540 (spe), 3759 & 4355 (lut), 4358 (pet), 5649 (lut).
Montchal, H. 160 (pre).
Monteiro (anno 1874) 1 (pet).
Monteiro & Murta 1505 & 1811 (wel).
Mooney, H. F. 2872 (wal).
Moor, H. W. 22 & A55/28 (sar), 287 & 1018 (pre), 1021 & 1024 (sar).
Moors, D. R. K16 (emi).
Morat, P. 1426 (boi).
Mortehan 196 (pre), 719 (mor), 776 (pre), 1031 (sar), 1085 (con).
Mortelmans 5 & 98 (wel).

Morton, J. K. A352 (pre), SL675 (sar), A714 (pre), SL716 (sar), SL1013 (pre), SL1688 (his), A2495 & A2653 (sar), A3635 (bar), A3645 (sar), A3916 & A4147 (pre), 4147 (his), see also GC.
Mottan, M. 977 (wel).
Motley 25 & 760 (sin).
Mullenders, W. 1131 (wel).
Müller, T. 938 (pet), 1185 (cou).
Mullin, M. J. 71/56 (kom), 72/56 (nic), 120/51 (kom).
Murta & Silva 590 (wel), 775 & 776 (amb).
Mutimushi, J. M. 1060 (wel), 1644 (nic), 3139 (wel), 3954 (kom).
Myre, M. 4777 (kom).
Mwakalinga 4 (emi).
Mwasumbi & Harris 2420 (zim).

Nai Noc in herb. Kerr 233 (cau).
Napper, D. 938 (wel), 1467 (cou).
Naskan 2795 (wal).
Nee, M 11385 (sar).
Neves Rosa, F. 79 (pet).
Newberry 37 (sar).
Newman, J. L. 71 (emi).
Newton 295 (sar).
Ngameni Kamga, B. 157 (pre).
Ngongondo, G. 4 (cou).
Niel see van Niel
Noe, N. 223 (cau).
Noerkas 303 (cau).
Nolde see van Nolde
Nsimundele 459-464-575-576 (wel).
Nuvunga, A. 496 (hyp).

Oatley, T. B. 55 (ger), 56 (lut).
Obermeyer, A. A. 2038 (spe), 2379 (kom).
Okafor see FHI
Okeke see FHI
Oldeman, R. A. A. 86 (gra), 243 & 724 (his), 727 (gra), 755 (pre), 936 (sar).
Oldenhove 10 (sar).
Olorunfemi, J. SE156 (pre); see also FHI.
Onochie see FHI
Onwudinjoh see FHI
Onyeachusim see FHI
Overlaet 1112 (amb), 1113 (pre).
Oxtoby, E. EA15390 (mir).

Pacock, M. A. 276 (wel).
Paoli, G. 493-627-898 (mir).
Paolo, S. 810 (cou).
Parker, I. GM/333/S & GM/334/S (mir).
Parkinson, C. E. 367-1202-1683 (wal), 2048 (cau).
Paroisse, G. 1 (sar), 3 (his), 5-6-7-8-23-28-36-37-43 (sar), 44 (his), 60-61-62-63-83-95 (sar).
Parsons, B. 11 (mir).
Paulo 810 (cou).
Pauwels, L. 1368-1523-2757-4194-4296-4558 (wel), 5511 (sar), 5912 (his), 5918 (bul).
Pawek, J. 7406 (nic).
Pedro & Pedrogao see Gomes Pedro & Pedrogao
Pegler, A. 915 (spe).
Pentz, J. A. 348 (spe).
Pereira 2500 (kom).
Periquet 153 (pre).
Perrier de la Bâthie, H. 957-975-8134-8135-8852-8908-11215-19038 (boi).
Perrotet 457 (sar), 466 (his), 467-477-2001 (sar).
Peter, A. 13172 (kom), 31376 & 31522 (cou), 31551 (pet), 32679-32738-32928-33048--33136-33176-33630-34100-34769-35002-35240-44494-44503 (emi), 44805 & 46534 (cou), 47334 (amb), 58105 (his), 58107 (cau), 58200 (wel), 58211 (cou), 58246 (zim), 58257 (cou), 58259 (zim), 58271 (cou), 58284 (zim).
Peyre de Fabrègues 493-2013-3538 (sar).
Phelps, R. J. 128 (kom).
Phipps, J. B. 789 (kom), 818 & 1377 (nic), 1423 (pet), 1430 (kom), 3175 (emi).
Pienaar & Vahrmeyer 212 (kom).
Pierlot, R. 1460 & 2878 (con).
Pierre, L. 45 (cau), 216 (gra), 3582 (wal), 4411 (cau), 4412 (wal).
Pilz, G. E. 2262 (sar).
Pirey see de Pirey
Pitot, A. 762 & 763 (sar var. gla).
Pitterij 21 (pre).
Pleva 12 (emi).
Plowes, D. C. H. 1823 (kom), 2352 (pet), 2722 & 2813 (kom).
Po Khant 13377 (per).
Pobéguin, H. 1 (sar), 2 (pre), 6 (sar), 11 (his), 18 & 19 (sar), 28 (sar var. gla), K30-140-150 (his), 176 (pre), 177 (sar), 179 (tho), 905 & 1288 (sar var. gla).
Pocs, T. 6466c (zim).
Poilane, E. 902-7836-13380-16428-17507-23311-27416 (cau).
Poisson, E. 18 (his), 60 (boi), 80 (his).
Pole Evans, I. B. 813 (emi), 1860 (wel), 1886 (gar), 2969 (wel), 2983-3019-3032 (emi), 3069 (nic), 4682 (spe), 4722 (ger), 5731 (gra).
Polhill & Paulo 1268a (emi).
Pooley, E. S. 27 (lut), 64 (ger).
Poore, M. E. D. 1004 (cau).
Pope 1433 (kom).

Pott, R. 4582/13291 (spe).
Poucet, J. 500 (arn), 501 (his).
Prain 33 & 71 (wal).
Prawiroatmodjo 1833 (cau).
Preuss 13-116-1114-1328 (pre).
Price, W. R. 1286 (div).
Procter, J. E. A. 449 (emi), 1938 (wel), 3305 (emi).
Purves, J. M. 218 (cou).
Putman 118 (pre).
Pynaert, L. 49 (sar), 72 & 392 (arn), 393-610-740 (pre), 843 (his), 906 & 1020 (pre), 1077 (his), 1342-1391-1762 (pre).
Pyne, C. T. 103 (sar).

Quarré, P. 290 & 516 (wel), 2599 (gar), 3588-4235-4666-5172-6179-6241-13998 (wel).
Queen Victoria Memorial Herbarium 6410 (spe).
Quesnel 1847 (gra).
Quintas, F. 140 (pet).
Quisumbing, E. 42648 (cau).

Ragwan, R. S. 108 (wal).
Raimundo 417-685-821-1198 (amb).
Ramos, M. (BS-series) 20521-22589-49693-76844 (cau).
Rattray, J. M. 371 (spe).
Rawlins, S. 254 (cou).
Raymond, W. D. 55 (cou), 112 (pet), 191 (kom).
Raynal, J. & A. 9568 (sar), 13644 (gra).
Rea, H. J. A. 25 (emi), 129 (wel).
Reed 12/1949 (sar).
Rees, A. F. T176 (cou).
Regnier 50 (cau), 335 (wal).
Reinwardt 117 (cau).
Renier, M. 25 (par), 166 (wel).
Repton, J. E. 1799 (spe), 6026 (ger).
Reygaert, F. 231 (pre), 335 (his), 345 (pre), 355 (his), 776-781-934-1114-1173-1251-1308-1451 (pre).
Reynolds, G. W. 1905 (sar), 7561 & 7562 (wel).
Richard 635 (wal).
Richards, H. M. 34 (wel), 706 (emi), 1234 (wel), 1420 & 1624 (emi), 1722 (wel), 1954 (gar), 2198 (wel), 3646 (gar), 4628 & 5585 (emi), 6194 (gar), 9037 (emi), 13218 (gar), 15167 & 15282 (emi), 16947 & 17105 (wel), 20517 (gar), 20682 (wel), 21228 (emi), 27282 (wel).
Richardson & Livingstone 99 & 131 (wel).
Ridley, H. N. 1830 (sin), 3994 (cau), 6040 & 6702 (sin), 14947 & 14970 (wal).
Ritchie, A. H. B1422 (mir).
Risopoulos, S. 799 (wel), 1101 (emi).
Ritschard, F. 1744 (wel).
Roadon 1 (his), 5 (sar).
Robert, M. 7 (div).
Roberts, A. PRE 32429 (ger).
Robertson, R. G. 141 (wel), 171 (gar).
Robertson, S. A. 1765 (mir).
Roberty, G. 7169-10508-10734 (sar), 10768 (his), 13276 (sar), 13557 (gra), 13662 (pre), 15424 (sar), 15511 (pre), 15591 (gra), 15695 (his), 16663-13541-17163 (sar), 17551 & 17597 (his).
Robin, R. 77 (par).
Robinson, E. A. 2612-3206-3787 (wel), 3976 (gar).
Robson, N. K. B. 92 & 93 (cou), 53 (nic).
Robijns, W. 25 (wel), 796 & 1164 (pre), 1961 (emi), 3861 (wel).
Rodgers, W. A. 1523 (emi).
Roffery, J. 60041/7 (mir).
Rogeon, J. F. 136 (sar).
Rogers, F. A. 5837 (pet), 8411 (cou), 10066 & 10288 (wel), 13060 (kom), 26249 (wel), 29921 (ger).
Rosevear, D. R. 18/29 (pre), 22/31 (sar).
Ross, A. F. see MacGregor
Ross, J. H. 1951 (lut).
Ross, R. 37 (his), A39/46 & 121/25/5 (sar), 192 (pre).
Rossignol 135 (his).
Rounce, N. V. 203-248-283 (emi).
Round, N. P. 203 (emi).
Roux, J. P. 238 (amb).
Rowland 144 (his).
Rowland-Jones, M. 43 (pet).
Rudatis, H. 15 (pre), 27 (his), 1680 (spe).
Ruffo, C. K. 503 (gra).
Ruigvet 17792 (wel).
Rushworth 1025 (spe), 1222 (nic).
Ryan 70 (sar).

Saboureau, P. 2006-2191-2715-3294-5635 (boi).
Sacleux, R. P. 2132 (kom).
St. Barbe Baker, R. E. 1102 (pet).
Salesiens 276 & S458 (wel).
Samai, S. K. 467 (sar).
Sampson 411 (div).
Sanford, W. W. 517a (pre), 6908 (sar).
Sanjinje 21 (wel).
Santapau, H. 243 (wal), 10799 (boi).
Santos, R. M. 128 & 130 (amb), 649 & 697 (wel), 1023 & 1025 (amb), 1591 & 1675 (wel), 2537-2821-2860 (amb).
Satabie, B. 236 (pre), 541 (mor).
Saunders 5 & 15 (sar).
Savile, A. H. 22 (emi).
Saxer 613 (sar).

Schäfer, P. A. 7237 (pet).
Schenkel, R. 79 (mir).
Schiffner 27 (cau).
Schinz, H. 222 (amb).
Schlechter, R. 11624 (pet), 12313 (pre).
Schlieben, H. J. 5506 (cou), 5211 (pet), 5610 (kom), 11867 (cou), 12911 (spe).
Schmidt, J. 639 (wal).
Schmitz, A. 482 (wel), 1633 (emi), 2989 (gar), 3017 (wel), 5610 (gar), 5643 & 5748 (wel), 6865 (emi).
Schnell, R. 683 & 1271 (pre), 3813 (his), 4263 (sar), 4487 (his), 4640 (sar), 4757 & 4758 (his), 4902 & 5228 (pre), 5249 (bar).
Scholes, J. 39 & 222 (pre).
Schultze 214 (emi).
Schuurman, J. A. (H-series) 126 (div), 127 (his), 128 (gra), 129 (boi), 130 (tho), 131 (wel), 132 (sar), 133 (pre).
Schwarz BH 31919 (pet).
Schweikert, H. G. 1671 (spe).
Scortechini 1818 (per), 1819 (cau).
Scott Elliot, G. F. 2793 (pet), 4512 (sar), 5300 (his), 5657 (sar), 8316 (wel).
Scully, W. 175 & 761 (spe).
Seimund, E. 108 (cau).
Semsei, S. R. 1001 & 1430 (cou).
Senni, L. 267 (mir).
Seret, F. 501 (pre), 773 (his), 783 (pre).
Service des Eaux et Fôrets de Madagascar (SF-series) 2772-4330-4451-5418-6218-11148-11165-11234-11244-11336-12234-12274-12653-16837-16849-18429-18661-18827-20794-25997-28946 (boi).
Service des Recherche Forestières de Cameroun (SRFK-series) 4141 & 15499 (bul).
Servicos Agricolos da Guiné 29 (his).
Seyrig, A. 332 (boi).
Shantz & Turner 4145 (kom).
Siame, W. 122 (wel).
Sidey, J. L. 3967 (spe).
Sieber, F. W. 334 (cau).
Sigaldi, see de Sigaldi
Sillans 419 (sar), 1597 (pre).
Silva, see da Silva
Sim, T. R. 2166 & 19709 (spe), 20658 (cou).
Simão, J. 176 (kom), 601/48 & 66 (cou), 631/48 (kom).
Simon & Williamson 1055 (wel), 1180 & 1433 (wel).
Sinclair, J. 5639 & 6826 (sin), 8933 (cau), 38384 (sin).
Sita, P. 1058 (pre), 1225 (con), 1539 (bul), 1918 (his), 1960 (con), 2462 (par), 2609 (sar).
Slayner, F. J. 100 (spe).
Small, D. 543 (sar).
Smiley, K. L. 497 (ger).
Smith, C. A. 20 (ger).
Smith, F. G. 1176 (emi).
Smitin & St. John 6857 (cau).
Smuts, J. C. 301 (kom).
Smythe, C. W. 3 (sar), 4 (his), 77 (pre), 245 (gra).
Snowden, J. D. 1883 (cou).
Sole, M. 409 (spe).
Soriano, M. PNH 11230 (cau).
Sousa, E. 111 (ger), 2979 (sar).
Sousa, J. A. 47 (amb).
Soyaux, H. 55 (bul), 312 (grl), 312b (his), 458 (gra).
Speiser, P. (P-series) 25 (gra), 26 (tho), 28 & 29 (con), 30 (grl), 31 (con).
Speldewinde, C. A. 11240 (cau).
Spire 130 (cau), in herb. Pierre 7051 (cau).
Squires, R. W. 901 (per).
SRGH 11733 & 14988 (cou), 28063 (wel), 34652 (kom).
Stacy Morris, K. R. 529 (his).
Staner, F. 1386 (his), 1436 (pre), 1495 (mor), 1615/1619 (arn).
Staudt, A. 14 (tho), 664 (pre).
Stephen, J. 708 & 750 (lut), 753 (pet), 755 (lut), 756 (ger).
Stewart, M. 8961 (spe).
Steyaert 30-94-104-116-120-169-191-216-252-258-283-309-335 (pre).
Stocks, J. 20 & 22 (pet), 148 (hyp).
Stohr, F. O. 478 (wel).
Stolz, A. 125 (cou).
Stoney 840 (cou).
Stopp, K. (BO-series) 128 (wel).
Stowes, F. N. 1062 (sar), 1208 (his).
Straub 27 (sar).
Streel, M. 299 (wel).
Strey, R. 2421 (amb), 3759 & 3762 (lut), 5185 & 5281 (ger), 5920 & 10195 (spe), 10270 (lut).
Strid, A. 2315 (kom).
Stuhlmann 805 & 823 (cou).
Sulit, M. D. (PNH-series) 12290 & 12424 (cau).
Surcouf, J. B172 (cou).
Surville 738 (bul).
Swaine see GC
Swinhoe, R. 06/70 (div).
Swynnerton, L. J. M. K51 (kom), 940-942-2053 (emi).
Symoens, J. J. 6486a (wel).
Synnott, T. J. H. 478 (pre).

Talbot, P. A. 80 (tho), 90a (gra), 211 (bul), 364 (pre), 1349 & 1479 (sar), 1482 & 2029 (his), 2045 & 2054 (gra), 3026 (grl), 3062 (gra), 3078

Van Niel, J. P. 4637 (sin).
Vanphruk, P. 664 (per), 659 (wal).
Van Rensburg, H. J. 2533 (nic), 3040 (wel).
Van Someren, V. G. L. EA11166 (pre).
Van Veldhuizen, J. 557 (gra).
Vasse, G. 40 & 276 (cou).
Vaughan, J. H. 2494 (pet).
Veldkamp, J. F. 6150 (sar).
Velgueiras 1 (hyp).
Venger 740 (his).
Venour, W. A. H114/50 (mir).
Venter, H. J. T. 1785 (ger).
Verboon 342 (emi).
Verdcourt, B. 33 (cau), 2880 (emi).
Verdick, E. 84 & 146 (wel), 235 & 236 (gar).
Verger 956 (sar), 1226 (pre).
Vermoesen, F. 142 (pre), 315 (con).
Versteegh & Den Outer 67 (pre), 491 (sar), 492 (his).
Versuchsanstalt Kamerun 20 (his), 382 (gra).
Vesey-Fitzgerald, L. D. E. F. 3175 (emi).
Veterinary Officer Mazabuka CRS 443 (nic).
Vianzi 2 (cou).
Vidal, J. E. 3260 & 5099 (cau).
Videw 8106 (kom).
Vigne, C. 94 (pre), 147 (sar), 154 (pre), 1071 (his), 1083 (bar), 1084 & 1697 (pre), 1871 (bar), 1912 (pre), 2671 (sar), 3145 (gra), 4380 (bar).
Vikindu 1 (pet).
Villiers 1111 (con).
Vin 58 (wel), 86 (gar).
Virgo, K. J. 7 (sar).
Volk, O. H. 566 (amb).
Vollesen, K. (MRC-series) 2954 (cou), 4221 & 4246 (kom).
Von Mechow, A. 251 (wel).
Von Nolde, I. 254 (amb).
Von Wettstein, R. & F. 4 (amb).
Voorhoeve, A. G. 205 & 782 (sar).
Vrijdagh 36 & 83 (his), 405 (pre).

Wagemans, J. 1459 (sar), 1603 (arn).
Wager, H. 22986 (spe).
Walker, abbé 29 (con).
Wallace, C. V. 635 (emi).
Wallich herb. 1046 (partly wal), 1641 (wal), 4459 (wig).
Walter, H. & E. 1098 & 1161 (amb).
Wang 357 (div).
Wanntorp, H. & H. E. 872 & 1084 (amb).
Warburg, O. 1563 (cau), 17193 (pub).
Ward, C. J. 21 & 41 (emi), 1472-1641-2647-2694-3451 (ger), 3500 (pet), 3502 (lut), 3536 (ger), 3574 (lut), 3842 (pet), 6626 (ger).
Warnecke 133 (his), 476 (sar).
Wassarak 16 (cau).
Waterlot 1060 (sar).
Watkins, G. 107 (emi), 521 (pre), 2372 (emi).
Watt, J. S. 41 & 1973 (wel).
Wearne, W. D. 25 & 60 (ger).
Weiss, E. 2634 (div).
Wellens 194 (pre).
Wells, M. J. 2205 (ger), 3199 (spe).
Welwitsch, F. 22 (wel), 719 (amb), 1117-5926-5990-5991 (wel), 5992 (amb), 5994 (par), 5995 & 5996 (pre), 5998 & 5999 (amb).
Wenzel, C. A. 228 (cau).
West, O. 3279 & 3471 (wel), 4536 (nic), 4575 (cou), 4964 (spe), 6939 (kom).
Westphal, G. 57 (pet).
West-Skinn, R. 6 (his), 282 (gra).
Wheelan, J. H. 4 (his & sar), 5 (his).
Whellan, A. J. 396 (nic), 494 (pet), 1411 (emi), 1988 & 1989 (wel), 2020 (kom).
White, C. T. 8649 (spe).
White, F. 2068 & 3258 (wel), 3301 (gar).
Whitmore, T. C. FRI12958 (wal).
Wigg, L. G. T. 30-406-1079 (emi).
Wight, R. 1878 & 2546 (wig), 2547 (wal), 6349 (wig).
Wilberforce, P. W. 45 (wel).
Wild, H. A66 (pet), 2375 & 2667 (kom), 4226a (nic), 4875 (wel), 6340 (spe), 6620 (cou), 6627 (pet), 10843 (wel).
Williams, G. R. 378 & 628 (cou).
Williams, G. R. & Brass & Woodward 20968 (kom).
Williams, J. G. 10163 (emi).
Williams, T. 437 (pre).
Wilson 200 (div).
Wilson, J. G. 80 (emi).
Winkler, H. 583 (cau), 1218 (pre).
Winters, H. 2228 (sar).
Wiss, H. J. 509 (spe).
Wisse, C. A. 1042 (gra).
Wit see de Wit
Woerjantoro 1 (boi), 4 (pre), 6 (gra).
Wood, D. D. 160 (gra).
Wood, J. M. 817-4305-7895-8649-9926-10048-11740-12069 (spe).
Woodburn, J. C. 38 (emi).
Wray, L. 3306 (cau).
Wright, C. 327 (div).
Wright, J. M. 306 (wel).

Yallah 15 (his), 116 (pre).
Yasothorn 37 (cau).
Ybert, J. P. 322 (pre).

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REGISTER

Synonyms are in italics. Page numbers of principal entries in bold face; those of figures, maps and photographs in italics.