Notes on Secamonoideae (Apocynaceae) in Africa

Jens KLACKENBERG
Naturhistoriska riksmuseet, Sektionen för fanerogambotanik,
Box 50007, SE-104 05 Stockholm, Sweden.
klack@nrm.se

ABSTRACT
The African taxa that have been referred to *Toxocarpus* (Apocynaceae, Secamonoideae) are revised. All three species, including one species sometimes placed in a monotypic genus, *Rhynchostigma*, are transferred to *Secamone*. The following recombinations are made: *Secamone brevipes* (Benth.) Klack., *S. letouzeana* (H. Huber) Klack. and *S. racemosa* (Benth.) Klack. In addition a fourth species is described as new and given the name *S. goyderi* Klack. Keys to the genera of subfamily Secamonoideae from continental Africa and Madagascar and to the continental African species of genus *Secamone* are given. Descriptions, distributions and drawings of the four species added to *Secamone* are given.

KEY WORDS
Apocynaceae,
Secamonoideae,
Africa.

RÉSUMÉ
Notes sur les Secamonoideae (Apocynaceae) d'Afrique.
Les taxons africains qui ont été rattachés au genre *Toxocarpus* (Apocynaceae, Secamonoideae) sont revisés. Les trois espèces, y compris celle placée dans le genre monotypique *Rhynchostigma*, sont transférées dans le genre *Secamone*. Les combinaisons suivantes sont établies : *Secamone brevipes* (Benth.) Klack., *S. letouzeana* (H. Huber) Klack. et *S. racemosa* (Benth.) Klack. De plus, une quatrième espèce, reconnue comme nouvelle, *S. goyderi* Klack., est décrite. Des clés de détermination des genres de la sous-famille des Secamonoideae en Afrique continentale et Madagascar et des espèces de *Secamone* d'Afrique continentale sont présentées. Les descriptions, distributions et illustrations de ces quatre espèces rattachées au genre *Secamone* sont données.

MOTS CLÉS
Apocynaceae,
Secamonoideae,
Afrique.

INTRODUCTION

Subfamily Secamonoideae is characterized by having four pollinia per corpusculum, not two as in Asclepiadoideae, and by not lacking a corpusculum and instead furnished with a spoon-like pollen carrier as in Periplocoideae. In a recent classification of Apocynaceae s.l., ENDRESS & BRUYNS (2000) accepted nine genera in Secamonoideae Endl., viz. *Calyptranthera* Klack., *Genianthus* Hook f., *Goniostemma* Wight, *Pervillaea* Decne., *Rhynchostigma* Benth., *Secamone* R. Br., *Secamonopsis* Jum., *Toxocarpus* Wight & Arn. and *Trichosandra* Decne. Six of those are found in Madagascar and continental Africa, i.e. *Calyptranthera*, *Pervillaea*, *Rhynchostigma*, *Secamone*, *Secamonopsis* and *Toxocarpus*. *Calyptranthera*, *Pervillaea* and *Secamonopsis* are endemic to Madagascar, while *Secamone* and *Toxocarpus* are considered to be widespread in Africa, India and Southeast Asia, and the monotypic *Rhynchostigma* to be an endemic to central tropical Africa. In this paper, however, it will be shown that African species of *Toxocarpus* and *Rhynchostigma* are better included in *Secamone*. This means that subfamily Secamonoideae is represented in continental Africa by the single genus *Secamone*.

Secamone consists of suffrutescent twiners or small scrambling herbs with usually white to yellow small flowers. It is distributed in Africa from Cape Province in the south to Senegal, Republic of Central Africa and northern Somalia in the north. It also occurs on Bioko Island (Fernando Poo) in the Bay of Guinea. The genus is widely distributed in Madagascar and is also present on several smaller islands in the Indian Ocean, i.e. Mauritius, La Réunion, Rodrigues, Seychelles, Socotra, Zanzibar, Pemba and Comoros. In Asia it is found in Sri Lanka and southern India, and from southern China in the northwest through Southeast Asia to eastern Australia and New Caledonia. On the African mainland 19 species are recognized (GOYDER 1992 and this paper), in Madagascar and adjacent islands 69 species (KLACKENBERG 1992a, 1997b, 1998, 2000a,b,c), one on Socotra (GOYDER 1992) and in Asia at present two species are recognized (KLACKENBERG 1992b).

MATERIAL AND METHODS

This study is based on herbarium material from the following herbaria (abbreviations according to HOLMGREN et al. 1990): A, B, BM, BR, G, GH, K, L, MO, NY, P, US and Z.

All specimens cited have been studied if not otherwise stated.

Asclepiadaceae are included in Apocynaceae s.l. and the classification of the family follows ENDRESS & BRUYNS (2000), i.e. the former family Asclepiadaceae is subdivided into three subfamilies: Periplocoideae, Secamonoideae and Asclepiadoideae.

Measurements of floral parts were made on boiled material, of vegetative parts and fruits on dry material. The measurements of the gynostegium are in accordance with earlier studies of *Secamone* in Madagascar and Asia (see KLACKENBERG 1992a). The style head in *Secamone* is situated directly on the ovary. It has a broader "basal portion" with the stigmatic area just below the top and a narrower (at least at base) "apical portion" (= "broader basal part" and "narrower apical part" of "stigma head" in KLACKENBERG 1992a,b).

The species concept used in this revision conforms to KLACKENBERG (1992b).

The drawings were made from herbarium material.

TAXONOMIC ORIENTATION AND NOTES ON MORPHOLOGY

The subfamily Secamonoideae is characterized by having four pollinia per corpusculum, not two as in Asclepiadoideae. Four pollinia, however, is considered a primitive character and consequently not possible to use to characterize this subfamily (KLACKENBERG 1992a). Recognition of the Secamonoideae as a separate subfamily was recently discussed by ENDRESS &

BRUYNS (2000). However, no apomorphies for this taxon were presented. The pollinia of Secamonoideae differ from those in Asclepiadoideae in that they are composed of tetrads held together by cross-wall fusion, without an outer wall enclosing the pollinium. Also in this character Secamonoideae are primitive and similar to those few genera of Periplocoideae that have pollinia. The apomorphic character, i.e. pollinia with individual pollen grains and the whole structure covered by a thick wall, is found in the Asclepiadoideae. The subfamily is easily recognized as presently circumscribed, however, by these plesiomorphies and by the soft semi-ellipsoid corpuscules which are U-shaped in cross section. Although it is difficult to point at morphological apomorphies to characterize Secamonoideae, recent molecular studies (gene *mat*K) of Apocynaceae (by CIVEYREL 1996; CIVEYREL et al. 1998) nevertheless show this subfamily to be monophyletic. Some genera within the subfamily seem to be monophyletic. This is true for the Malagasy endemics *Secamonopsis*, *Pervillaea* and *Calyptranthera*, but might also to be the case for the widely distributed *Secamone* (CIVEYREL 1996; CIVEYREL et al. 1998; KLACKENBERG 1996a, 1997a). No species of *Toxocarpus* nor *Genianthus* were included in these analyses, however, and much data still is lacking in order to sort out monophyletic groups within the subfamily. Nevertheless, African *Secamone* seem to form a monophyletic group together with the Malagasy species of the genus (CIVEYREL 1996; CIVEYREL et al. 1998) and, according to the analyses of CIVEYREL (1996, fig. 41), are probably even nested within the Malagasy taxa. Only one African species (*S. parvifolia* (Oliv.) Bullock), however, has been analysed so far.

The generic delimitation of *Secamone* in relation to *Toxocarpus* has been discussed several times (DECAISNE 1844; BENTHAM 1876; SCHUMANN 1895; BROWN 1902; SCHLECHTER 1907, 1914; CHOUX 1914; TSIANG 1939; KLACKENBERG 1992a). In most papers both genera are accepted. However, the most often used diagnostic character, i.e. dorsiventrally versus laterally compressed corona lobes, is not reliable. This and other differences are distinct in Asian material, but blurred when studying African and Malagasy Secamonoideae (KLACKENBERG 1992a). The plasticity of the corona structure in Apocynaceae was also discussed by WOODSON. He concluded that "authors ... seem not to have understood what a versatile feature this organ is" (WOODSON 1941), and discarded the variation in corona morphology as a character to be used at generic level. This is surprising taken into account the delicate function carried out by the corona in pollination. A variable nature of the corona lobe morphology, however, is corroborated if studying the shape of the corona in relation to a phylogeny based on molecular data. From the cladogram presented by CIVEYREL (1996, fig. 41) it can be seen that species with considerable differences in corona morphology show up as closely related species in a repeated pattern within the genus. For example, *S. falcata* Klack. with distinctly falcate lobes and *S. buxifolia* Decne. with dorsiventrally compressed rather straight lobes, group together. Furthermore, *S. sparsiflora* Klack. (dorsiventrally compressed lobes) forms a clade with *S. unciata* Choux (slightly laterally compressed lobes). *Secamone ecoronata* Klack., which lacks corona lobes, is related to *S. minutifolia* Choux, which has well developed dorsiventrally compressed corona lobes. Consequently, the shape of the staminal corona seems to be variable and of limited taxonomic value at generic level in this taxon group.

GOYDER (1992) recognized 16 species in a revision of continental African *Secamone*. Because of the uncertain boundaries within the subfamily, three species which traditionally have been placed in *Toxocarpus* and *Rhynchostigma* due to their dorsiventrally flattened corona lobes, were excluded. These are the taxa primarily dealt with in this paper. These three species together with the new species here described, show many diagnostic characters inseparable from Malagasy *Secamone* and, seen in a wider perspective, cannot be kept in a separate genus based mainly on the single character of dorsiventrally compressed corona lobes. As will be discussed below, the remaining characters exhibited by *Toxocarpus* in Africa and *Rhynchostigma* are frequently found also in Malagasy *Secamone*. Consequently, there is no

morphological difference between what has been called *Toxocarpus* in Africa and *Secamone* in Madagascar.

Toxocarpus was described from South Indian material (*T. kleinii* Wight & Arn.) but has been conceived as a widely distributed paleotropical genus. In Madagascar it was formerly composed of five species. In a series of papers, however, KLACKENBERG (1992a, 1995, 1996a, 1996b, 1997a) showed that these taxa formed a paraphyletic group and placed one of them in a newly erected genus *Calyptranthera* Klack. (*T. caudiclavus* Choux), two others in *Secamone* (*T. ankarensis* Jum. & H. Perrier and *T. sulfureus* Jum. & H. Perrier), and reinstated the forgotten name *Pervillaea* Decne. for the remaining two (*T. tomentosus* (Decne.) Jum. & H. Perrier and *T. decaryi* Choux). The African species *T. africanus* Oliv. and *T. leonensis* Scott-Elliot already had been transferred to *Secamone* by BULLOCK (1953) and BROWN (1902), respectively, placements that were accepted by GOYDER (1992). In this paper the remaining *Toxocarpus* in Africa, *T. brevipes*, *T. letouzeanus* and *Toxocarpus* / *Rhynchostigma racemosus* are transferred to *Secamone*. Consequently, *Toxocarpus* is no longer considered to be present in Africa or in Madagascar.

Secamone racemosa has sometimes (BENTHAM 1876; BULLOCK 1962, 1963) been recognized as a monotypic genus, *Rhynchostigma*, characterized e.g. by its "racemose" inflorescences and imbricate buds in addition to its dorsiventrally flattened corona lobes. These characters, however, have wrongly been interpreted as unique and do not in fact support recognition of this taxon at the generic level. For example, *S. racemosa* shares several characters with *S. gerrardii* from southern Africa, such as relatively large flowers, corolline corona in form of small pits in the lobe sinuses, large pollinia, and inflorescences in form of monothyrses in true axillary position. This includes all the "unique" characters of *Rhynchostigma* on which a separation of this taxon at generic level is based, except the imbricate aestivation and flattened corona lobes. *Secamone gerrardii* has contorted aestivation and subulate corona lobes. However, as discussed above, the shape of the staminal corona is a variable character between species and seems to lack importance at higher taxonomic levels. Furthermore, the quincunx aestivation in *S. racemosa* is found in several Malagasy species of *Secamone*, e.g. in *S. pinnata* Choux, *S. cloiselii* Choux, *S. geayi* Costantin & Gallaud, *S. minutifolia* Choux, *S. cristata* Jum. & H. Perrier and *S. pachystigma* Jum. & H. Perrier. In *S. pachystigma* the aestivation varies between sinistrorsely to dextrorsely contorted or imbricate and quincunx within a single population (KLACKENBERG 1992a). Although considered an important character even at tribal level in other taxa within Gentianales the aestivation is of limited taxonomic value in Secamonoideae. It can not be the basis for a separation of *Rhynchostigma* as a monotypic genus.

Cymes in a truly axillary position are characteristic for *Secamone racemosa*. Both Asclepiadoideae and Secamonoideae generally have inflorescences in extra-axillary position, i.e the cyme is situated just beside a petiole, not in the axil nor in the middle between the opposite petioles. Cymes in true axillary position are also observed, however, in *S. gerrardii* and in several species of Malagasy *Secamone*, such as *S. brachystigma* Jum. & H. Perrier and *S. pulchra* Klack. In *S. laxa* Klack. both positions seem to be present. *S. glaberrima* K. Schum. also have cymes in true axillary position and is furthermore furnished with the rare type of inflorescence found in *S. racemosa*, the monothyrse. *S. tenuifolia* Decne., a common species from the Central Plateau of Madagascar and closely related to *S. glaberrima*, however, has the common configuration of irregular cymes in extra-axillary position. This is also the case in the remaining former species of *Toxocarpus* in Africa, *Secamone brevipes* and *S. letouzeana*, as well as in *S. goyderi*.

A corolline corona in the form of small pits in the corolla lobe sinus is present in some Malagasy *Secamone*, e.g. distinctly so in *S. humbertii* Choux, in addition to *Secamone racemosa* and *S. gerrardii*. KUNZE (1990) stated that the scattered occurrence of corolline coronas in Secamonoideae and Asclepiadoideae points to old patterns preserved in the genotype and which are realised when selection favours it.

TAXONOMY

Key to the genera of subfamily Secamonoideae from continental Africa and Madagascar

Species from the small adjacent islands of Bioko, Zanzibar, Pemba, Socotra and the Comoros are also included in the key. *Calyptranthera*, *Pervillaea* and *Secamonopsis* are endemic to Madagascar.

1. Anthers with thick connective distinctly protruding above thecae; projecting part triangular to strongly elongate and filiform, rarely club-shaped 2
1'. Anthers without distinctly projecting connective or with membranaceous appendix on top of anthers 3
2. Leaves with dense indumentum below of curled (at least when dry) whitish hairs ..... **Pervillaea**
2'. Leaves glabrous or with sparse erect, straight to slightly bent reddish hairs ..... **Calyptranthera**
3. Corpusculum with seemingly 2 pollinia on long caudicles ..... **Secamonopsis**
3'. Corpusculum with the 4 pollinia free from each other or ± glued to each other in pairs to a short caudicle or all together in one unit, but not with 2 long caudicles ..... **Secamone**

SECAMONE R. Br. (in Africa)

Prodr. 1: 464 (1810) & Asclepiadeae: 44 (1810), preprint of Mem. Wern. Nat. Hist. Soc. 1: 55 (1811); Benth. & Hook. f., Gen. Pl. 2: 746 (1876); Hook. f., Fl. Brit. Ind. 4: 12 (1883); K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4(2): 261 (1895); Choux, Mém. Acad. Malgache 1: 3 (1926); Hutch. & Dalziel, Fl. W. Trop. Afr. 2: 88 (1963), Dyer, Genera of Southern African Plants 1: 485 (1975); Klack., Opera Bot. 112: 12 (1992); Goyder, Kew Bull. 47: 439 (1992); Klack., Kew Bull. 47: 597 (1992); F. Friedmann, Fl. Seychelles, Dicot.: 471 (1994). — Lectotype: *Secamone emetica* (Retz.) R. Br. ex Schultes (= *Periploca emetica* Retz.), vide PHILLIPS (1951): 606.
Rhynchostigma Bentham in Benth. & J.D. Hooker, Hooker's Icon. Pl. 12: 77 (May 1876); Benth., Gen. Pl. 2: 771 (May 1876). — Lectotype: *Rhynchostigma racemosum* Bentham, vide BULLOCK (1962): 194.

The description refers to African and Malagasy taxa, with characters found only outside continental Africa put in brackets.

Herbaceous to suffrutescent twiners to small scrambling (or erect) shrubs, underground systems poorly known. Stems terete, sometimes with chlorophyll. Leaves decussate on elongate branches (or sometimes seemingly whorled on brachyblasts), linear to ovate to broadly obovate or almost orbicular, rounded or retuse to acute to acuminate or apiculate to mucronate at the apex, truncate to tapering at the base, (usually) petiolate, glabrous to hairy, basically pinnately nerved, thin and herbaceous to coriaceous; indumentum of rather long and erect to usually shorter and appressed, sometimes reddish, hairs, (sometimes with long curved intertwined white hairs); nerves not visible to sometimes distinctly protruding at both sides when dry; epidermis smooth to sometimes tuberculate-papillate.

Inflorescences terminal to extra-axillary but often seemingly and rarely truely axillary, much shorter to longer than the adjacent leaves; cymes lax to dense with few to many or rarely solitary flowers. Flowers pentamerous, actinomorphic, from 1.5 mm to slightly more than 1 cm long. Calyx lobes linear to broadly ovate or oblong to orbicular, rounded to acute at the apex, glabrous to hairy, usually ciliate, usually with glands at the sinuses. Corolla in bud cylindric or narrowly conical to ovoid or globose, sinistrorsely or dextrorsely twisted or not twisted, valvate or usually contorted with the right or left lobe-margins overlying or imbricate, fused for c. 1/7 to c. 1/2(-6/7) of their length, usually glabrous outside, glabrous to usually variously hairy to papillate inside, white to yellow or greenish; tube short and open to campanulate or longer and cylindrical to pitcher shaped; lobes erect to spreading or rotate to reflexed, linear to orbicular, rounded to obtuse to acute at the apex, entire (but sometimes with somewhat uneven wavy margin); corolline corona absent or present and consisting of more or less fleshy ridges usually forming a V at each lobe sinus or sometimes forming a cross-bar at the inner face of the corolla lobe with a small pocket formed in the very sinuses, and sometimes with

the corona ridges running united below the sinuses along the sutures of the corolla lobes towards the base of the tube. Staminal column arising from the base of the corolla tube; filaments with usually long sclerified margins (which are sometimes furnished with pouch-like structures near the bases); connective produced into a membranous tip; corona lobes shorter to longer than the staminal column, laterally or dorsiventrally compressed or subulate, falcate to straight to arched over the staminal column, (rarely absent). Pollinia two in each anther-loculus, globose to narrowly ellipsoidal, attached by a caudicle to a ± semi-ellipsoidal soft corpusculum. Style absent (or rarely very short). Style head (short and not protruding to) elongated and protruding up to 3 times beyond the anthers, consisting of 2 parts; basal portion swollen, narrowing abruptly into the apical portion; apical portion entire to deeply bifid at the apex, evenly narrow to often broadened towards the apex and then club-shaped or (rarely with the upper margin thin and recurved); stigmatic surfaces localised in 5 spots on the flanks of the basal portion of the style head.

Follicles appressed to widely spreading (to reflexed), linear in outline to ovoid, glabrous to hairy. Seeds ovate, compressed, crowned with a coma of white or ivory hairs.

Key to the species of *Secamone* in Africa (excluding Madagascar and the Comoro Islands)

1. Corona lobes laterally compressed or subulate to almost missing ..... See: Key to species in GOYDER, Kew Bull. 47: 440 (1992).
1'. Corona lobes dorsiventrally flattened and about as long as the staminal column or longer 2
2. Midrib of leaf sometimes impressed above but always raised at the very central part when dry; inflorescences truely axillary; cyme a monothyrse; flowers quincunx; calyx glabrous ..... 1. **S. racemosa**
2'. Midrib impressed above without raised central part; inflorescences extra-axillary; cyme irregularly di- to monochasial without single main axis; flowers contorted; calyx hairy 3
3. Mature leaves glabrous or with hairs along the midrib and margins mostly near the base only, and without tuberculate/papillate lower epidermis; style head projecting about twice as long as the corona lobes or longer ..... 2. **S. brevipes**
3'. Leaf lamina with short appressed hairs below and with tuberculate/papillate epidermis; style head projecting less than twice as long as the corona lobes 4
4. Corolla lobes at least twice as long as the corolla tube; corolla tube glabrous inside ..... 4. **S. letouzeana**
4'. Corolla lobes about as long as the corolla tube; corolla tube hairy inside ..... 3. **S. goyderi**

For a key and descriptions of the species from Madagascar and the Comoro Islands, see KLACKENBERG (1992a).

For descriptions of the continental African species *S. africana* (Oliv.) Bullock, *S. afzelii* (Schultes) K. Schum., *S. alpini* Schult., *S. attenuifolia* Goyder, *S. delagoensis* Schltr, *S. dewevrei* De Wild., *S. erythradenia* K. Schum., *S. filiformis* (L. f.) J.H. Ross, *S. gerrardii* Harv. ex Benth., *S. gracilis* N.E. Br., *S. leonensis* (Scott-Elliot), *S. parvifolia* (Oliv.) Bullock, *S. punctulata* Decne., *S. retusa* N.E. Br., *S. socotrana* Balf. f. and *S. stuhlmanii* K. Schum., see GOYDER (1992). Descriptions, taxonomic discussions and distributions of the remaining continental African taxa, that formerly have been placed in *Toxocarpus*, follow below. In addition one new species is described.

1. Secamone racemosa (Benth.) Klack., **comb. nov.**

Rhynchostigma racemosum Benth. in Hook. f., Icon. Pl. 12: 77, pl. 1189 (1876); K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4(2): 286, fig. 85: R-S (1895); Bullock in Hutch. & Dalz., Fl. W. Trop. Afr. 2: 88, ed. 2 (1963). — *Toxocarpus racemosus* (Benth.) N.E. Br., Fl. Trop. Afr. 4(1): 287 (1904). — Type: *Mann 1273*, Cameroon. Camer. Mount., 4,500 ft., Feb. 1862, (holo-, K!; iso-, GH!, P!).

Suffrutescent twiner; youngest branches covered with short reddish hairs, glabrescent. Leaf blade 5-12 × 2-5 cm, somewhat ovate to somewhat obovate but usually elliptic, cuneate to rarely almost truncate at the base, acuminate at the apex, glabrous on both sides to rarely with sparse reddish appressed hairs below, green above, yellowish and paler below; epidermis smooth (not tuberculate/papillate); venation pinnate, looped with straight parallel divaricate to almost right-angled veins; midrib when dry sometimes grooved above but always with a distinctly raised rib in the middle, raised at least towards the base below; petiole 8-20 mm long, with appressed reddish hairs.

Inflorescences axillary, usually shorter than the adjacent leaves but often longer near the apex of a branch; cyme a lax and rather few-flowered pendulous thyrse with distinct main axis and dichasial branches that sometimes are reduced to a single flower each, with usually sparse reddish curved hairs; internodes becoming shorter towards the apex, basal one usually 1.5-2(-3) cm long; pedicels 3-10 mm long; bracts elongate, 1.5-3 mm long. Calyx with one to several surrounding calycoid bracts; lobes about as long as to usually shorter than the corolla tube, 3-4 × 1.5-2.2(-2.7) mm, ovate to usually oblong, obtuse to rounded at the apex, glabrous but with ciliate margin. Corolla narrowly ovoid in bud with obtuse apex, fused for 1/2-1/3 of its length into a tube, quincunx, not twisted, glabrous, white or yellowish to green, sometimes pinkish; scent not known; tube campanulate with 5 deep cavities at base between the corona lobes but not protruding between the calyx lobes, 2.7-3.6 mm long; lobes probably rotate or recurved, 4.3-5.4 × 2-3.4 mm, oblong to sometimes obovate, truncate to rounded at the apex; corolline corona of five fleshy cross-bars between the corolla lobes at the sinuses and forming small pockets. Staminal column 2.5-3.4 mm high; thecae crowned by ciliate membranaceous tips. Staminal corona present; lobes dorsiventrally flattened, 0.9-2 mm long, oblong with crenately truncate to bifid apex, straight, about as long as to longer than the staminal column, attached along c. 1/2 of the stamen. Pollinia 0.4-0.5 mm long. Style head projecting at least twice as long as the staminal column; apical portion 2 to 4 times as long as the basal portion, 3.3-5.3 mm long, cylindric, entire to usually slightly bifid at apex.

Follicles 18-29 × 0.4-0.5 cm, linear, straight to slightly curved, thin-walled, finely hairy, probably divaricate when young but parallel to each other when mature. Seeds 5-8 mm long; hairs 3-4.5 cm long. — Figs. 1, 2 (map).

DISTRIBUTION AND HABITAT. — *Secamone racemosa* has a disjunct distribution with a western population on Bioko Island (Fernando Poo) and the Cameroon Mountains, and an eastern population at the Kivu range at the Congo-Kinshasa border with Uganda, Rwanda and Burundi. It usually grows in primary montane forest on marshy ground or along rivers, but also in clearings with secondary regrowth. In the Cameroon Mts. / Bioko Is. it is found between 1500 and 2000 m altitude. In the eastern population this species is usually found above 2000 m but has occasionally been collected as low as at 1000 m altitude. Flowering specimens seen from April to June and from September to January.

NOTES. — *Secamone racemosa* was described from a specimen collected 1862 on Mt. Cameroon but has not been recollected here since then (CABLE & CHEEK 1998). However, it has recently been found at the nearby Bioko Is. Bioko is located on the continental shelf in the Bay of Guinea and belongs phytogeographically to the Cameroon Mountains. *Secamone racemosa* is distinguished from the other three species with dorsiventrally compressed corona lobes by having truely axillary, seemingly racemose inflorescences with a distinct main axis (monothyrses). Furthermore it differs by having fleshy flowers with distinct corolline corona in form of ridges forming small pockets at the lobe sinuses and also by its quincunx aestivation. It has calycoid bracts surrounding the calyx. These bracts seem to be more numerous in specimens from the western population of Cameroon Mt. / Bioko Is. *Secamone racemosa* has one of the largest pollinia in the genus, twice as large as in *S. brevipes*, *S. letouzeana* and *S. goyderi*. Furthermore the follicles are long (18-29 cm) and narrow, all other species of African *Secamone* having follicles 10 cm or less.

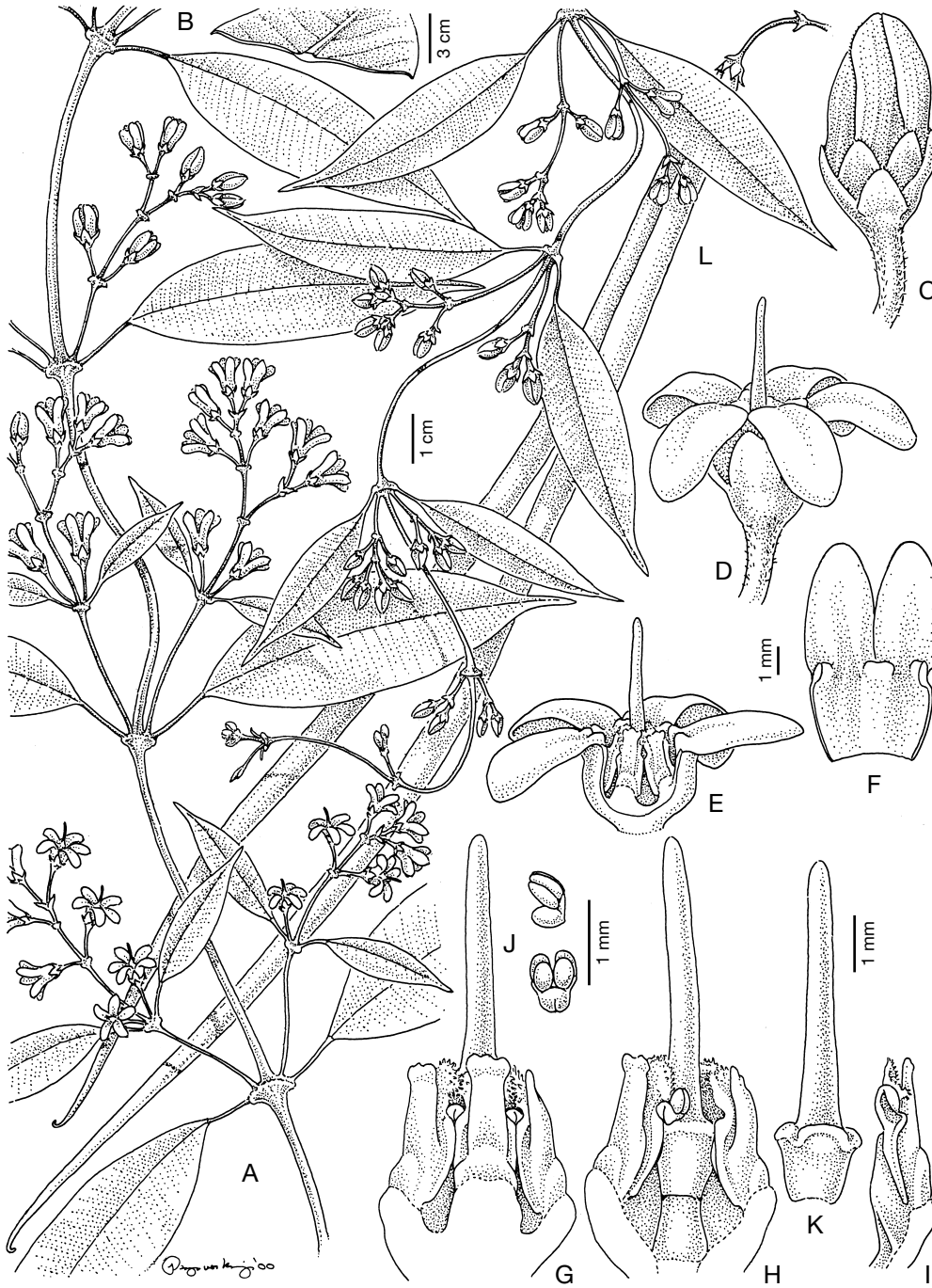

Fig. 1. — ***Secamone racemosa***: **A**, habit; **B**, cross section of leaf; **C**, flower in bud; **D**, flower; **E**, gynostegium and portion of corolla (one lobe removed); **F**, portion of corolla from within; **G**, gynostegium; **H**, gynostegium with one anther removed; **I**, anther, lateral view; **J**, pollinaria; **K**, stigma head; **L**, follicles. (A-K, *Reekmans 6467*; L, *Ntakiyimana 238*). Drawn by P. von KNORRING.

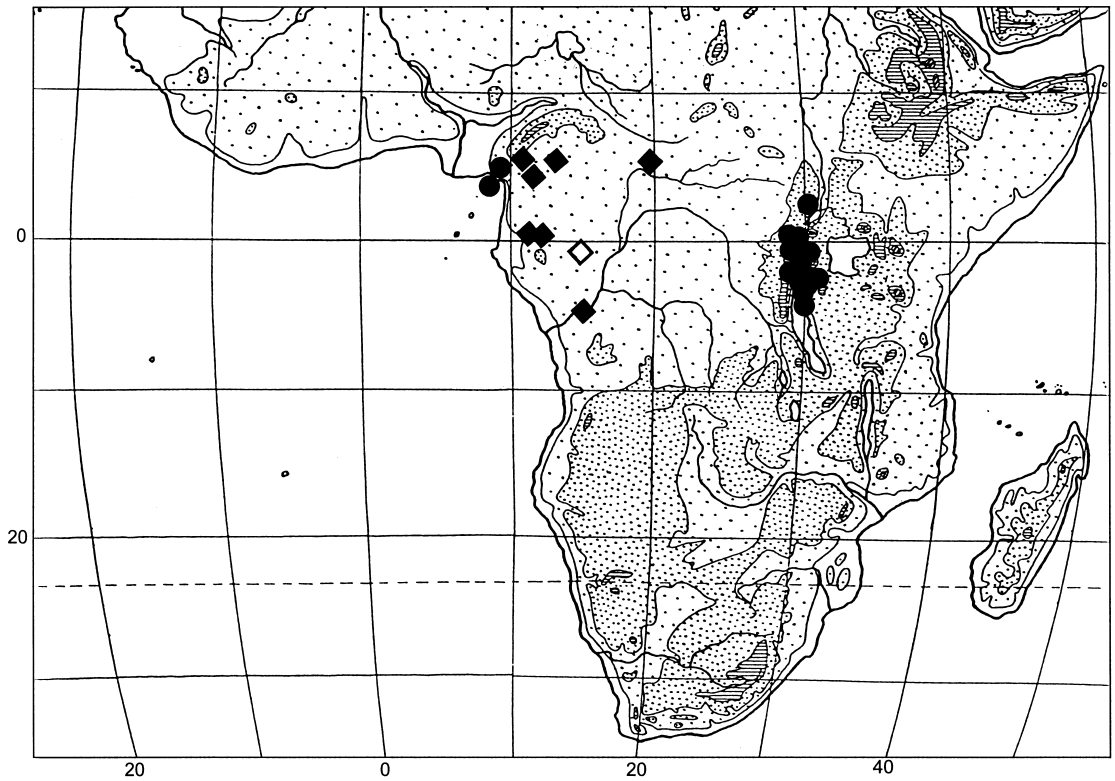

Fig. 2. — Distribution of ***Secamone racemosa*** (●) and ***S. letouzeana*** (◆, ◇ approximate locality).

However, fruiting specimens of *S. letouzeana* and *S. goyderi* are still unknown. Vegetative specimens of *S. racemosa* differ by having leaves with raised mid-rib above (Fig. 1B). The remaining species have impressed mid-ribs (Fig. 3B).

The marked disjunct distribution seen in *Secamone racemosa* fits into a recognized phytogeographical pattern, Afromontane Region, with similar vegetation above 2000 m altitude in the Central and West African Mountains (WHITE 1983). *Secamone africana* has a similar disjunct distribution but grows at slightly lower altitudes and has a wider distribution range. MORTON (1972) discussed the phytogeography of the West African Mountains and stated that 53 % of the species in Cameroon mountains are also found elsewhere, which means in almost all cases in the high mountains of Central and East Africa, i.e. with a markedly disjunct distribution of more than 2000 km. Furthermore, MORTON (1972) thought this disjunction to be a relict vicariance pattern due to a change in climate with a drop in temperature by c. 4-6°C. He concluded that there must have been a rather recent spell of colder climate as most disjunct species differ morphologically surprisingly little between the disjunct populations. This is in accordance with the findings in *Secamone racemosa* where the smaller Cameroon Mountains / Bioko population differs only by having usually more numerous bracts surrounding the calyx. Also LINDER (1998), based mainly on a couple of cladistic analyses (ENSERMU 1990; MANKTELOW 1996), came to the conclusion that Kivu and Cameroon mountains from an historical vicariance point of view are closely related areas of endemism.

MATERIAL STUDIED. — BURUNDI: *Lewalle 814*, Terr. Ijenda, route de Karonge, Mayuyu, c. 2000 m, 1966 (BR); *Lewalle 2331*, ibid., 2150 m, 1967 (BR);

Lewalle 2600, Terr. Bururi, vallée de la Siguvyaye, 1900 m, 1967 (BR); *Lewalle 4134*, Prov. Muramvya, Nyabigondo-Teza, sommet, 2530 m, 1969 (BR); *Lewalle 4756*, Terr. Muramvya, Bugarama, 2200 m, 1970 (BR); *Reekmans 6092*, Prov. Ngozi, Mukora (Rwegura), 2000 m, 1977 (BR); *Reekmans 6467*, Prov. Muramvya, Ryarusera, 2200 m, 1977 (BR, MO, P); *Reekmans 6639*, montagne Teza, 2200 m, 1977 (BR, P). — CAMEROON: *Mann 1273*, Mt. Cameroon, 4,500 ft., 1862 (GH, K, P); *Mann s.n.*, ibid. (P). — CONGO-KINSHASA: *Germain 3063*, route Rutshuru-Goma, près du village de Matiaso, env. de Lulenga, 1700 m, 1944 (BR); *Humbert 7648*, montagnes à l'ouest du lac Kivu, Mts. Biega, 2400-2790 m, 1929 (B, P); *Humbert 8314*, montagne au SW du lac Édouard, 1200-2000 m, 1929 (P); *Lebrun 4854*, entre Kasindi et Lubango, chaîne W du lac Édouard, 2060 m, 1932 (BR, US); *Leonard 4833*, Terr. Kalehe, Bunyakiri, 1000 m, 1959 (BR); *Leonard 5380*, Matembe, Lubero, 2200 m, 1959 (BR, P); *Liegeois 232*, Mt. Biega, 2400 m, 1949 (BR); *Ntakiyimana 238*, Prov. Kivu, Terr. Kalehe, ancienne route Mbayo, 2400 m, 1972 (BR); *Spitaels 435*, Mushari Est, Terr. Rutshuru, Kavumu, 2300 m, 1952 (BR); *Taton 698*, route Nioka Djugu, riv. Ruida, 1800 m, 1947 (BR); *de Witte 12208*, Distr. Kasindi, Parc National Albert, 2300 m, 1955 (BR). — EQUATORIAL GUINEA: *Carvalho 2306*, Bioko (Fernando Poo). Lago Biaó-Moca, 1650 m, 1986 (K); *Carvalho 2877*, Carretera del pico Basilé, km 14-15, 1900 m, 1987 (K); *Carvalho 3660*, ibid., 2000 m, 1988 (K); *Wrigley 592*, Above Moka, 6000 ft., 1959 (K). — RWANDA: *Bouxin 782*, Préf. Cyangugu, forêt de Nyungwe, env. d'Uwinak, 2460 m, 1971 (BR); *Bouxin 1201*, Préf. Cyangugu, forêt de Nyungwe, env. du Kamiranzovu, 1950 m, 1971 (BR); *Bouxin & Radoux 693*, Préf. Cyangugu, forêt de Nyungwe, route Butare-Cyangugu, sentier au km 100, 2200 m, 1969 (BR); *Bridson 163*, Préf. Cyangugu, route Pindura-Ibigugu vers km 88 route Butare-Cyangugu, 2300 m, 1980 (BR); *Christiaensen 1508*, Terr. Shangugu, Kamiranjovu, 2000 m, 1956 (BR); *Pierlot 3108*, Nyawarungu km 29, route MGL Tshigoma-Nyawarungu, massif du coude du Graben Africain (Kahusi), 2200 m, 1959 (BR); *Runyinya 580*, Préf. Cyangugu, marais Mubuga-Kibingo-Kuwamuhima près de Gisakura Commune Kagano, 1600 m, 1976 (BR); *Runyinya 963*, Préf. Kibuye, forêt de Mukura au nord et près de la roche de Ndaba, Kivumu, 2400 m, 1980 (BR); *Troupin 2657*, Shangugu, route Butare (Astrida)-Bukavu vers km 93, près du col Uwinka, 2450 m, 1956 (BR); *Troupin 11143*, *11145*, ibid., 1959 (BR); *Troupin 11242*, ibid., marais Kamiranzofu, 1920 m, 1959 (BR); *Troupin 11443*, Shangugu, route Astrida-Bukavu, env. du Nyungwe, 1930 m (BR); *Troupin 14823*, Préf. Cyangugu, Uwinka, km 93 route Butare-Cyangugu, 2400 m, 1973 (BR); *Troupin 15265*, Préf. Gisenyi, Gikungu, à 30 km au nord de Rutsiro, piste vers Masengati, 2150 m, 1974 (BR); *Troupin 16325*, Préf. Cyangugu, forêt de Nyungwe, Uwinka vers km 93 route Butare-Cyangugu, 2400 m, 1982 (BR). — UGANDA: *Ross 913*, Western province, Buekeragi ridge, Nyamugasani valley, 7100 ft., 1952 (BR).

2. Secamone brevipes (Benth.) Klack., **comb. nov.**

Rhynchostigma brevipes Benth. in Hook. f., Icon. Pl. 12: 78, sub pl. 1189 (1876); K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4(2): 287 (1895). — *Toxocarpus brevipes* (Benth.) N.E. Br., Fl. Trop. Afr. 4(1): 287 (1904); Bullock in Hutch. & Dalz., Fl. W. Trop. Afr. 2: 89, ed. 2 (1963). — Type: *Mann 484*, Cameroon, Nun River, Sep. 1860 (holo-, K!).

Rhynchostigma parviflorum Benth. in Hook. f., Icon. Pl. 12: 78, sub pl. 1189 (1876); K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4(2): 287 (1895). — *Toxocarpus parviflorus* (Benth.) N.E. Br., Fl. Trop. Afr. 4(1): 287 (1904). — Type: *Mann 983*, Cameroon, River Gaboon, July 1861 (holo-, K!; iso-, P!).

Secamone rubiginosa K. Schum. in Engler, Bot. Jahrb. Syst. 23: 233 (1896). — Type: *Staudt 365*, Cameroon, "365. *Secamone rubiginosa* K. Sch.", Lolodorf (holo-, B (not seen, extant?); iso-, K!).

Rhynchostigma lujaei De Wild. & Th. Dur., Compt. Rend. Soc. Bot. Belg. 38: 202 (1899). — *Toxocarpus lujaei* (De Wild. & Th. Dur.) De Wild., Ann. Mus. Congo. Bot., sér. 5, 1: 191 (1904). — Type: *Luja 52*, Congo-Kinshasa, Stanley Port, Sabuka, 24 Sep. 1898 (holo-, BR!).

Suffrutescent twiner; branches covered with short somewhat appressed to usually erect reddish hairs, sometimes almost glabrous. Leaf blade 3-10 × 1.5-5.5 cm, elliptic to broadly obovate, cuneate to sometimes truncate at the base, acuminate to rarely obtuse at the apex, usually glabrous on both sides but sometimes sparsely hairy near the base on lamina and along midrib and margins, paler below; epidermis smooth (not tuberculate/papillate); venation pinnate, looped with mostly straight parallel divaricate to particularly at lower part almost right-angled veins; midrib when dry impressed above, raised at least towards the base below; petiole 3-10 mm long, with reddish hairs.

Inflorescences extra-axillary, shorter than the adjacent leaves; cyme rather dense few- to many-flowered, basically dichasial but with internodes

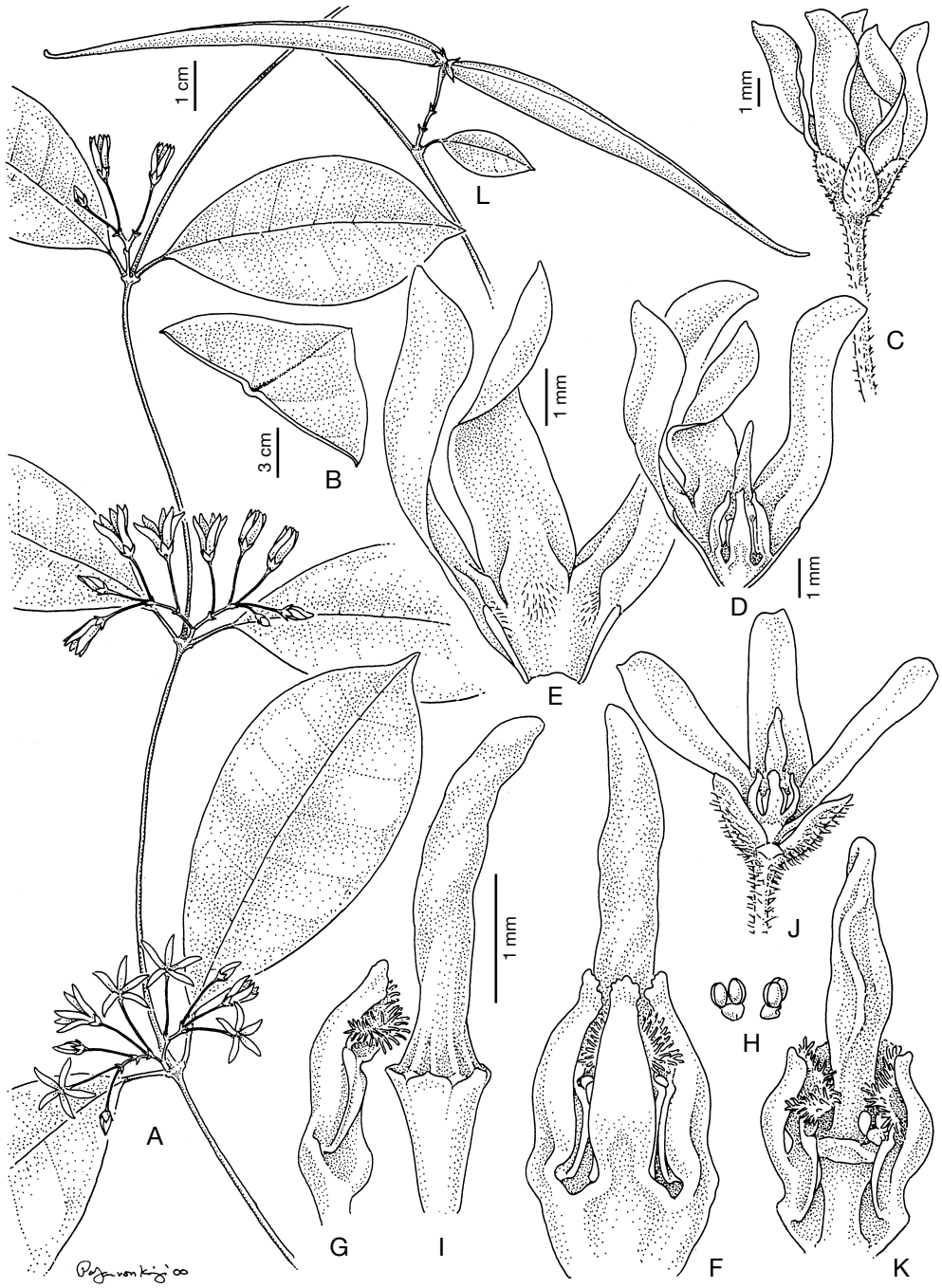

Fig. 3. — ***Secamone brevipes***: **A**, habit; **B**, cross section of leaf; **C**, flower; **D**, gynostegium and portion of corolla (two lobes removed); **E**, portion of corolla from within; **F**, gynostegium; **G**, anther, lateral view; **H**, pollinaria; **I**, stigma head; **J**, small flower with one calyx lobe and two corolla lobes removed; **K**, small gynostegium with one anther removed; **L**, follicles. (A-I, *Keay 28271*; J-K, *Callens 3642*; L, *Gillet 2124*). Drawn by P. von KNORRING.

of different lengths to sometimes umbel-like with internodes almost suppressed, pubescent; internodes up to 4(-7) mm long; pedicels 3-10 mm long; bracts triangular, 1-2 mm long. Calyx without surrounding bracts; lobes about as long as to usually distinctly longer than the corolla tube, 1.7-3 × 1-2 mm, narrowly ovate to usually ovate, acute to obtuse at the apex, with dense to sparse reddish hairs outside. Corolla narrowly ovoid in bud with acute to subacute apex, fused for 1/7-1/4 of its length into a tube, contorted with the left lobe-margins overlying, twisted to the right, glabrous to rarely with a few scattered hairs outside, with 5 small patches of hairs at mouth inside, white becoming yellow to somewhat orange, sweet-scented or without scent; tube campanulate with 5 small cavities at base but not protruding between the calyx lobes, 0.9-1.6 mm long; lobes probably erecto-patent, (3.2-)4-7.5(-11.4) × 1.3-2.5 mm, narrowly oblong or oblong to sometimes elliptic, rounded to truncate at the apex to usually asymetrically acute; corolline corona of narrow ridges forming a V at the lobe sinuses. Staminal column 1.2-1.7 mm high; thecae crowned by large reddishly hairy membranaceous tips. Staminal corona present; lobes dorsiventrally flattened, 0.8-1.4 mm long, oblong with crenately truncate apex, straight, about as long as to longer than the staminal column, attached at lower part of the stamen. Pollinia 0.15-0.2 mm long. Style head usually projecting about twice as long as or longer than the staminal column, rarely shorter; apical portion about 2 to 3 times as long as the basal portion, (1.7-)2.1-3.2 mm long, cylindric to usually fusiform and usually with irregular elongate swellings, ribbed at base, entire to slightly bifid at apex.

Follicles 7-10 × 0.4-0.6 cm, linear to very narrowly ovoid, thin-walled, with rather sparse reddish hairs, recurved about 90°. Seeds 8-9 mm long; hairs c. 4 cm long. — Figs. 3, 4 (map).

DISTRIBUTION AND HABITAT. — *Secamone brevipes* is distributed in central tropical Africa from southern Nigeria in the northwest to northwestern Zambia in the southeast. It grows in a wide range of habitats, e.g. in under vegetation of primary forest as well as in secondary forest, in both wet and dry places, along roads and rivers, in savannah country as well as in the Atlantic littoral forest. It is known from sea level up to 1000 m alt. Flowering specimens seen from throughout the year.

NOTES. — *Secamone brevipes* is the commonest and the most widely distributed species among the former African *Toxocarpus*. It is distinguished from *Secamone racemosa* by its contorted and more deeply cleft corolla (at least 3/4 of its length), as well as hairy calyx. It differs from the likewise deeply cleft *S. letouzeana* by its usually glabrous leaves and longer calyx (more than 1.5 mm long and at least as long as the corolla tube vs shorter than 1 mm and shorter than the corolla tube in *S. letouzeana*). The style head is long-projecting in both *S. brevipes* and *S. racemosa* (about twice as long or more than the staminal column, contrary to the only shortly projecting ones of *S. goyderi* and *S. letouzeana*.

MATERIAL STUDIED. — ANGOLA: *Gossweiler 9150*, Distr. do Congo Portuguez, Sumba, Peco, proximum flumen Zaire, 20 m, 1926 (BM, US); *Gossweiler 14111*, Nordeste de Lunda, circunscrição de Chitato, Dande (Dundo), poximum flumen Tchimana, 700 m, 1948 (K, P). — CAMEROON: *Bates 329*, Batanga, 1895 (BM, BR, G, K); *Bates 1758*, Bitya, near the river Ja (BR, K, P); *Bates 2120*, Nun river (K, P); *Bos 3465*, Batanga, Kribi road. 1968 (P); *Bos 3512*, Seashore 9 km N of Kribi, 1968 (MO, P); *Leeuwenberg 5560*, right bank Lobe river, near waterfall in mouth, near the beach, 8 km S of Kribi, 2 m, 1965 (B, BR, MO, P); *Letouzey 10745*, Dissahay près de NDOM, à 35 km au sud de Ndikinimeki, 1971 (P); *Letouzey 11530*, Nkongkengul, 12 km NNE M(N?)akak, à 50 km WSW de Yaoundé, 1932 (BR, P); *Letouzey 12729*, Nkol Tsia, 18 km NW Bipindi près de Gouap, 300-350 m, 1974 (P); *Letouzey 14717*, Miang, 25 km N Douala, 1976 (BR, P); *Mann 484*, Nun river, 1860 (K); *Mann 983*, Gabon river, 1861 (K, P); *Mann 1273*, West Trop. Africa, 1859-63 (GH); *Mezili 134*, Chute de la Lobe à 6 km de Kribi, 1968 (P); *Satabié 575*, collines de Massangui, 16 km NE Ngambe, 850 m, 1981 (P); *Staudt 365*, Lolodorf (K); *Villiers 883*, colline de Nboltoia près de Gouap, 18 km NW Bipindi, 1974 (P); *de Wilde & de Wilde-Duyfjes 2084*, About 8 km S of Kribi, on Lobe river border near the waterfalls, 1964 (BR, MO, P); *Zenker s.n.*, Bipindi, 1889 (BM, G, L, M, MO, P). — CONGO-BRAZZAVILLE: *Chevalier 27689*, Moyen-Congo, pays Bakongo, Mbamou à Gompaka, 1912 (P); *Chevalier 27721*, Moyen-Congo, de Gompaka à Brazzaville, 1912 (P);

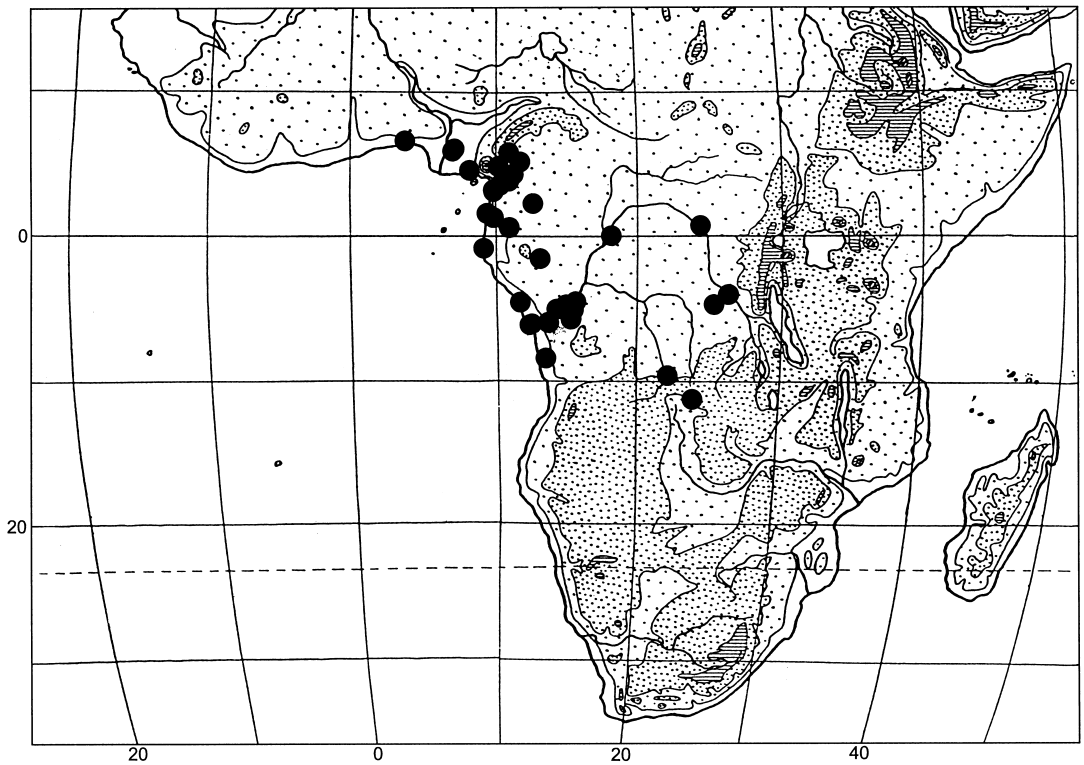

Fig. 4. — Distribution of ***Secamone brevipes***.

Sita 1235, région de Pointe-Noire, Pointe-Indienne (P). — CONGO-KINSHASA: *Breyne 217*, Terr. Kimuenza, vallée entre Livulu et Lovanium, 1966 (BR, MO); *Callens 3642*, Tampa, 1952 (BR); *Callens 4636*, Kibambi, 1954 (BR); *Carrington 28*, Terr. Kimuenza, route Luzizila, 1965 (BR); *Carrington 110*, Maluku, 1965 (BR); *Chevalier 28118*, Jardin botanique d'Eala, 1912 (P); *Chevalier 28251*, de Eala à Bakoussou, 1912 (P); *Compere 1995*, Kasangulu, 1960 (BR); *Dilob 240*, Mangoa river (BM); *Flamigni 10268*, Pelo, 1951 (BR); *Germain 1796*, Eala, c. 350 m, 1943 (BM, BR, P); *Germain 2701*, vallée de la Lufuna, 1944 (BR); *Germain 5338*, Yangambi, le long du fleuve, 1949 (BR); *Germain 7672*, env. de Lutanga, T. Lubefu, 1952 (BR); *Gillet 2124*, Kimnenga, 1901 (BR); *Gillet s.n.*, env. Kinshasa (Leopoldville), 1902 (BR); *Gillet s.n.*, Dulunsi, 1909 (BR); *Laurent 898, 1184*, Eala, 1905 (BR); *Lisowski 48130*, Haut-Zaïre, Yangambi, bord du Zaïre, 1978 (BR); *Louis 18*, Kisantu, 1935 (BR); *Louis 9476*, Yangambi, c. 470 m, 1938 (BR, K, P, NY); *Louis 10287*, Yangambi au pied de l'escarpement de l'Isalowe, c. 470 m, 1938 (BR); *Louis 13212*, Île Lituka, entre Yangambi et Isangi, c. 470 m (BR); *Louis 13629*, Yangambi, île Esali 2, c. 470 m, 1939 (BR, P); *Louis 15152*, Yangambi, île Booke wa Mbole, c. 470 m, 1939 (BR, P); *Luja 52*, Kisangani (Stanley Port), Sabuka, 1898 (BR); *Michel 9*, Nord Manyanga, Nord de Kaonga, 1903 (BR); *Nkunga 6130*, Terr. Madimba, Boko Disu, 1979 (BR); *Nkunga 6235*, Terr. Kimbanseke, Bwampongo, 1979 (BR); *Nsiowndele 973*, Kipaka, Kitwengi, 1982 (BR); *Pynaert 854*, *943, 1255, 1646*, Eala, 1906-1907 (BR); *Vanderyst s.n.*, Kimpako, 1908 (BR); *Young 240*, Dilolo, Mangoa river, 1932 (A, BM, NY, Z). — GABON: *Breteler & van Raalte 5546*, near Port Gentil, 1968 (BR); *Debeaux 432*, Cap Lopez (P); *Florence 1117*, Belinga, 900 m, 1978 (P); *Gillet 3209*, Moanda, 1903 (BR); *Hallé 2810*, Belinga, Bakota Ikambi dya kodi, 1964 (P); *Hallé 3715*, Belinga mines de fer, 1000 m, 1966 (P); *Hallé & Villiers 5459, 5506*, Cap Esterias, 1968 (P); *Klaine 861, 878, 921, 1090, 1176, 1612*, env. de Libreville, 1817 (P); *Le Testu 9002*, rég. entre Ogooué et Cameroun, 1932-1934 (P); *Le Thomas 8*, Port Gentil, 1966 (P); *Pobéguin 61*, Moudorobé, 1921 (P); *de Wilde et al. 806*, Eastern part of the Presidential Reserve Wonga-Wongué, c. 100 km S of Libreville, c. 130 m, 1988 (MO, P). — NIGERIA: *Dalziel 931*, Lagos (BM); *Emwiogbon*

65942, East Central state, distr., Igboetiti, forest UNN, 1972 (K); *Hepper 2235*, Enugu headwater area, Milliken Hill, 1958 (K); *Keay 25590*, Prov. Onitsha, distr. Awka, Agulu, 1949 (K); *Keay 28271*, Ogoja prov., Ikom distr., Bendiga Afi-Akparabong, 1950 (K, P); *Talbot 3031*, Eket distr., mainroad from Oron to Eket 28 miles (BM, Z). — ZAMBIA: *Holmes 1153*, 12 miles N of Mwinilunga Boma, 1955 (K); *Mutimushi 3191, 3293*, K. Hill, Mwinilunga, 1969 (K).

3. **Secamone goyderi** Klack., **sp. nov.**

Species haec Secamone brevipes *affinis lobis coronae dorsiventraliter aplanatis et praesertim cum* S. letouzeana *congruens epidermide folii subtus tuberculata et pubiscentibus sed differt ab duabus tubo corollae calyce distincte longiore; praeterea ab illa stigmate breviore et ab hac tubo corollae pubescenti differt.*

TYPUS. — *Thomas & Wilks 6592*, Gabon, Moyen-Ogooué region, between Ndjale town and railway station, 35 m alt., 22 July 1986 (holo-, MO!).

Suffrutescent twiner; branches covered with short appressed, retrorse, reddish hairs. Leaf blade 7-9 × 3.5-4.5 cm, elliptic to broadly elliptic to somewhat obovate, cuneate at the base, shortly acuminate at the apex, somewhat coriaceous; indumentum of short reddish appressed hairs, sparse above but denser and more distinctly visible in contrast to the glaucous lower finely papillate epidermis below; venation pinnate, looped with straight parallel divaricate to almost right-angled veins; midrib when dry impressed above, distinctly raised below; petiole 5-12 mm long, with appressed reddish hairs.

Inflorescences extra-axillary, shorter than the adjacent leaves; cyme rather dense and many-flowered, basically dichasial but with internodes of different lengths and sometimes almost suppressed, pubescent; internodes up to 1 cm long; pedicels 2-4 mm long; bracts triangular, less than 1 mm long. Calyx without surrounding bracts; lobes much shorter than the corolla tube, c. 1.3 × 0.9 mm, triangular, acute at the apex, with dense reddish hairs outside. Corolla obpyriform in bud with rounded apex, fused for c. 2/5 of its length into a tube, contorted with the left lobe-margins overlying, not to slightly twisted to the right, with appressed reddish hairs outside and tube with short hairs inside, yellow to creamy; tube campanulate and furnished with shallow pouches, c. 1.7 mm long; lobes probably recurved, c. 2.7 × 1.3 mm, oblong, truncate at the apex; corolline corona insignificant. Staminal column c. 1.6 mm high. Staminal corona present; lobes dorsiventrally flattened, c. 1.2 mm long, narrowly rectangular and slightly broadened at base of free part, with narrow basal part, straight, longer than the staminal column, attached along at least 1/2 of the stamen. Pollinia c. 0.2 mm long. Style head slightly projecting above the corona lobes; apical portion slightly longer than the basal portion, c. 1.3 mm long, slightly broadened below the apex, entire.

Follicles not seen. — Figs. 5, 6 (map).

The description of the flower is based on the type only.

DISTRIBUTION AND HABITAT. — *Secamone goyderi* is distributed in the central part of the tropical African rain forest area in Congo-Brazzaville and Gabon. It is known from low elevation, up to 550 m, in secondary scrub forest. Flowering specimens seen from May to August and November.

NOTES. — *Secamone goyderi* is sympatric with *S. brevipes* and *S. letouzeana*, although it seems to be restricted to elevations below 600 m while *S. letouzeana* grows higher up. It differs from *S. brevipes* by its long corolla tube, being much longer than the calyx. On the contrary, the style head being long and projecting about twice as long as the staminal column in *S. brevipes*, is short and hardly projecting in *S. goyderi*. Vegetatively the new species differs by having leaves with a pale and tuberculate/papillate lower epidermis covered with reddish hairs. In this character it is similar to *S. letouzeana*, which, however, has deepy cleft corolla with a completely glabrous tube. In *S. goyderi* the corolla tube is hairy inside.

This species is named after David GOYDER, Kew, who has analysed African Asclepiadaceae for many years with a special interest in Secamonoideae, but was kind enough to leave a few taxa to me to study.

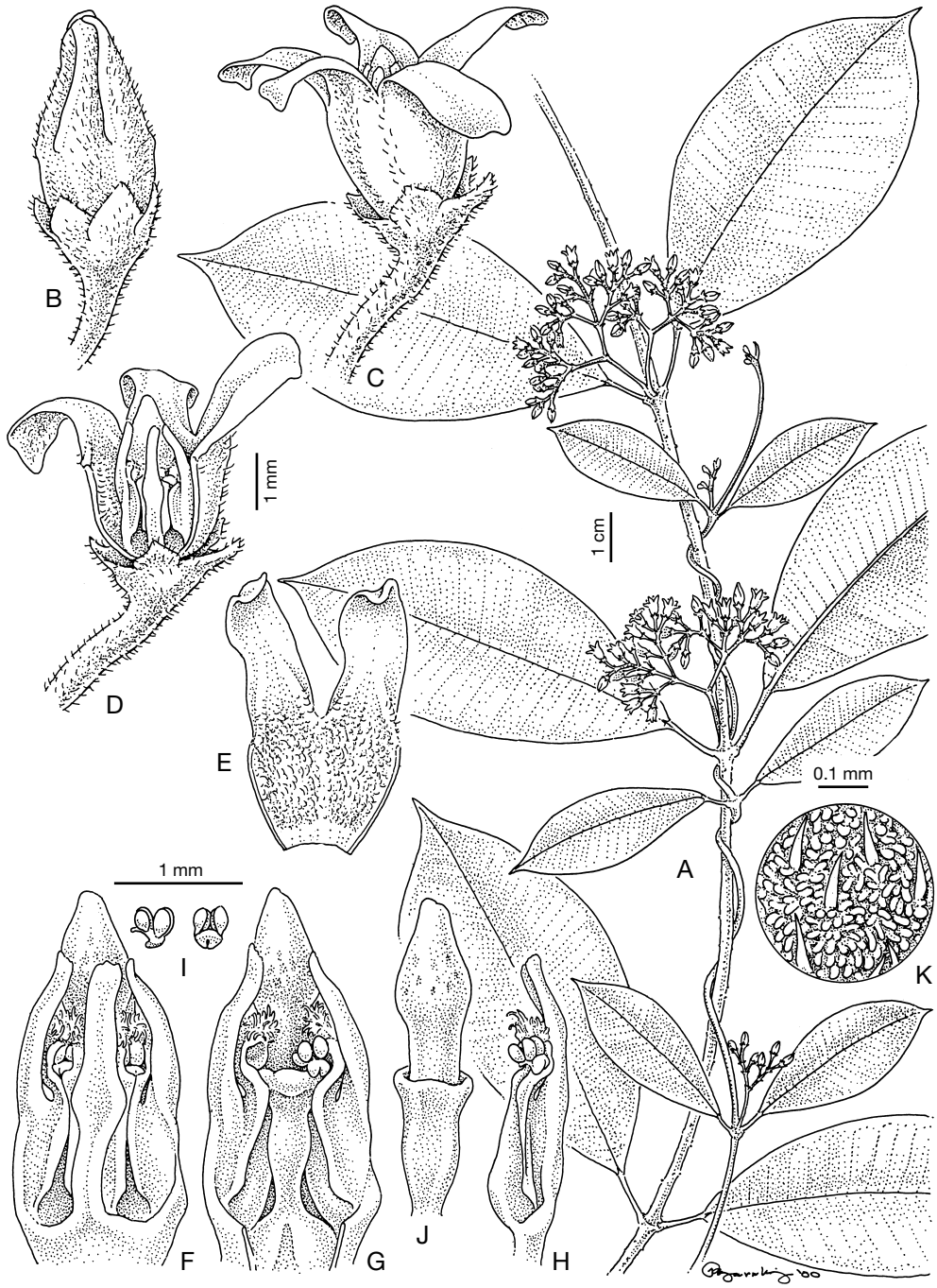

Fig. 5. — ***Secamone goyderi***: **A**, habit; **B**, flower in bud; **C**, flower; **D**, flower with two corolla lobes removed; **E**, portion of corolla from within; **F**, gynostegium; **G**, gynostegium with one anther removed; **H**, anther, lateral view; **I**, pollinaria; **J**, stigma head; **K**, magnification of lower leaf surface. (A-K, *Thomas & Wilks 6592*). — Drawn by P. von KNORRING.

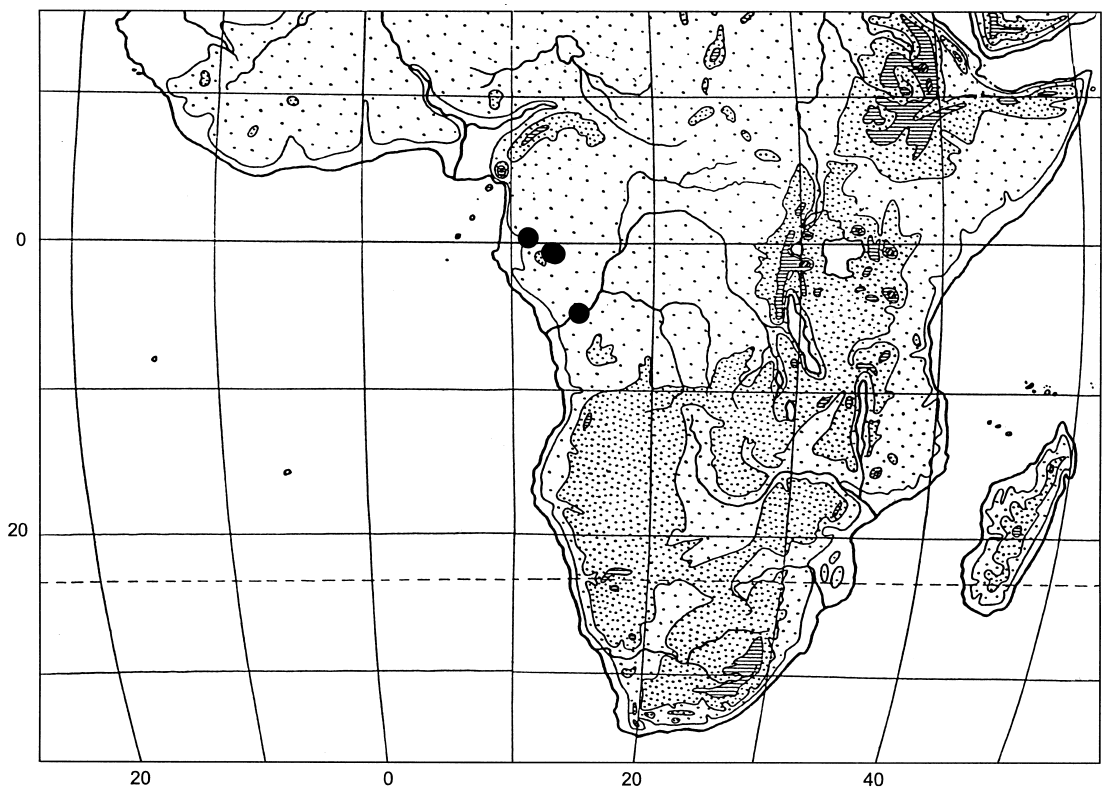

Fig. 6. — Distribution of ***Secamone goyderi***.

PARATYPES. — CONGO-BRAZZAVILLE: *Farron 4610*, 4 km SW Grand-Bois, 1965 (P); *de Nere 503*, région de Boko, plateau des Cataractes, 1963 (P). — GABON: *Le Testu 8100*, Lastoursville, Poubi, 1930 (P); *Le Testu 8860*, ibid., Djoconamoye, 1931 (P); *Louis, Breteler & de Bruijn 934*, massif du Claillu, along road Mimongo to Koulamoutou, between Dibandi and Diyanga, 20-30 km NE of Mimongo, c. 550 m, 1983 (P).

4. **Secamone letouzeana** (H. Huber) Klack., **comb. nov.**

Toxocarpus letouzeanus H. Huber, Bull. Mus. Hist. Nat., B, Adansonia 11: 447 (1989). — Type: *de Wilde & de Wilde-Duyfjes 1695*, Cameroon, N'Kolbisson, c. 8 km W of Yaoundé, c. 700 m alt., 1964 (holo-, P!; iso-, MO!, YA).

Suffrutescent twiner; branches covered with short appressed, retrorse, reddish hairs. Leaf blade 7-9 × 2-2.7 cm, narrowly ovate to elliptic, cuneate to almost truncate at the base, acuminate at the apex; indumentum of short whitish appressed hairs, sparse and glabrescent above but denser on a glaucous lower finely papillate epidermis below; venation pinnate, looped with straight parallel divaricate to almost right-angled veins; midrib when dry impressed above, distinctly raised below; petiole 4-8 mm long, with dense short appressed hairs.

Inflorescences extra-axillary, shorter than the adjacent leaves; cyme rather lax and many-flowered, basically dichasial but with internodes of different lengths and sometimes almost suppressed, pubescent; internodes up to 1.5 cm long; pedicels 2-3 mm long; bracts triangular, c. 0.5 mm long. Calyx without surrounding bracts; lobes shorter than the corolla tube, 0.6-0.8 × 0.3-0.7 mm, narrowly oblong to triangu-

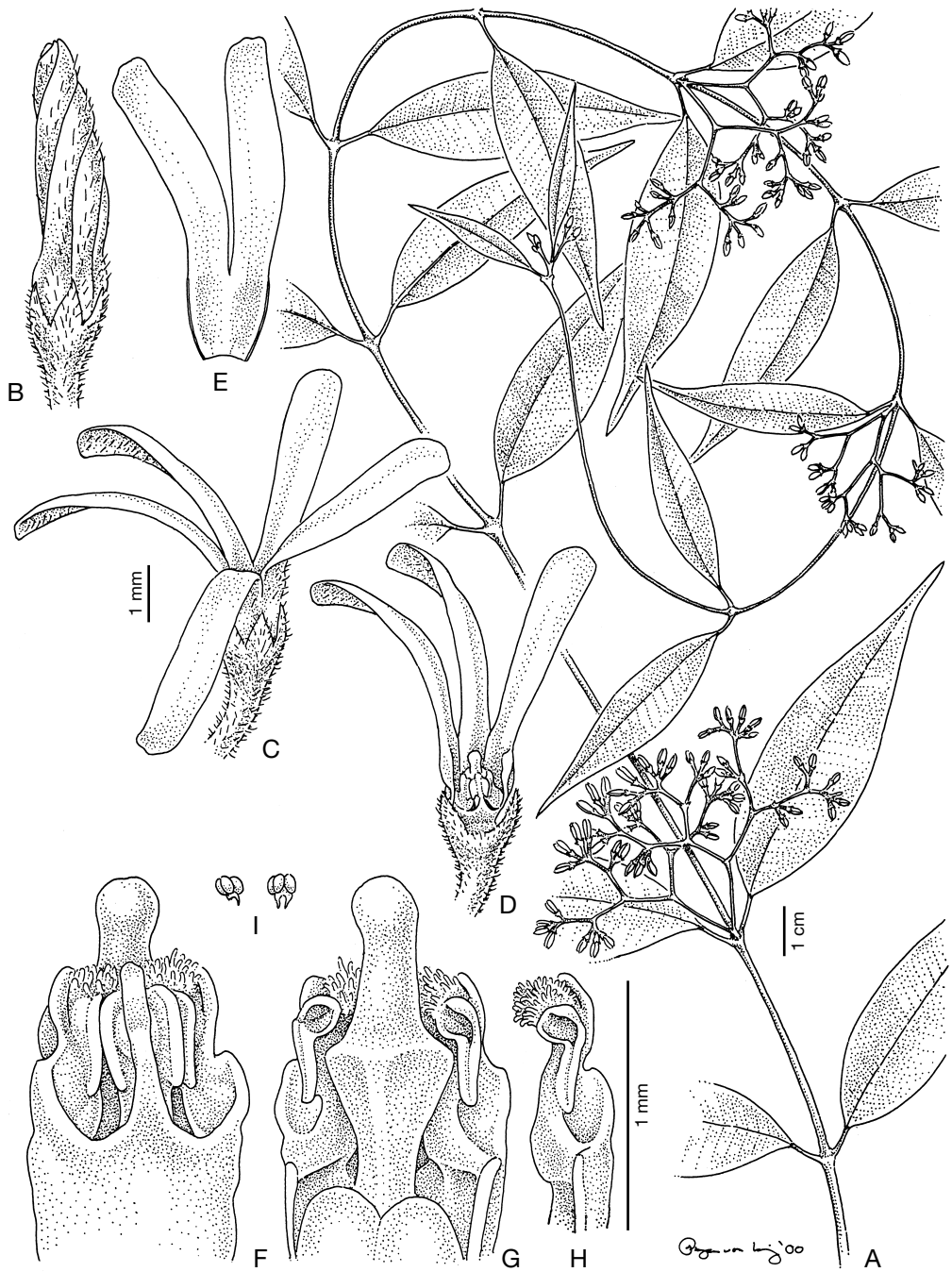

Fig. 7. — ***Secamone letouzeana***: **A**, habit; **B**, flower in bud; **C**, flower; **D**, flower with one calyx lobe and two corolla lobes removed; **E**, portion of corolla from within; **F**, gynostegium; **G**, gynostegium with two anthers removed; **H**, anther, lateral view; **I**, pollinaria. (A-I, *Breyne 919*). Drawn by P. von KNORRING.

lar, acute to obtuse at the apex, with dense reddish hairs outside. Corolla cylindric in bud with subacute apex, fused for 1/6-1/4 of its length into a tube, contorted with the left lobe-margins overlying, twisted to the right, with few reddish hairs outside, glabrous inside, white to yellowish to greenish cream, sweet-scented; tube urceolate and furnished with small pouches that slightly protrude between the calyx lobes, 0.6-1.2 mm long; lobes probably erecto-patent, 3.3-4.7 × 0.5-0.9 mm, narrowly oblong, rounded to truncate at the apex; corolline corona lacking. Staminal column 0.6-0.8 mm high. Staminal corona present; lobes dorsiventrally flattened, 0.3-0.6 mm long, rather narrow but broader near the base jutting out into the cavities of the corolla tube, straight, shorter to longer than the staminal column, attached at lower part of the stamen. Pollinia 0.05-0.1 mm long. Style head distinctly projecting above the staminal column; apical portion about 1.5 to almost 2 times as long as the basal portion, 0.5-0.7 mm long, not to only slightly broadened at the apex, entire.

Follicles not seen. — Figs. 2 (map), 7.

DISTRIBUTION AND HABITAT. — *Secamone letouzeana* is distributed in the central part of the tropical African rain forest area between Cameroon and northern Congo-Kinshasa. It is known from 600-1300 m altitude and grows at road cut and in marshy places. Flowering specimens seen from January, March and July.

NOTES. — This species has strikingly delicate flowers. For diagnostic characters, see *Secamone goyderi*.

MATERIAL STUDIED. — CAMEROON: *Jacques-Félix 2591*, Bangangté, 1300 m, 1938 (P); *Breteler 941*, Forest along river Sanaga near Goyoum, 20 km West of Deng Deng, 635 m, 1961 (P); *de Wilde & de Wilde-Duyfjes 1695*, N'Kolbisson, c. 8 km W of Yaoundé, c. 700 m, 1964 (P, MO). — CENTRAL AFRICAN REPUBLIC: *Tisserant 1399*, plateau de l'Oubangui, région de Bambari, 50 km E Bambari, 1924 (P). — CONGO-KINSHASA: *Breyne 919*, Maluku, 1970 (BR, MO, K); *Breyne 3065*, Maluku, 1976 (BR); *Pauwels 4878*, Terr. Maluku, au-delà de la Nsele, 1965 (BR, MO); *Pauwels 5283*, Terr. Maluku, rivière Nsele, 1975 (BR, MO). — GABON: *Le Testu s.n.*, Haut-Ogooué, 21 mar. 1930 (MO); *Ollerton 76*, c. 15 km W of Lope on main road, 1997 (K); *Reitsma, Wilks & Nzebi 3398*, c. 20 km NW of Booué, Mt. de Casque, 1987 (K).

REFERENCES

BENTHAM G. 1876. — Asclepiadeae: 728-785, in BENTHAM G. & HOOKER J.D., *Genera Plantarum* 2. London.

BROWN N.E. 1902. — Asclepiadeae: 231-503, in THISELTON-DYER W.T. (ed.), *Flora of Tropical Africa* 4(1).

BULLOCK A.A. 1962. — Notes on African Asclepiadaceae: IX. *Kew Bull.* 15: 193-206.

BULLOCK A.A. 1963. — Asclepiadaceae: 85-103, in HUTCHINSON J. & DALZIEL J.M., *Flora of West Tropical Africa* 2.

CABLE S. & CHEEK M. 1998. — *The Plants of Mount Cameroon - a conservation checklist.* RBG, Kew.

CHOUX M.P. 1914. — Études biologiques sur les Asclépiadacées de Madagascar. *Ann. Mus. Col. Marseille*, sér. 3, 2 : 211-459.

CIVEYREL L. 1996. — *Phylogénie des Asclepiadaceae, approche palynologique et moléculaire.* Thèse, Université Montpellier 2 (diss.).

CIVEYREL L., LE THOMAS A., FERGUSON K. & CHASE M. 1998. — Critical reexamination of palynological characters used to delimit Asclepiadaceae in comparison to the molecular phylogeny obtained from plastid matK sequences. *Molecular phylogenetics and evolution* 9: 517-527.

DECAISNE J. 1844. — Asclepiadeae: 490-665, in DE CANDOLLE A.P., *Prodromus systematis naturalis regni vegetabilis* 8. Paris.

ENDRESS M.E. & BRUYNS P.V. 2000. — A revised classification of the Apocynaceae s.l. *Bot. Rev.* 66: 1-56.

ENSERMU KELBESSA 1990. — *Justicia* sect. *Ansellia* (Acanthaceae). *Acta Univ. Ups. Symb. Bot. Ups.* 29: 1-96.

GOYDER D.J. 1992. — *Secamone* (Asclepiadaceae subfam. Secamonoideae) in Africa. *Kew Bull.* 47: 437-474.

HOLMGREN P.K., HOLMGREN N.H. & BARNETT L.C. 1990. — *Index herberiorum 1. The Herbaria of the World,* ed. 8. *Regn. Veg.* 120, New York.

KLACKENBERG J. 1985. — The genus *Exacum* (Gentianaceae). *Opera Bot.* 84: 1-144.

KLACKENBERG J. 1992a. — Taxonomy of *Secamone* s. lat. (Asclepiadaceae) in the Madagascar Region. *Opera Bot.* 112: 1-127.

KLACKENBERG J. 1992b. — Taxonomy of *Secamone* (Asclepiadaceae) in Asia and Australia. *Kew Bull.* 47: 595-612.

KLACKENBERG J. 1995. — Malagasy Asclepiadaceae: Reinstatement of the genus *Pervillea* and two new combinations. *Phytologia* 78: 189-191.

KLACKENBERG J. 1996a. — Revision of the Malagasy genus *Pervillea* (Asclepiadaceae) and its phylogenetic relationship to *Calyptranthera*. *Nord. J. Bot.* 16: 165-184.

KLACKENBERG J. 1996b. — The new genus *Calyptranthera* (Asclepiadaceae) from Madagascar. *Novon* 6: 25-27.

KLACKENBERG J. 1997a. — Revision of the Malagasy genus *Calyptranthera* (Asclepiadaceae). *Adansonia*, sér. 3, 19: 21-37.

KLACKENBERG J. 1997b. — *Secamone marsupiata* Klack. (Asclepiadaceae, Secamonoideae), a new species from Madagascar. *Candollea* 52: 301-304.

KLACKENBERG J. 1998. — *Secamone drepanoloba*, a new species of Asclepiadaceae. *Bot. Jahrb. Syst.* 120: 119-120.

KLACKENBERG J. 2000a. — Two new species of *Secamone* (Apocynaceae, Secamoneae) from Madagascar. *Novon* 10: 215-219.

KLACKENBERG J. 2000b. — *Secamone brevicoronata* and *S. pedicellaris*, two new species of Apocynaceae, Secamoneae. *Willdenowia* 30: 45-51.

KLACKENBERG J. 2000c. — Novelties in *Secamone* (Apocynaceae s.l., Secamoneae) from western Madagascar. *Candollea* 55: 75-85.

KUNZE H. 1990. — Morphology and evolution of the corona in Asclepiadaceae and related families. *Tropische und subtropische Pflanzenwelt* 76: 1-51.

LINDER H.P. 1998. — Numerical analyses of African plant distribution patterns: 67-86, in HUXLEY C.R., LOCK J.M. & CUTLER D.F. (eds.), *Chorology, Taxonomy and Ecology of the Floras of Africa and Madagascar*. Kew.

MANKTELOW M. 1996. — *Phaulopsis* (Acanthaceae) - a monograph. *Acta Univ. Ups. Symb. Bot. Ups.* 31: 1-184.

MORTON J.K. 1972. — Phytogeography of the West African Mountains: 221-236, in VALENTINE D.H. (ed.), *Taxonomy, Phytogeography and Evolution.* Academic press, London, New York.

PHILLIPS E.P. 1951. — *Gen. S. African Fl. Pl.*, ed. 2. Pretoria.

SCHLECHTER R. 1907. — Asclepiadaceae africanae: 26-56, in ENGLER A., Beiträge zur Flora von Africa, 28. *Bot. Jahrb. Syst.* 38.

SCHLECHTER R. 1914. — Die Asclepiadaceae von Deutsch-Neu-Guinea: 81-164, in LAUTERBACH C., Beiträge zur Flora von Papuasien 2. *Bot. Jahrb. Syst.* 50.

SCHUMANN K. 1895. — Asclepiadaceae: 189-306, in ENGLER A. & PRANTL K. (eds.), *Die natürlichen Pflanzenfamilien* 4(2), Leipzig.

TSIANG Y. 1939. — Notes on the Asiatic Apocynales IV. *Sunyatsenia* 4: 31-94.

WHITE F. 1983. — *The vegetation of Africa*. Paris, Unesco.

WOODSON R.E. 1941. — The North American Asclepiadaceae. *Ann. Missouri Bot. Garden* 28: 193-244.

Manuscript received 14 March 2001;
revised version accepted 26 July 2001.