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Contribution to the taxonomic revision of *Brachycorythis*-complex (Orchidaceae, Orchidoideae)

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Abstract. The aim of this paper is to present materials towards the taxonomic revision of *Brachycorythis*-complex (Orchidinae, Orchidaceae), which constitutes seven terrestrial genera and forty-eight species distributed in sub-Saharan Africa, Madagascar and SW Asia. The detailed morphological descriptions, together with distribution data and ecological preferences for particular taxa are provided. Artificial keys for taxa identification were prepared. A molecular timescale for *Brachycorythis* species on a background of the subtribe Orchidinae was reconstructed using nuclear and plastid molecular markers. The results show that representatives of *Brachycorythis* separated from its last common ancestor presumably ca 20 Mya and the youngest taxa within the group seem to be its Asiatic representatives.

Key words: *Brachycorythis*-complex, ecology, molecular clock, morphology, revision, taxonomy

1. Introduction

Although the biodiversity is one of the most significant topics of scientific discussion, our knowledge about the species occurring on the Earth is still very poor. As it is speculated, more than 70% species remain still undescribed and many of them become extinct before they are discovered (Chivian 2002). The recognition of species richness and documenting the distribution of biodiversity is the first and the most fundamental step for effective conservation and sustainable exploitation of natural resources for the future (Gaston 2000). There is no doubt that taxonomy is of great importance to understanding the biodiversity, not only for systematic or evolutionary aspects, but also to the species ecology and conservation efforts. One of the most important species-rich biodiversity regions in the world is Africa (Linder 2001), where more than 50% (or even 80%) plant species is considered to be endemic (Davis *et al.* 1994). The botanical exploration of Africa is far from satisfactory, underlining the need for intensified inventories (Sosef *et al*. 2017). *Brachycorythis*-complex is one of the unrecognized taxa, from the taxonomic point of view. Two opposite taxonomical concepts of its infrageneric relationships were presented by Schlechter (1921) and Summerhayes (1955). Moreover, since its last revision (Summerhayes 1955) numerous new *Brachycorythis* species were described and their taxonomic position within the group have not been yet revised. Due to the low avability of the material for DNA studies, the phylogenetic reconstrucion of the studied group is still impossible.

There is no doubt that the development of various molecular techniques (which allowed to obtain the DNA material in a very short time) and methods of phylogenetic reconstruction caused the crisis of Linnean taxonomy. Some scientist support more modern approach, which is faster and relatively cheaper (Riedel *et al.* 2013; Renner 2016). Dupérré (2020) pointed that giving the DNA-based diagnoses is rather slower or sometimes even impossible, especially for historical materials, gathered in the herbaria wordwide. On the other hand, according to Mayo *et al.* (2006), the alpha-taxonomy is a base for providing the biodiversity maps and species names. Moreover, the detailed diagnoses, together with descripion of species ecological preferences and

behavior are essential. It allows to avoid species missidentification (Lehmann *et al.* 2017), and should be the integral part of species naming. It should be never repleced by DNA characters (Dupérré 2020).

As the alpha-taxonomy is an essential part of modern taxonomic practice and underpins all biodiversity research (Mayo *et al.* 2006), the main purpose of this work is to realize a taxonomic revision of the *Brachycorythis*-complex. Moreover, the timescale of the *Brachycorythis*-complex was reconstructed (the analysis was performed for selected representatives of the subtribe Orchidinae – of which the species of *Brachycorythis* are members).

2. The history of *Brachycorythis* classification

The first concept of the genus *Brachycorythis* was proposed by Lindley (1838) to accommodate the newly described species *Brachycorythis ovata* Lindl., a plant presenting a number of unique features, i. e. inflated lip hypochile and blunty, helmet-like (galeate), obliquely inserted perianth, what denied its affinity to any known orchid genus. The name *Brachycorythis* comes from Greek *'brachy'* – short' and *'korys'* – 'a helmet' – an allusion to the helmet-like dorsal sepal and petals. The genus, originally placed within the tribe Ophrydeae by Lindley (1838), currently is classified within the subtribe Orchidinae (Orchideae, Orchidaceae).

In 1850, Harvey and Reichenbach combined the species of *Brachycorythis* with two species of another closely related genus *Schizochilus* Sond. The concept was not widely accepted, because of the differences in floral morphology between the genera and habitat requirements as well. The genera were separated anew by Bentham & Hooker (1883) and Pfitzer (1899). Furthermore, these authors placed *Brachycorythis* within the tribe Diseae Benth. & Hook. at the same time. The affinity of *Brachycorythis* to Diseae was argued by Schlechter (1895), who indicated the close relationship between *Brachycorythis* and *Platanthera* Rich. (Orchideae), from which it differs in habit, column architecture and petals more or less connate to the column. The author presented a broad concept of the genus, since he included also two other species of *Schizochilus* within this group. Additionally, he proposed a new genus, *Neobolusia* Schltr., to accommodate *Brachycorythis tysoni* Bolus. In 1898, Rolfe proposed a new concept of the genus, in which all species possessing a boat-shaped or hollower-out hypochile and lacking a prominent spur, were classified within *Brachycorythis*, while the spurred species were transferred to *Platanthera* Rich. (together with *Gymnadenia macrantha* Lindl.). In the same year, the species were re-classified within *Brachycorythis* by Kraenzlin, who also described a new spurless species, *Brachycorythis congoensis*. The generic independence of *Neobolusia* and *Schizochilus* were upholded. Kraenzlin's futher research resulted in description of another genus within the *Brachycorythis*-complex, *Schwartzkopffia* (represented by achlorophyllous, saphrophytic plants).

Rolfe (1912), in Flora Capensis, re-defined his view of *Brachycorythis* and due to the lack of spur in *Neobolusia*, he re-transferred it into *Brachycorythis*. The spurred species, *Gyaladenia tenuior* (Rchb.f.) Szlach. and *G. macowaniana* (Rchb.f.) Schltr., were also classified within the genus, the same as *Platanthera virginea* Bolus (described in 1896), placed later within *Neobolusia* by Schlechter (1915).

The first comprehensive revision of *Brachycorythis* was proposed by Schlechter in 1921. Author decided to keep *Schizochilus*, *Neobolusia* and *Brachycorythis* apart. The last genus was divided into four separated genera, two of them (*Gyaladenia* Schltr. and *Diplacorchis* Schltr.) were newly described: *Schwartzkopffia* – relatively small, leafless, saprophytic plants, with stem covered by cataphylls and inflorescence with 2-3 flowers; *Brachycorythis* s. str. – plants with spurless lip hypochile, petals connate to the column and naked viscidia; *Gyaladenia* – plants with short spurred lip hypochile, relativiely short column, petals free from the column, naked viscidia; *Diplacorchis* – plants with long-spurred lip hypochile, viscidia hidden in bursicles and the hypochile deccurent on to the epichile as tall plates, terminating abruptly in the front. The genus *Phyllomphax* were described by Schlechter in 1919 to accommodate the species previously placed within *Habenaria,* the section *Phyllostachya* Benth. (Bentham & Hooker 1883), consisting of both Asiatic and African species, including *Gymnadenia macrantha* Lindl. Although author suggested its strong affinity to *Brachycorythis* then, the genus was not classified as one of the *Brachycorythis*-complex in his revision (1921).

The Schlechter's concept was generally accepted by Braid (1925), who classified within the group twelve species more.

The next taxonomic revision of *Brachycorythis* were undertaken by Summerhayes (1955). Although the author firstly maintained Schlechter's concept (1936), after more comprehensive studies he stated that 'was unable to find the differences between genera described by Schlechter' and included all his genera into *Brachycorythis sensu lato*, leaving only *Schwartzkopffia* in a generic rank. In Summerhayes opinion, the features such as presence of the spur, bursicles or lip hypochile and epichile projection are too variable in this group and possess no taxonomic value for separating the genera on its basis.

The autonomous status of *Neobolusia* was later confirmed by Dressler (1981, 1993), and Linder & Kurzweil (1995).

In 2006 Szlachetko *et al.* presented the materials to the taxonomic revision of the *Brachycorythis*-complex. Based on the morphological differences, especially on lip morphology, they distinguished seven genera within the group: *Brachycorythis* Lindl., *Thulinia* P.J. Cribb, *Gyaladenia* Schltr., *Phyllomphax* Schltr., *Schwartzkopffia* Kraenzl., *Silvorchis* J.J. Sm. and newly described *Afrorchis* Szlach. The authors provided the taxonomic key for the genera, their descriptions and the list of species.

3. Characteristics of the *Brachycorythis*-complex

The representatives of *Brachycorythis*-complex are mostly terrestrial plants (only one species, *B. kalbreyeri* Rchb.f., was found to be semi-epiphytic). The underground storage organs are usually tubers of different shape, rarely the short rhizome with numerous, fleshy roots is present (e.g., in the genus *Silvorchis* J.J. Sm.). Most of the complex representatives are leafy plants, but in two genera, *Schwartzkopffia* Kraenzl. and *Silvorchis,* the species are achlorophyllous, leafless, with stem covered by imbricating or scale-like sheaths. In other genera, stem can be leafy through its length (*Gyaladenia* Schltr., *Afrorchis* Szlach.) or only in parts (e.g. *Thulinia* P.J. Cribb). Leaves, if present, are sessile to shortly petiolate, of different shape and apex and of the same size throughout the plant length (*Phyllomphax* Schltr.), or can gradually decrease in size up the stem and sometimes become floral bracts (*Afrorchis*). Sometimes, leaves can be glandular or pubescent (*Brachycorythis* Lindl. *s. str.*). Floral bracts are large, leaf-like (*Phyllomphax*, *Gyaladenia*) or much smaller than leaves (*Thulinia*). The inflorescence can be lax (*Phyllomphax, Thulinia*) to dense, with few (*Schwartzkopffia*, *Silvorchis*) to many (*Gyaladenia*, *Brachycorythis s. str.*), small (*Gyaladenia*) to relatively large (*Phyllomphax*) flowers. Petals and sepals can be subsimilar (*Afrorchis*) or dissimilar (*Phyllomphax, Brachycorythis s. str., Schwartzkopffia* or *Silvorchis*). Lip is covered densely with papillae giving it velvety texture. Its lamina can be constricted (*Brachycorythis s. str.*) or not into hypochile and epichile. The epichile is entire or more often with 3 lobes (*Afrorchis*, *Schwartzkopffia*, *Silvorchis*). The middle lobe can be obscure (*Phyllomphax*, *Brachycorythis s.str.*). In *Gyaladenia (G. rhodostachys* (Schltr.) Schltr. and *G. rhombogossa* (Kraenzl.) Szlach.) the lip can be unlobed. Rarely, the irregular callus on the lip can be observed, as in *Thulinia* or *Brachycorythis s. str.* (*B. buchananii* Rolfe), sometimes, there are prominent keels running from the gynostemium base down to the middle of the lamina (*Gyaladenia*), but in most species the lip is ecallose. In some species the lip is only slighty concave at the base (*Brachycorythis*, *Schwartzkopffia*), but in many species the flowers are producing a spur of different form and size, which is usually free. The only exception is *Thulinia* in which the spur is connate with the ovary. Spur is usually empty and entire inside, but in *Phyllomphax* can be divided inside by longitudinal diaphragma forming two compartments.

According to Szlachetko & Rutkowski (2000), the gynostemium in this group can be slender (*Phyllomphax*) or relatively massive (*Thulinia, Schwartzkopffia*) (Fig. 1). Anther is usually erect, only in *Thulinia* is bent-backwards, of ovoid-conical to ellipsoid (most genera), ellipsoid-ovoid (*Thulinia*) or broadly ellipsoid shape

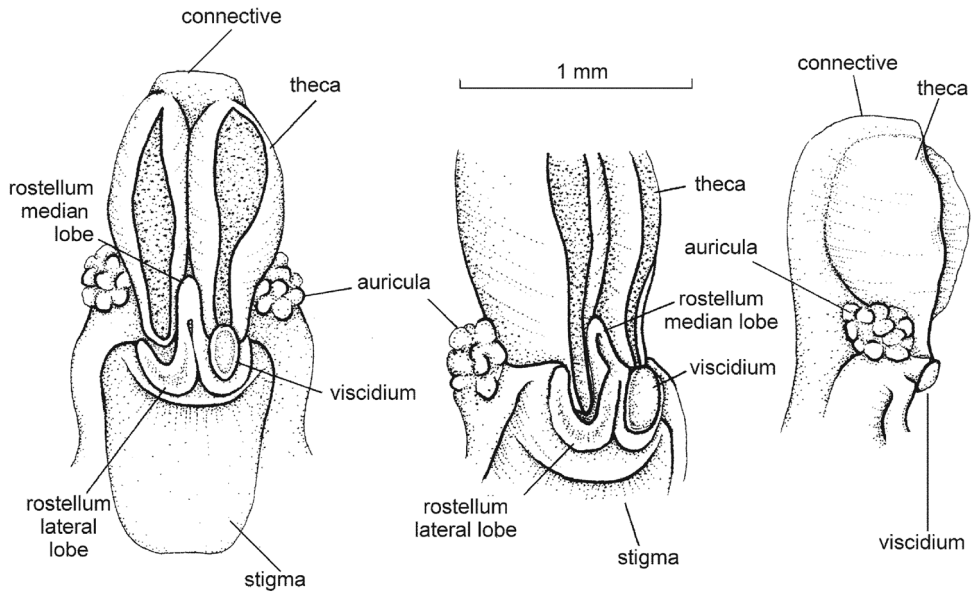

Fig. 1. Gynostemium structure of *Brachycorythis* Lindl. (Szlachetko & Rutkowski 2000)

(*Schwartzkopffia)*. The connective is narrow (*Thulinia*) to rather wide (or very wide in *Schwartzkopffia*). In most genera elongated thecae are located close to each other. In *Schwartzkopffia*, however, they are divergent in the middle and convergent in the base and the apex. Thecae of *Thulinia* are parallel, narrow with thin walls and free at the base. Pollinia are always two, sectile, of oblong or oblong-obovoid shape and slightly falcate (*Schwartzkopffia*). Caudiculae always two, filiform, interlocular, in *Schwartzkopffia* are shorter than the pollen mass. Prominent auriculae are formed of large cells (swollen in *Schwartzkopffia* and *Thulinia*). In *Thulinia* they are separated from the anther, conspicuous, of irregular ellipsoid shape. Raphides are present (numerous in *Thulinia*). Ventral, confluent stigma is 2- (*Schwartzkopffia*) or 3-lobed, with lateral lobes larger than the middle one, of elliptic to obovate or oblong-elliptic (*Schwartzkopffia*) or broadly cordate-obovate (*Thulinia*) shape. Rostellum of most representatives of *Brachycorythis* is short, truncate, perpendicular to the stigmatic surface, 3-lobed, with canaliculate lateral lobes placed close to each other. In *Schwartzkopffia*, rostellum is very short and wide, also 3-lobed, the ligulate, slightly pleated, massive and thick middle lobe is placed between thecae, while the lateral lobes are erect, short, canaliculate and spreading apart. In *Thulinia*, rostellum is perpendicular, with prominent, pleated middle lobe, which protrudes in front of the anther, while lateral lobes are smaller and canaliculated. Viscidia are always two, thin and naked, detachable, cellular, of elliptic (most of the genera) or obliquely obovate (*Schwartzkopffia*) or more or less obovate (*Thulinia*) shape. Bursicles may be present (in *Schwartzkopffia* and in *Thulinia* are absent).

4. Ecology and distribution

The species of the *Brachycorythis*-complex occur in the Old World, in Africa, Madagascar and Asia. The variety of habitats (listed below) show that it is rather imposible to define the equal ecological requirements for the whole taxon. Plants of *Brachycorythis* may occur in permanently wet habitats, e.g. *Afrorchis angolensis* (Schltr.) Szlach. in central Africa, as well as in seasonally wet areas, e.g. *Brachycorythis mixta* Summerh. (Summerhayes 1968; la Croix & Cribb 1995), and also in the moist grasslands of the summer rainfall areas in southern Africa (Schelpe 1966).

The vast majority of *Brachycorythis*-complex species are terrestrial herbs (ca 98% of species). They occur in mixed deciduous forests, hardwood and bamboo forests, evergreen (broad leaved) forest, semi-deciduous broad-leaved sub-montane forest, primary forest, open, waterlogged, rough, montane grassland, humid steppe, sandy, woodland and wet-steppe savanna, miombo woodland, *Brachystegia* woodlands (*Brachystegia microphylla-Julbernardia* woodland, *Brachystegia-Isoberlinia* woodland and with *Brachystegia spiciformis* Benth., *Uapaca kirkiana* Müll. Arg., *Syzygium guineense* (Willd.) DC. subsp. *macrocarpum* (Engl.) F. White, *Faurea* Harv. and *Protea* L.), wet and dry dambo, open, moist pastures, the margins of scrubs, open clayey meadows, river slopes, paths by streams, and (peaty) marshes. Usually grow together with *Pinus spp., Protea* trees, under the trees (i.e. *Mango*), among grass *Xyris* L., *Trachycalymna* Bullock, *Ascolepis* Nees ex Steud., and with other orchids. Some species are found also in xerophytic scrub, ericaceous bushland, on rocky summit, or in highly degraded (fire-damaged) areas. The only semi-epiphytic species, *Brachycorythis kalbreyeri*, is found in riverine forests and rainforests growing on the trees, often among the ferns and on *Parkia biglobosa* (Jacq.) R. Br. *ex* G. Don. The representatives of the *Barchycorythis*-complex prefer clay or sandy soils or the granite outcrops (Summerhayes 1968; la Croix & Cribb 1995), but they are also found in red and black soils or in the turf, or on alluvial soil between rocky limestone ridges. They occur at the elevation range between the sea level to 3750 m (growing on the hill slopes and in mountain areas). Flowering takes place throughout the year.

Most of the species (ca 55%) are distributed in tropical and southern Africa. The species with the widest distribution range are, e.g., *Brachycorythis pubescens* Havr*., B. ovata* Lindl. and *B. buchananii* Rolfe*,* which are generally distributed in the whole sub-Saharan Africa. *Phyllomphax macrantha* (Lindl.) Summerh. and *Gyaladenia conica* (Summerh.) Szlach. were reported from west-central part of the continent, while *Brachycorythis velutina* occurs only in east Africa. The number of species are distributed only in central Africa (*Gyaladenia rhodostachys* Schltr*., G. friesii* Schltr*., Afrorchis angolensis* (Schltr.) Szlach*., Brachycorythis inhabanensis* Schltr. and *B. mixta* Summerh.).

Twenty species were reported from tropical and subtropical Asia (*Phyllomphax acuta* (Rchb.f.) Schltr., *P. obovalis* (Summerh.) Szlach., *P. siamensis* Szlach. & Olędrz., *P. brevicalcarata* Szlach. & Olędrz., *P. seidenfadeniana* Szlach. & Olędrz., *P. helferi* (Rchb.f.) Schltr., *P. laotica* (Gagnep.) Szlach., *P. henryi* Schltr., *P. splendida* (Summerh.) Szlach., *P. wightii* (Summerh.) Szlach., *P. neglecta* (H.A. Pedersen) Olędrz. & Szlach., *P. iantha* Schltr., *P. obcordata* (Lindl. ex Wall.) Schltr., *P. thorelii* (Gagnep.) Tang & F.T. Wang, *P. galeandra* (Rchb. f.) Schltr., *P. menglianensis* (Y.Y. Qian) Olędrz. & Szlach., *Silvorchis colorata* J.J. Sm., *S. vietnamica* Aver., Dinh & K.S. Nguyen, *S. aurea* (Aver. & Averyanova) Szlach., *S. furcata* (Aver. & Nuraliev) Olędrz. & Szlach.

Brachycorythis pleistophylla Rchb.f. (var. *pleistophylla* and var. *leopoldi* (Kraenzl.) Geerinck) grows in

Africa and Madagascar, while the range of *Gyaladenia disoides* (Ridl.) Szlach. is limited to Madagascar exclusively.

Numerous species, representing five genera, of the studied group were reported from very few areas and are characterized by a narrow distribution range. Some of them are known from different regions in Asia, Madagascar, others – from some regions in Africa and Madagascar. *Phyllomphax menglianensis* (Y.Y. Qian) Olędrz. & Szlach., is known only from the Yunnan Province (China), where it is found growing in grassland, in the open monsoon and evergreen broad-leaved forests, at the elevation ca 1600 m. *Silvorchis colorata* J.J. Sm. is endemic to evergreen forest areas of western Java. *S. vietnamica* Aver., Dinh & K. S. Nguyen, *Silvorchis furcata* (Aver. & Nuraliev) Olędrz. & Szlach. and *S. aurea* (Aver. & Averyanova) Szlach. are found only in some provinces in Vietnam. *Brachycorythis basifoliata* Summerh. was noted only in São Tomé and Príncipe so far, where it grows in a dense primary forest, at elevation 700-800 m. Finally, the only representative of *Thulinia, T. albolutea* P.J. Cribb, is known only from the Nguru Mountains in Tanzania, where it is found in xerophytic scrub and ericaceous bushland, growing on rocky summits, at elevation between 380 and 2100 m.

5. Materials and methods

5.1. Linnean taxonomy

The taxonomic revision was based on the analyses of herbarium specimens from numerous European and American institutions (AMES, B, BR, BM, K, L, MO, P, US, W) from which the materials were loaned or examined directly in these institutions. The total number of ca 1000 specimens were revised. The standard procedure on working with the herbarium material has been implemented. Flowers were taken from the middle part of inflorescence, then rehydrated and examined under the stereomicroscope. Particular parts of the flower were drawn in details and measured. The descriptions of each part were prepared (including the length of pedicel and ovary; size and shape of sepals, petals and lip; fusion of petals with column sides; presence, shape and size of the spur; size of gynostemium). The data concerning the vegetative characters (height of the stem; number, size and shape of the leaves; size and density of the inflorescence and bracts; presence of the hairs) were also collected. Then all the information was compared with the type material, original description of particular species (especially the protologues) and the original illustrations. The data of the collectors and the collections numbers, as well as distribution and ecology details from every herbarium sheet were collected in the database.

The representative specimens are citied as follow: collector's name and number, locality, habitat, date, herbarium acronym. The abbreviations of all the authors names are citied according to Brummitt & Powell (1992). All acronyms are cited in accordance to *Index Herbariorum* (Thiers 2018). The nomenclature types are cited in accordance with the *International Code of Nomenclature for algae, fungi and plants* (Turland *et al.* 2018), following the recommendation of McNeill (2014).

For each studied taxon (genera and species), the detailed description and distribution maps are provided. There are also the taxonomic dichotomous keys for determination of studied taxa prepared.

5.2. Molecular clock analysis

The phylogeny and diversification time (molecular clock) of the subtribe Orchidinae (incl. Habenariinae) were reconstructed based on the commonly used nuclear (ITS, *Xdh*) and plastid (*matK*, *psaB*, *psbA-trnH*, *rbcL*, *trnL-trnF*) molecular markers. All DNA sequences were obtained from the National Center for Biotechnology Information (NCBI) and are listed in the Appendix 1. Two separate matrices – of nuclear (1821 bp; 138 species included) and plastid (6568 bp; 135 species included) data, were prepared for the analyses. Matrices were automatically aligned in Mafft (https://mafft.cbrc.jp/alignment/server/). The minor mistakes were then corrected in SeaView v.4. and AliView. Highly variable and ambiguously aligned characters of *psbA-trnH* and *trnL-trnF* were excluded from the datasets. The evolutionary models, separately for each used molecular marker, were estimated on the PhyML website (http://www.atgc-montpellier.fr/phyml/), using the AIC criterion. The analysis indicated two models of evolution: HKY+I+G and GTR+I+G, what was respected in all later analyses.

Two different analyses were conducted to reconstruct the phylogenetic relationship and divergence time of particular lineages within Orchidinae & Habenariinae: time diversification reconstruction (molecular clock) and Maximum Likelihood analysis. As the outgroup, the representatives of the tribes Cranichideae, Codonorchideae and Diurideae were chosen. As this paper is focused on *Brachycorythis*-complex, therefore, on the phylogenetic trees we presented only generic relationships for the rest Orchidinae (incl. Habenariinae) representatives. Full-reconstructed trees are available upon request from the corresponding author.

To estimate the diversification time of particular linages within the studied group, the Bayesian uncorrelated relaxed molecular clock (lognormal) approach and the Yule model of speciation were used. Analyses were run using BEAST (Drummond & Rambaut 2007) v.1.8.3. on the CIPRES Science Gateway (Miller *et al.* 2010).

The age of the tree root was set to 54.39 Mya, the outgroup to 53.25 and the ingroup to 38.1 Mya, according to Givnish *et al.* (2015). The analysis was conducted in two independent runs, every with 50 mln (nuclear dataset) or 100 mln (plastid dataset) generations. The quality of results from each run was verified in Tracer (Drummond & Rambaut 2007). In the next step, the .log files were combined into the one (with burn-in=25%) using LogCombiner. The maximum clade credibility tree was obtained in TreeAnnotator v. 1.5.3.

The maximum likelihood analyses were preformed using raxmlGUI 2.0 (Edler *et al.* 2020), with 1000 (nuclear dataset) or 500 (plastid dataset) bootstrap replicates

The final results are presented as the maximum clade credibility trees, obtained from molecular clock analysis, with the timescale and PP & BS support given.

6. Results and discussion

6.1. Taxonomic treatment

After the comprehensive revision, the taxonomic statuses of all genera recognized by Szlachetko *et al.* (2006) within the *Brachycorythis*-complex were upholded. There are 7 genera and 48 species included in the studied group, for which the taxonomical description, information about the geographical distribution and habitat preferences are here provided.

The genus *Phyllomphax*, represented by 18, mostly Asiatic, species is divided into 4 informal groups: *Phyllomphax acuta*-group (4 species), *Phyllomphax helferi*-group (7 species), *Phyllomphax galeandra*-group (5 species) and *Phyllomphax macranta*-group (2 species). Endemic to Nguru (Tanzania), *Thulinia* still consists of a single species only. *Gyaladenia* (mostly African genus, with one species in Madagascar) is divided into 2 subgenera: subgen. *Gyaladenia* (6 species) and subgen. *Diplacorchis* (4 species). The genus *Afrorchis* consists of 5 African species. Within the genus *Brachycorythis*, 3 sections are recognized: sec. *Brachycorythis* (4 species), sec. *Microcorythis* Schltr. (2 species) and sec. *Dasycorythis* Schltr. (3 species). The genus *Silvorchis* (Asiatic) comprises 4 species. The species previously recognized within the genus *Schwartzkopffia* were included in the varietas rank into the one taxon – *S. pumilio*.

Three new species: *Phyllomphax siamensis* Szlach. & Olędrz., *Phyllomphax brevicalcarata* Szlach. & Olędrz., *Phyllomphax seidenfadeniana* Szlach. & Olędrz. and six new combinations were proposed: *Phyllomphax neglecta* (H.A. Pedersen) Olędrz. & Szlach., *Phyllomphax menglianensis* (Y.Y. Qian) Olędrz. & Szlach., *Afrorchis congoensis* (Kraenzl.) Olędrz. & Szlach., *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach., *Schwartzkopffia pumilio* (Lindl.) Schltr. var. *lastii* (Rolfe) Olędrz. & Szlach., and *Schwartzkopffia pumilio* (Lindl.) Schltr. var. *buettneriana* (Kraenzl.) Olędrz. & Szlach.

Key to the genera:

1. Flowers with prominent ovoid-conical to cylindrical spur 2
1. Flowers spurless, at most basal part of the lip more or less concave 5
2. Spur connate with the ovary, lip with irregular callus running from the base to its apex ..... *Thulinia*
2. Spur free from the ovary, lip usually ecallose, occasionally somewhat thickened along midline or with a pair of keels running in the lower lip part 3
3. Lateral sepals much larger than the dorsal one, spur ovoid-conical, short ..... *Afrorchis*
3. Sepals subsimilar in size, spur conical-cylindrical, elongate 4
4. Spur apically divided inside by diaphragma, hence with two compartments ..... *Phyllomphax*
4. Spur without any internal division ..... *Gyaladenia*
5. Plants leafy, leaves ovate, lanceolate, acute, sheathing at the base only, lip constricted near the middle forming a concave hypochile and flat or convex epichile ..... *Brachycorythis*
5. Plants leafless, stem covered by imbricating sheath-like cauline bracts, lip not divided into hypochile and epichile 6
6. African plants, sepals subsimilar, lip basally shallowly saccate ..... *Schwartzkopffia*
6. SE Asian plants, sepals dissimilar, lip with basal convex callus ..... *Silvorchis*

6.1.1. *PHYLLOMPHAX* Schltr.

Repert. Spec. Nov. Regni Veg. Beih. 4: 118. 1919. Generitype: *Phyllomphax macrantha* (Lindl.) Summerh. [= *Phyllomphax helleborina* (Hook.f.) Schltr.]. – Summerhayes, FWTA, ed. 1, 2: 407. 1936. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 31. 1998. – Perez-Vera, Orchid. Côte d'Ivoire: 109. 2003. – Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid.

36(1): 16. 2004. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 19. 2007. – Szlachetko, Orchid. Ivory Coast: 36. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 93. 2010.

Tuber 1 or few, ellipsoid or ovoid, or clustered, fleshy roots. Stem leafy above basal third or quarter, or through its length, glabrous. Leaves sessile to subpetiolate, glabrous, gradually decreasing in size up the stem becoming floral bracts. Inflorescence few- to many-flowered, usually lax. Flowers resupinate of various size, usually relatively large, broadly opened. Floral bracts leafy. Sepals and petals dissimilar. Lip spurred, entire or 3-lobed at the apex, the middle lobe obscure, sometimes absent, lateral lobes large, obliquely triangular or rhombic, acute. Spur saccate with conical or mamillate, often hooked apex, divided inside into two parallel compartments, densely covered inside by ciliae or papillae, rarely glabrous. Gynostemium slender. Anther erect, connective narrow, blunt or apiculate, locules close to each other, parallel. Pollinia massulate, caudicles shorter than pollen mass. Stigma entire, oval to elliptic, slightly concave in the centre. Rostellum tongue-like, the middle lobe pleated, both lateral lobes in close contact to each other. Viscidia naked. Auricles prominent.

A genus of 18 species known from Africa and southern Asia. *Phyllomphax* is characterized by large, leafy floral bracts, entire or sometimes very unequally 3-lobed lip, with obscure, often completely reduced middle lobe, prominent, elongate spur, usually cylindrical-conical, but occasionally ovoid-clavate, and sepals usually similar in size and shape. The unique character, however, which distiguishes this genus from other representatives of *Brachycorythis*-alliance is spur apically divided into two chambers or compartments. In most species there is a membrane inside the spur, but in some other, the apex of the spur is bilobed with both lobes somewhat separated. In both cases, the spur apex is two-chambered. The only exception is *Phyllomphax obcordata*.

Key to the species:

1. Lip ca twice or longer than wide ..... *P. acuta*
1. Lip more or less as long as wide or wider than long 2
2. Lip suborbicular, widest near the middle, apex truncate to rounded 3
2. Lip triangular to ovate in outline, widest at the apex, truncate or apically bilobed 8
3. Leaves up to 4 × 2 cm, usually smaller, elliptic to ovate-elliptic 4
3. Leaves larger 5
4. Spur ca 4-6 × 1.8-4 mm ..... *P. splendida*
4. Spur ca 9-11 (12.7) × 3 mm ..... *P. henryi*
5. Spur less than 5 mm long ..... *P. wightii*
5. Spur over 5 mm long 6
6. Pedicellate ovary glabrous ..... *P. helferi*
6. Pedicellate ovary ciliate to glandular 7
7. Cauline leaves 4, lip 16-22 × 16-23 mm wide, suborbicular-subquadrate in outline, truncate at the apex ..... *P. laotica*
7. Cauline leaves 5-11, lip (16)20.5-28 × (16.6)22.3-29.5 mm, transversely elliptic in outline, notched at the apex ..... *P. neglecta*
8. Lip deeply bilobed at apex 9
8. Lip triangular to triangular-ovate, usually truncate or sometimes with short apiculate apex in the middle 11
9. Lip triangular-ovate in general outline, deeply and very unequally 3-lobed .... *P. tanganyikense*
9. Lip pentagonal to broadly ovate in outline or so, deeply to shallowly bilobed 10
10. Leaves 1.2-4.5 × 1-2.8 cm, pedicel and ovary slightly pubescent along ridges ... *P. menglianensis*
10. Leaves 5-11 × 2-4 cm, pedicel and ovary glabrous ..... *P. macrantha*
11. Leaves small, up to 3 × 2 cm 12
11. Leaves larger, 5-6 × 1.7-3 cm 13
12. Cauline leaves 8-12, lip 6.7-10.5 × 8.7-10.5 mm ..... *P. iantha*
12. Cauline leaves 5-8, lip 6.3- 8.5 × 5-7 mm ..... *P. obcordata*
13. Stem and ovary glabrous ..... *P. thorelli*
13. Stem densely papillate in the upper part, ovary papillate ..... *P. galenadra*

Phyllomphax acuta-group

This group embraces species, which can be characterized by relatively long and narrow leaves and broadly lanceolate-ovate to oblong-ovate lip, longer than wide.

6.1.1.1. *Phyllomphax acuta* (Rchb.f.) Schltr.
(Figs. 2-4)

Repert. Spec. Nov. Regni Veg. Beih. 4: 119. 1919. ≡ *Gymnadenia acuta* Rchb. f., Otia Bot. Hamburg.: 32. 1878; TYPE: CAMBODIA, *Godefroy-Leboeuf 474* (HOLOTYPE:

Fig. 2. *Phyllomphax acuta* (Rchb.f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Godefroy-Leboeuf 474*, P). Scale bar = 3 cm

Fig. 3. *Phyllomphax acuta* (Rchb.f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Kostermans 1104*, AMES). Scale bar = 3 cm

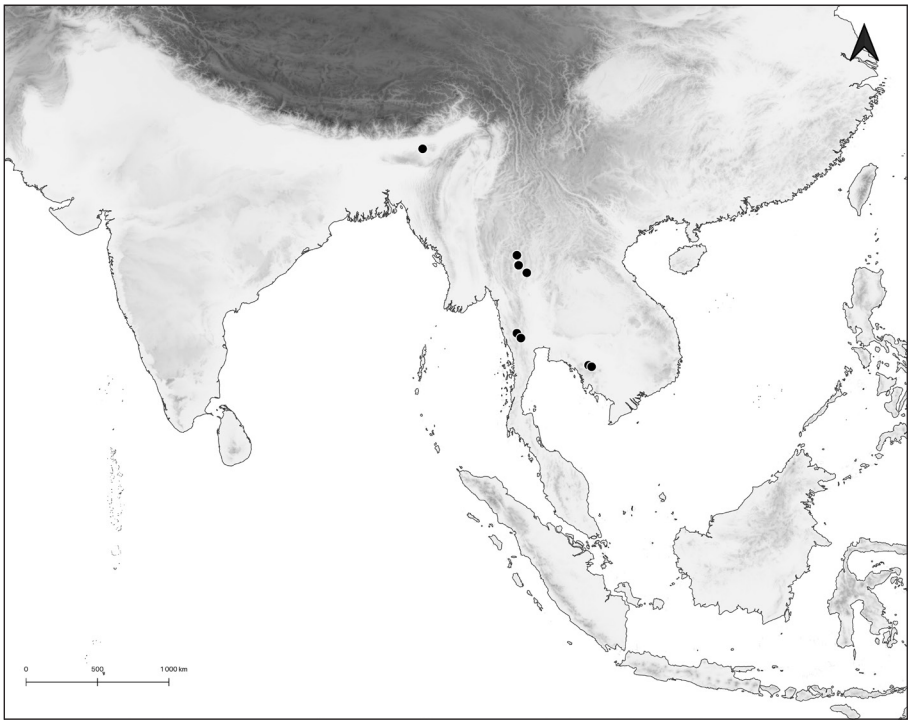

Fig. 4. Distribution map of *Phyllomphax acuta* (Rchb.f.) Schltr.

K!, Isotypes: P!, W! – drawing, UGDA-DLSz! – copy, drawing). ≡ *Platanthera acuta* (Rchb. f.) Kraenzl., Orch. Gen. Sp. 1: 611. 1899. ≡ *Habenaria acuta* (Rchb.f.) Gagnep., Fl. Gén. Indo-Chine 6: 597. 1934. ≡ *Brachycorythis acuta* (Rchb.f.) Summerh., Kew Bull. 10(2): 238. 1955.

Tuber ca 3 cm long, 0.5 cm wide, oblong ellipsoid to globose. Stem 16-35 cm tall, erect, rather slender, glabrous, covered in the basal part with sheath-like, bladeless leaves. Cauline leaves 4-7, arranged along the stem above the lower third, sessile to subsessile, 4-12 cm long, 1.3-2.8 cm wide, narrowly elliptic-lanceolate to ligulate-lanceolate, acute, except the lowermost, spreading, gradually decreasing in size up the apex of inflorescence, ciliate along margins only. Inflorescence up to half of the entire plant length, up to 15 cm long, laxly 4-7-flowered. Flowers relatively large, glabrous. Sepals and petals white, lip magenta or pinkish with purple spotted centre, occasionally lip white. Floral bract up to 75 mm long, similar to cauline leaves, narrowly elliptic-lanceolate to ligulate-lanceolate, acute. Pedicel and ovary up to 20 mm long, slender, twisted, ciliate. Dorsal sepal 7.5-14(17.2) mm long, 3-4(5.2) mm wide, oblong elliptic-lanceolate to narrowly ligulate, shortly acuminate at the apex, 5-veined. Petals 7-12(15) mm long, 1.3-4 mm wide, narrowly lanceolate to linear-lanceolate, acute to acuminate, 3-veined, more or less sigmoid. Lateral sepals up to 14(17) mm long and 4(5.4) mm wide, oblong-elliptic to ligulate, acuminate, falcate, usually 5-veined. Lip 10-15.5(16.5) mm long, 4-7(9.5) mm wide, broadly lanceolate to oblong-ovate, acute to acuminate, with a pair of short keels at the spur entrance, margins more or less distantly crenate. Spur 4.5-11 mm long, (1.8)3-5 mm in diameter at the base, the basal part swollen, broadly cylindrical, the apex slender, bifid, finger-like, erect, with longitudinal membrane inside splitting it in two chambers. Gynostemium 3-4 mm long.

Ecology: In mixed deciduous forest, on the ground, in shaded places. Flowering time: June-September.

General distribution: India, Thailand, Cambodia. Alt. 480-940 m.

Representative specimens: India: Assam, S Lushai Hills, on ground in shaded forests, alt. 750 m, Sep. 1928, *Wenger 245* (K!). Thailand: Doi Chiengdao, Hua Doi-Nang, alt. 940 m, Jun. 1952, *Garrett 1392* (K!); Chiang Mai, Me Chem, mixed deciduous forest, alt. 700 m, Jul. 1922, *Kerr* 487 (K!, UGDA-DLSz! – copy); Sai Yok, Kanburi, 1 Aug. 1828, *Put 1815* (K!, UGDA-DLSz! –copy); Lampang, ?, alt. 480 m, 26 Aug. 1922, *Khoon Winit 742* (K!, UGDA-DLSz! – copy); *Sine loc.*, 13 Jul. 1946, *Kostermans 1104* (AMES!, UGDA-DLSz! – drawing). Cambodia: Prov. Pursat, Prum Bat, 18 Jun. 1875, *Godefroy-Leboeuf 474* (K!, P!, W! – drawing, UGDA-DLSz! – copy, drawing); between Punchre and Stungchre, *Poilane 17758* (P!); Prov. Kompong-spen, between Punlovea and Pun-rung, *Poilane 17537* (P!).

Notes: *Phyllomphax acuta* can be easily separated from all other genus representatives by the leaves and lip form. *P. acuta* can be closely related to *P. obovalis*, which can be separated from the former by having leaves linear-lanceolate, ca 7-10 times longer than wide (vs 3-4 times longer than wide, narrowly elliptic-lanceolate to ligulate-lanceolate, acute) and lip up to twice longer than wide, obtuse at the apex (vs ca 2.5-3.5 times longer than wide, acute to acuminate).

6.1.1.2. *Phyllomphax obovalis* (Summerh.) Szlach. (Figs. 5-7)

Richardiana 6: 78. 2006. ≡ *Brachycorythis obovalis* Summerh., Kew Bull. 10(2): 237. 1955; Type: MYANMAR (BURMA), *Lace 4222* (Holotype: K!, Isotypes: K!, E, UGDA-DLSz! – copy).

Tuber 1-3, up to 3.5 cm long, 0.5-0.7 cm wide, ellipsoid to globose. Stem 20-40 cm tall, erect, slender or delicate, glabrous, covered in the basal part with sheath-like, bladeless leaves. Cauline leaves 3-6, arranged along the stem above the lower third or quarter, sessile to subsessile, 4-10 cm long, up to 1.7 cm wide, linear-lanceolate, acuminate, spreading, gradually decreasing in size up the apex of inflorescence, ciliate along margins only. Inflorescence can start above the lower third of the stem, but usually shorter, up to 16 cm long, laxly 4-11-flowered. Flowers relatively large. Floral bract up to 110 mm long, similar to cauline leaves, narrowly

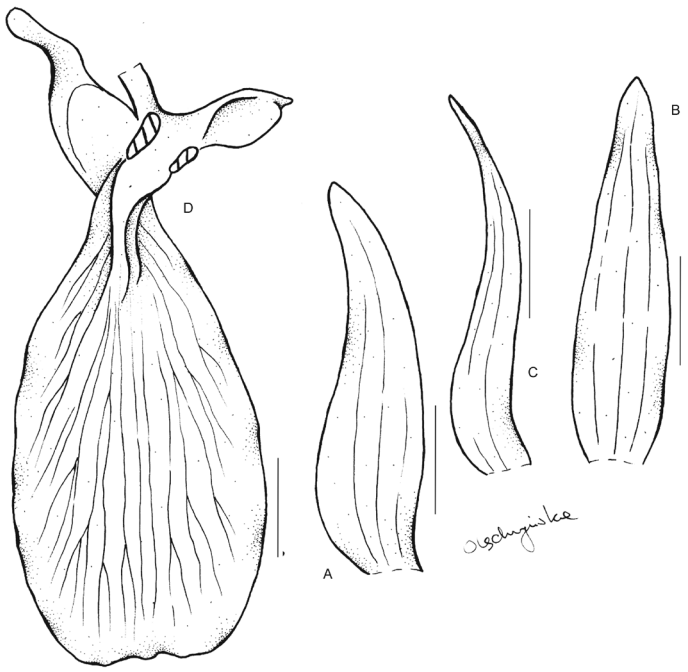

Fig. 5. *Phyllomphax obovalis* (Summerh.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Ganderson 87(a)*, AMES). Scale bar = 3 cm

Fig. 6. *Phyllomphax obovalis* (Summerh.) Szlach.

Explanations: habit (drawn from *Lace 4222*, K – holotype). Scale bar = 3 cm

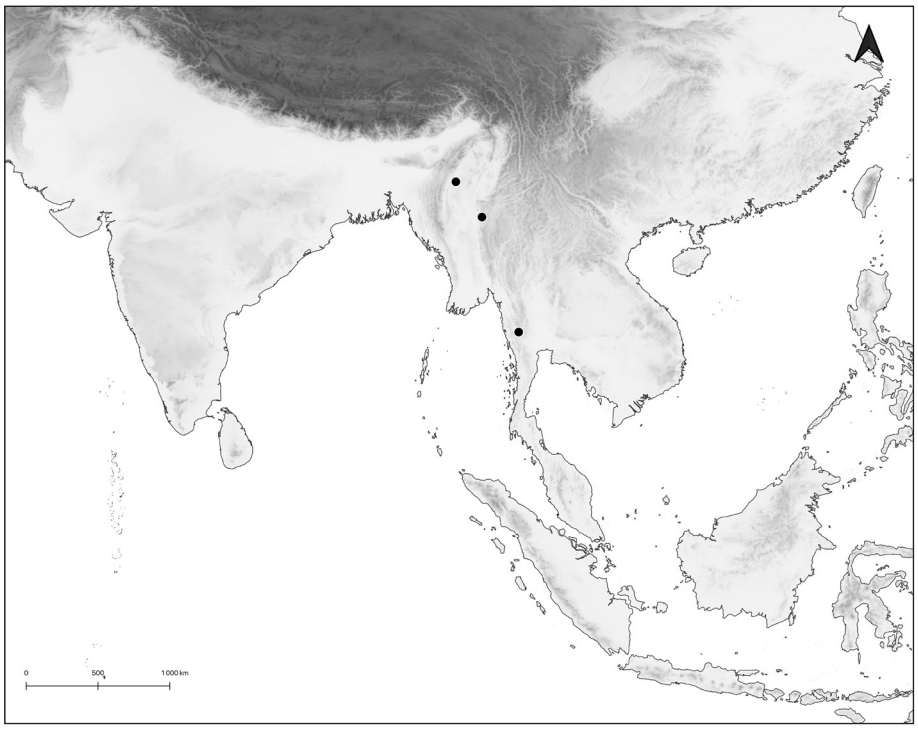

Fig. 7. Distribution map of *Phyllomphax obovalis* (Summerh.) Szlach.

lanceolate to linear-lanceolate, acuminate. Pedicel and ovary ca 13 mm long, slender, twisted, ciliate. Dorsal sepal 8.5-12 mm long, 1.6-4 mm wide, oblong elliptic to narrowly lanceolate, acute at the apex, 3-veined. Petals 7-11 mm long, 1.3-1.6 mm wide, linear to narrowly lanceolate, acute to acuminate, 2- or 3-veined, more or less sigmoid. Lateral sepals up to 13 mm long and 4 mm wide, oblong-elliptic to ligulate-lanceolate, acute, falcate, 2-3-veined. Lip up to 14 mm long, ca 7 mm wide, ligulate-ovate to narrowly ovate, runded to truncate at the apex, with a pair of short keels at the spur entrance, margins almost entire. Spur 4.5-6 mm long, 1.8 mm in diameter at the base, the basal half swollen, broadly cylindrical, the apical half slender, finger-like, with longitudinal membrane inside splitting it in two chambers, papillate inside. Gynostemium 3 mm long.

Ecology: No data. Flowering time: June-August.

General distribution: Myanmar (Burma), Thailand. Alt. 70-1050 m.

Representative specimens: Myanmar (Burma): Distr. Upper Chindwin, Paungbyin Reserve, alt. 185 m, Aug. 1908, *Lace 4222* (K!, E, UGDA-DLSz! – copy); Maymyo Plateau, alt. 1050 m, 11 Jun. 1911, *Lace 5273* (K!, UGDA-DLSz! – copy); *Sine loc.*, *Ganderson 87(a)* (AMES!, UGDA-DLSz! – copy, drawing). Thailand: Distr. Kanburi, Hin Dat, Jul. 1926, *Put 75* (K!); Distr. Say Yok, Prov. Kanchanaburi, ca 70 m, *Madran 2406* (K!)

Notes: See above.

6.1.1.3. *Phyllomphax seidenfadeniana* Szlach. & Olędrz., sp. nov. (Figs. 8-11)

The new entity is similar to *Phyllomphax acuta* (Rchb.f.) Schltr. and *P. obovalis* (Summerh.) Szlach., especially in the general habit. They differ in the lip form. In *P. acuta* and *P. obovalis* lip is ca twice longer than wide, ligulate to lanceolate. In *P. seidenfadeniana* the lip is elliptic-ovate, only slightly longer than wide, usually widest just below the middle.

Type: THAILAND, *Niyondham et al. 353* (Holotype: AMES!, UGDA-DLSz! – copy, drawing).

Etymology: Dedicated to Dr. Gunnar Seidenfaden (1908-2001), an eminent Danish orchidologist.

Tuber ca 2 cm long, 1 cm wide, globose. Stem 42-50 cm tall, erect, slender, glabrous, covered in the basal part with sheath-like, bladeless leaves. Cauline leaves 5-6, arranged along the stem in the upper half or above the lower third, sessile to subsessile, 7-10 cm long, ca 1.5 cm wide, linear-lanceolate, acuminate, spreading, gradually decreasing in size up the apex of inflorescence, ciliate along margins only. Inflorescence 8-11 cm long, laxly 3-6-flowered. Flowers rather large. Floral bract 20-70 mm long, similar to cauline leaves, but smaller, narrowly lanceolate to linear-lanceolate, acuminate. Pedicel and ovary 12-20 mm long, slender, twisted, glabrous. Dorsal sepal (9)16 mm long, 3.2-5 mm wide, oblong elliptic-ovate to ligulate, acute at the apex, 5-veined. Petals (8)13.5 mm long, 3.2-4 mm wide, ligulate-lanceolate,

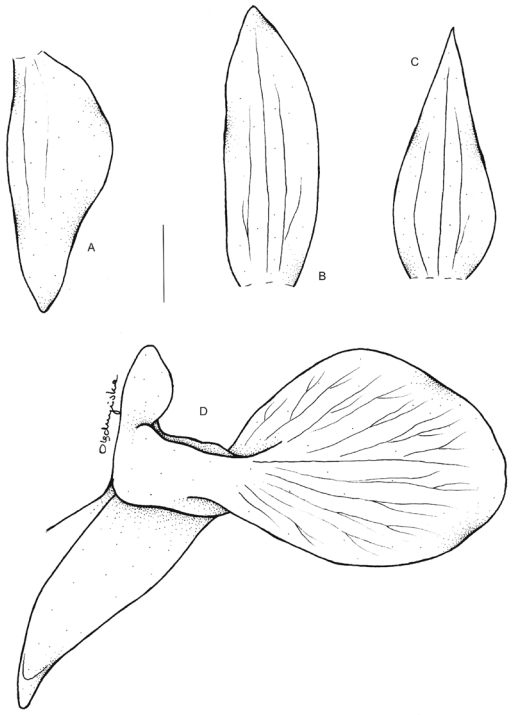

Fig. 8. *Phyllomphax seidenfadeniana* Szlach. & Olędrz.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Kerr 499,* P). Scale bar = 3 cm

Fig. 9. *Phyllomphax seidenfadeniana* Szlach. & Olędrz.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Niyondham & al. 353*, AMES – holotype). Scale bar = 3 cm

Fig. 10. *Phyllomphax seidenfadeniana* Szlach. & Olędrz.
Explanations: habit (drawn from *Larsen & al. 30758*, L). Scale bar = 3 cm

acute, 3-veined, subfalcate. Lateral sepals (10)18 mm long, 4.5-6 mm wide, oblong-elliptic to ligulate, acute, subfalcate, 3- or 4-veined. Lip (11)20 mm long, (7)15-18 mm wide, elliptic-ovate, obtuse at the apex, with a pair of short keels at the spur entrance, margins almost entire, somewhat undulate. Spur 9-12 mm long, 4-5 mm in diameter at the base, the basal part swollen, broadly cylindrical, the apical half slender, conical-finger-like, with longitudinal membrane inside splitting it in two chambers. Gynostemium 4-5 mm long.

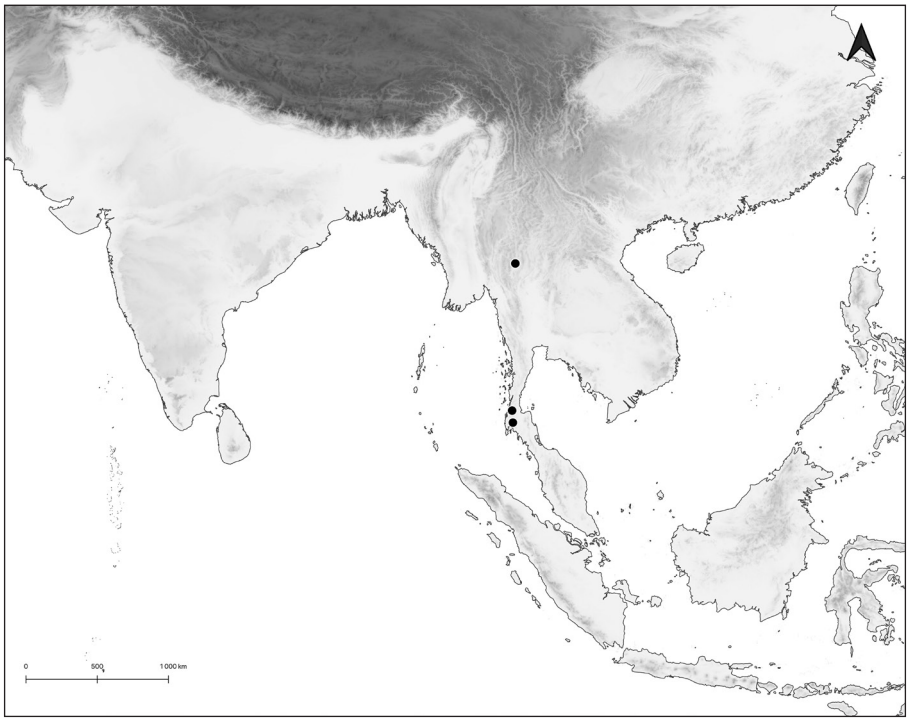

Fig. 11. Distribution map of *Phyllomphax seidenfadeniana* Szlach. & Olędrz.

Ecology: Terrestrial on sandy soil, among grass.
Flowering time: July, October.
General distribution: Thailand. Alt. 60-1600 m.
Representative specimens: Thailand: Chiang Mai, Muang Ha, alt. 1600 m, Oct. 1922, *Kerr* 499 (P!, UGDA-DLSz! – copy, drawing); Peninsular, Foothill of Khao Phra Mi., 9°17'N, 98°26'E, on sandy soil, among grass, alt. 60 m, 1972, *Larsen et al. 30758* (L!, UGDA-DLSz! – copy, drawing); Thung Chalee, Nang Yon, Phang Nga, 150 m, 20 Jul. 1979, *Niyondham et al. 353* (AMES!, UGDA-DLSz! – drawing).
Notes: This species is somewhat similar to those described above, i. e., *Phyllomphax acuta* and *P. obovalis*, especially in the general habit. Both species have, however, different lip form than *P. seidenfadeniana*. In *P. acuta* and *P. obovalis* lip is ca twice longer than wide, ligulate to lanceolate. In the new entity, the lip is elliptic-ovate, slightly longer than wide, usually widest just below the middle.

Fig. 12. *Phyllomphax brevicalcarata* Szlach., Olędrz.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Maxwell 07-449,* AMES – holotype). Scale bar = 3 cm

6.1.1.4. *Phyllomphax brevicalcarata* Szlach. & Olędrz., sp. nov. (Figs. 12-13)

The lip form of this species is similar to *Phyllomphax seidenfadeniana* Szlach. & Olędrz., but very short spur with very wide orifice terminated with short mamillate apex, mucronate sepals combined with narrow petals can characterized the new entity.
Type: CAMBODIA, *Maxwell 07-449* (Holotype: AMES!, Izotype: L!, UGDA-DLSz! – copy, drawing).

Etymology: In reference to the very short spur.

Stem ca 30 cm tall, erect, slender, glabrous, covered in the basal part with sheath-like, bladeless leaves. Cauline leaves 5-6, arranged along the stem in the upper part, subpetiolate, up to 8 cm long and 2 cm wide, linear-lanceolate, acute to acuminate, spreading, gradually decreasing in size up the stem, ciliate along margins

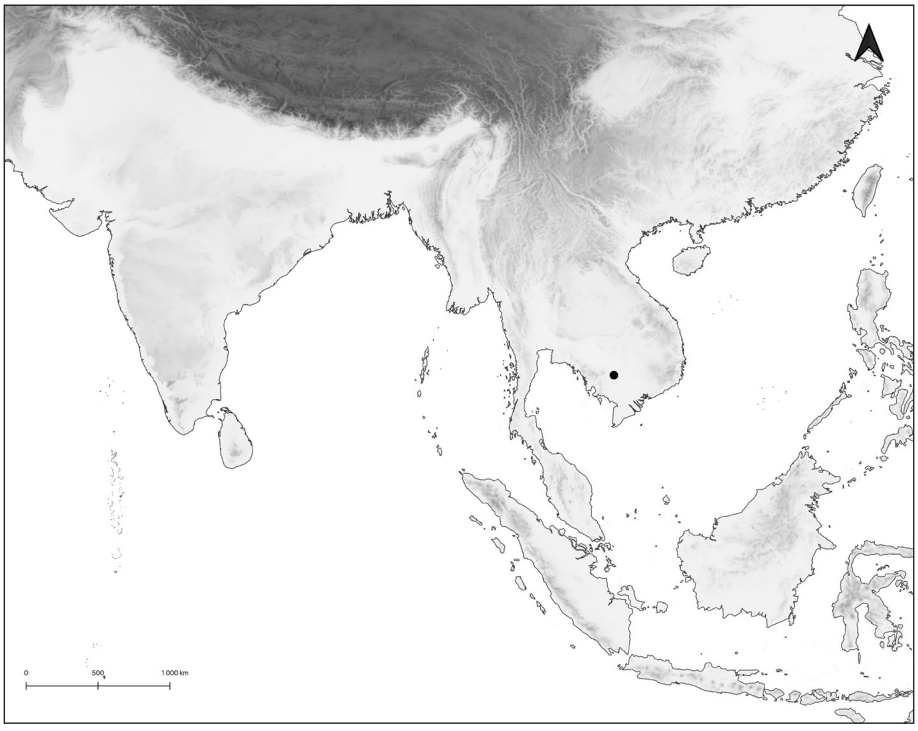

Fig. 13. Distribution map of *Phyllomphax brevicalcarata* Szlach. & Olędrz.

only. Inflorescence 18 cm long, laxly few-flowered. Flowers relatively small. Floral bract 50 mm long, similar to cauline leaves, but smaller, narrowly lanceolate to linear-lanceolate, acuminate. Pedicel and ovary 11 mm long, slender, twisted, ciliate. Dorsal sepal 8 mm long, 3 mm wide, oblong ovate to ligulate-lanceolate, acute at the apex, 3-veined, mucronate. Petals 6.2 mm long, 1.4 mm wide, linear-lanceolate, acuminate, 2-veined, subfalcate. Lateral sepals 8 mm long, 3.6 mm wide, obliquely elliptic, acute, 3-veined, mucronate. Lip 8.5 mm long, 7 mm wide, elliptic, obtuse at the apex, with a pair of short keels at the spur entrance, margins almost entire. Spur 3 mm long, 3 mm in diameter at the base, conical, terminated by mamillate apex, with longitudinal membrane inside splitting it in two chambers. Gynostemium 3 mm long.

Ecology: open to partly shaded, fire-damaged, degraded, deciduous, seasonal, hardwood and bamboo forest; metamorphic sandstone bedrock. Flowering time: July.

General distribution: Cambodia. Alt. 30 m.

Representative specimens: Cambodia: Kratie. Distr.: Sambour. Mekong River, Kring Island, SE. side, inland, in open to partly shaded, fire-damaged, degraded, deciduous, seasonal, hardwood and bamboo forest; metamorphic sandstone bedrock, alt. 30 m, 31 Jul. 2007, *Maxwell 07-449* (AMES!, L!, UGDA-DLSz! – copy, drawing).

Notes: This species is unique in this group by having very short spur with very wide orifice terminated with short mamillate apex, mucronate sepals combined with narrow petals. The lip form is similar to *Phyllomphax seidenfadeniana*.

Phyllomphax helferi-group

This group includes species with suborbicular lip, which is more or less as long as wide, with truncate to rounded apex.

6.1.1.5. *Phyllomphax siamensis* Szlach., Oędrz., sp. nov. (Figs. 14-15)

This is the only species in the genus with broadly obovate lip, widest just above the base, prominently thickened in the center with erose-crenate margins.

Type: Thailand, *Putt 3967* (Holotype: AMES! 69726, Isotype: P! 01778610, UGDA-DLSz! – copy, drawing).

Etymology: An allusion to the older name of the country of origin of this species.

Stem 22 cm tall, erect, slender, glabrous, covered in the basal part with sheath-like, bladeless leaves. Cauline leaves 6-7, arranged along the stem above the lower third, sessile to subsessile, up to 5.5 cm long and 2.8 cm wide, elliptic-ovate to elliptic-lanceolate, acute to acuminate, spreading, gradually decreasing in size up the apex of inflorescence. Inflorescence 9 cm long, laxly few-flowered. Flowers large. Floral bract 40 mm long, similar to cauline leaves, but smaller, narrowly lanceolate to linear-lanceolate, acute, ciliate along margins. Pedicel and ovary 17 mm long, slender, twisted, glabrous. Dorsal sepal 17 mm long, 5 mm wide, oblong elliptic-ovate, acute at the apex, 5-veined. Petals

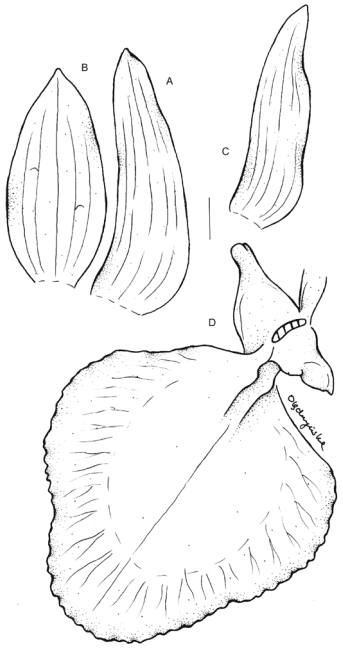

Fig. 14. *Phyllomphax siamensis* Szlach. & Oędrz.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Putt 3967,* AMES – holotype). Scale bar = 3 cm

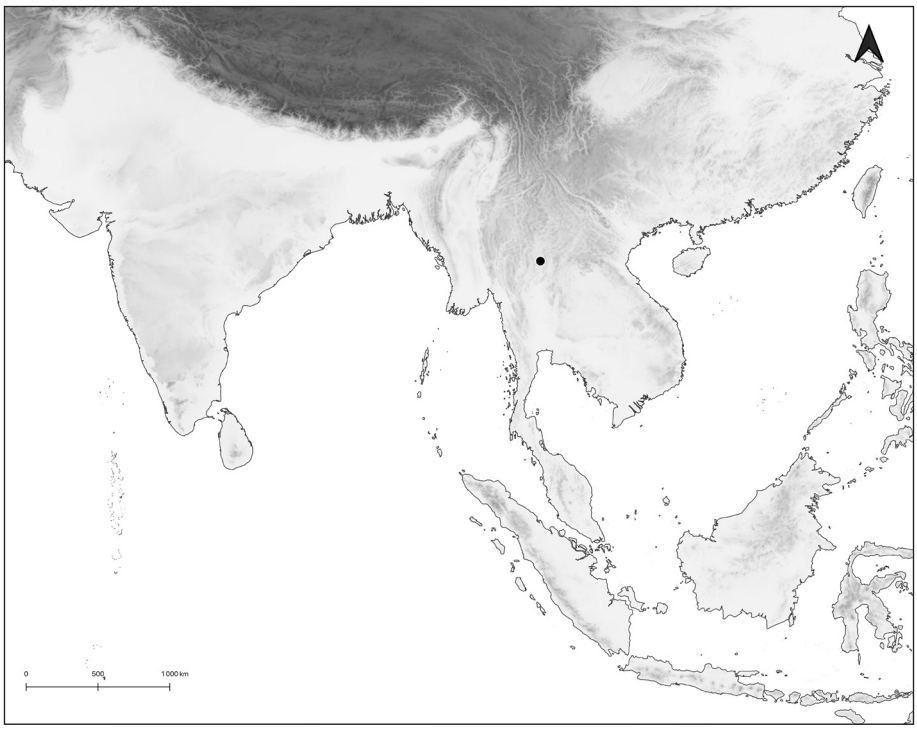

Fig. 15. Distribution map of *Phyllomphax siamensis* Szlach. & Oędrz.

16 mm long, 3.5 mm wide, ligulate with lanceolate, acute apex, 5-veined, sigmoid. Lateral sepals 18-19 mm long, 4 mm wide, ligulate to linear-lanceolate, subacute, subfalcate, 5-veined. Lip 25 mm long and wide, broadly obovate, obtuse at the apex, with a pair of short keels at the spur entrance, major part of the lip center thickened, margins erose-crenate. Spur 9 mm long, 4.5 mm in diameter at the base, the basal part swollen, broadly cylindrical, the apical half slender, conical-finger-like, somewhat bifid at apex, with longitudinal membrane inside splitting it in two chambers. Gynostemium 6.5 mm long.
Ecology: No data. Flowering time: July.
General distribution: Thailand. Alt. not given.
Representative specimens: Thailand: Chianguai, Muang Payas, 11 Jul. 1931, *Putt 3967* (AMES! 69726; P! 01778610, UGDA-DLSz! – copy, drawing).
Notes: In habit, especially reatively short and wide leaves, it is similar somewhat to *Phyllomphax splendida*, *P. henryi* and *P. wightii*, but easily recognized from all other species of the genus by broadly obovate lip, widest just above the base, prominently thickened in the center with erose-crenate margins.

6.1.1.6. *Phyllomphax helferi* (Rchb.f.) Schltr.
(Figs. 16-17, Plate I)

Repert. Spec. Nov. Regni Veg. Beih. 4: 119. 1919. ≡ *Gymnadenia helferi* Rchb. f., Flora 55: 276. 1872; Type: MYANMAR (BURMA), *Helfer 244* (Holotype: W!, Isotype: K!, UGDA-DLSz! – copy). ≡ *Habenaria helferi* (Rchb.f.) Hook. f., Fl. Brit. Ind. 6: 164. 1890. ≡ *Platanthera helferi* (Rchb. f.) Kraenzl., Orch. Gen. Spec. 1: 611. 1899. ≡ *Brachycorythis helferi* (Rchb. f.) Summerh., Kew Bull. 10(2): 235. 1955. = *Gymnadenia sesamoides* E.C. Parish *in* Mason, Burma, ed. 2,2: 184. 1883. Type (Pedersen 2009): MYANMAR (BURMA), *Parish s.n.* (Lectotype: K!).

Tubers oblongoid to ellipsoid. Stem 12-25 cm tall, erect, slender, glabrous, basally enveloped in bladeless leaves. Cauline leaves 4-7, arranged along the stem above the lower third, up to 12 cm long and 2.2 cm wide, sessile, narrowly ligulate-lanceolate to oblong lanceolate, acute to acuminate, spreading, gradually decreasing in size up the inflorescence, glabrous. Inflorescence in the apical quarter of the plant length, ca 8 cm long, laxly 2-4-flowered. Flowers usually large, sepals and petals white to pink or purple tinged outside, lip white, pink to deep purple, whitish in the centre, occasionally with pinkish or purplish radiating lines of dots, spur entrance bright yellow. Floral bract up to 70 mm long, similar to cauline leaves, narrowly elliptic-lanceolate to ligulate-lanceolate, acute. Pedicel and ovary up to 12-15 mm long, slender, twisted, glabrous. Dorsal sepal 9-16 mm long, 3.2-5 mm wide, oblong elliptic-lanceolate to lanceolate, obtuse, acute to shortly acuminate at the apex, 3- or 5-veined. Petals 8-16 mm long, 3-7 mm wide, obliquely ovate-lanceolate to ovate-ligulate, acute to acuminate, 3- or 5-veined.

Fig. 16. *Phyllomphax helferi* (Rchb.f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Wang 75986*, AMES). Scale bar = 3 cm

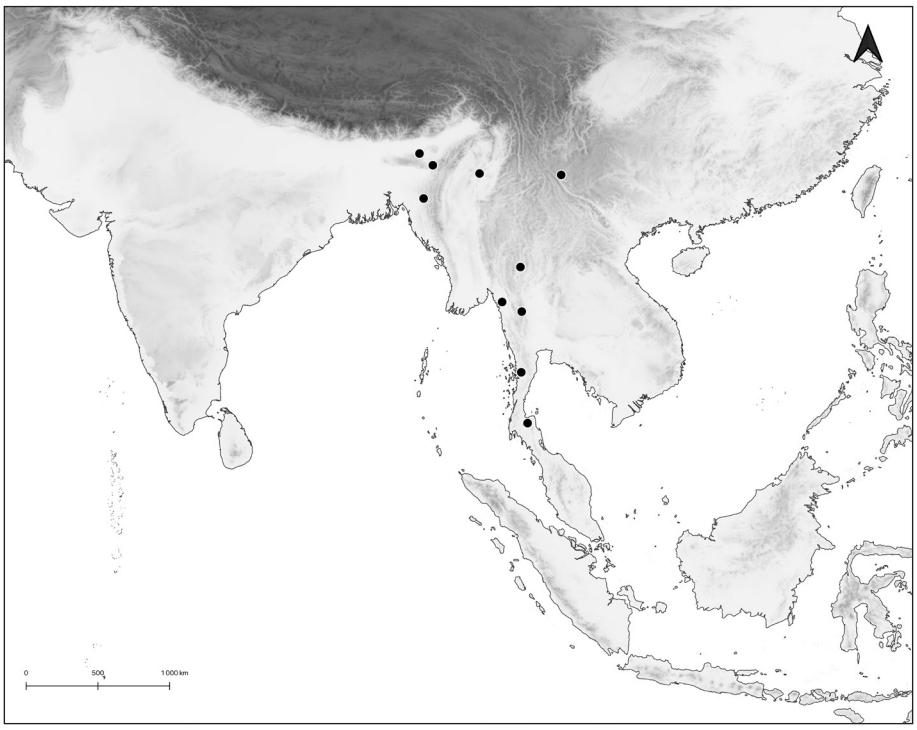

Fig. 17. Distribution map of *Phyllomphax helferi* (Rchb.f.) Schltr.

Lateral sepals (10)17-20.5 mm long, 4.5-6.7 mm wide, obliquely oblong-triangular, acuminate, 3- or 5-veined. Lip (11)20-26 mm long, (7)15-31 mm wide, ovate to suborbicular-ovate, rounded, obtuse or acute at the apex, margins crenate-undulate. Spur 9-11 mm long, 4-5 mm in diameter at the base, conical to conical-cylindrical, the apex slender, finger-like, erect, bifid, with longitudinal membrane inside splitting it in two chambers. Gynostemium 3-5 mm long.

Ecology: In deciduous mixed forest and bamboo forest, on sandy soils, among grass, on shady moist banks. Flowering time: June-October.

General distribution: India, China, Myanmar (Burma), Thailand. Alt. up to 1600 m.

Representative specimens: India: Assam, Khasia Hills, *Simons s.n.* (K!); Cachar Hills, Haflong, alt. 800 m, Aug. 1908, *Craib 205* (K!); South Lushai Hills, on shady moist banks, alt. 900 m, Aug. 1931, *Wenger 313* (K!). China: Yunnan, Sep. 1936, *Wang 75986* (AMES! 55570, UGDA-DLSz! – copy, drawing). Myanmar (Burma): Tenasserim, 1837, *Helfer 244* (K!, W!, UGDA-DLSz! – copy); Distr. Katha, near Mohnyin Reserve, alt. 300 m, Jul. 1911, *Lace 5350* (K!); Moulmein, *Lobb s.n.* (K!). Thailand: Tung Fueng, Jul. 1915, *Kerr s.n.* (K!); Me Chem, alt. 500 m, Jul. 1922, *Kerr s.n.* (K!); Kampea Pet, Kao Hua Mot, in deciduous mixed forest, alt. 1600 m, Jun. 1922, *Kerr s.n.* (K!); Surat Ban Nasan, alt. 10 m, Aug. 1927, *Kerr s.n.* (K!); Ban Kawp Kep, alt. 10 m, Aug. 1927, *Kerr 0430* (K!); Ban Kawp Kep, in bamboo forest, Aug. 1927, *Kerr 0430A* (K!).

Notes: This species can be confused with *Phyllomphax obovalis*, especially in the general habit and relatively narrow leaves. Both taxa can be distinguished by the lip form, which is much narrower in *P. obovalis*. *P. helferi* and *P. laotica* share similar habit and leaves form, but the former differs from *P. neglecta* by glabrous ovary, which is glandular in the latter species. There is a different spur/lip ratio in both species – the spur of *P. helferi* is ca twice shorter than lip, whereas in *P. laotica* it can be ca 3 times shorter than lip.

6.1.1.7. *Phyllomphax laotica* (Gagnep.) Szlach. (Figs. 18-21)

Richardiana 6: 77. 2006. ≡ *Habenaria laotica* Gagnep., Bull. Soc. Bot. France 78: 71. 1931;

Type: (Pedersen 2009): CAMBODIA, *Thorel 2145* (Lectotype: P!, Isolectotypes: K!, P!, UGDA-DLSz! – copy, drawing). ≡ *Brachycorythis laotica* (Gagnep.) Summerh., Kew Bull. 10(2): 236. 1955.

Tubers ellipsoid. Stem 10-23(50) cm tall, erect, slender, enveloped basally in bladeless leaves. Cauline leaves 4-5(9), arranged along the stem above the lower half, 5-9.5 cm long, 1-2.6 cm wide, usually smaller, subsessile to shortly petiolate, ligulate-lanceolate to oblong lanceolate, acute, erect-spreading, gradually decreasing in size upwards, ciliate along margisn only. Inflorescence in the apical quarter or third of the plant length, up to 13 cm long, laxly 2-4-flowered. Flowers relatively large, pure white, or white except the center

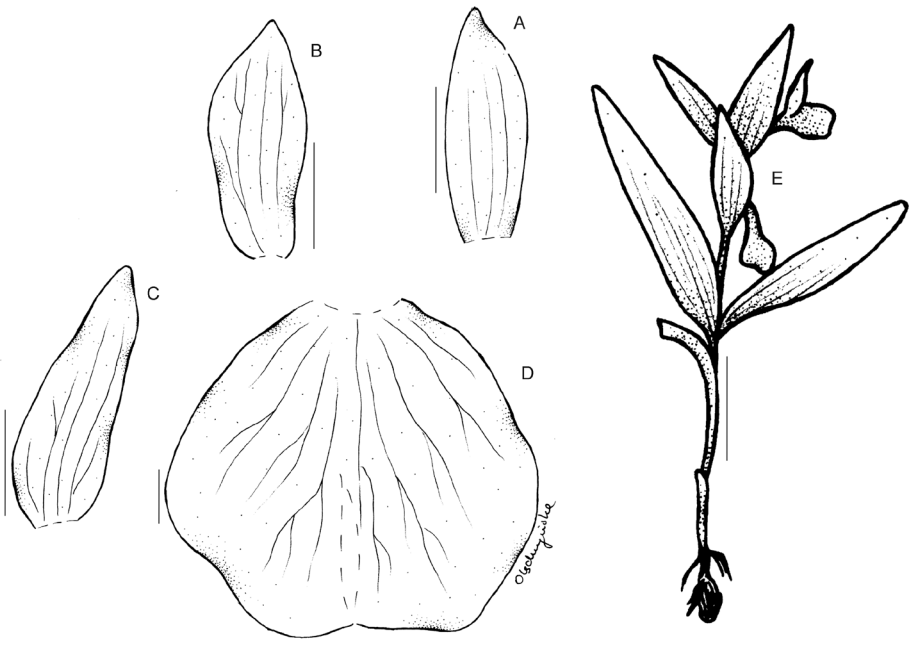

Fig. 18. *Phyllomphax laotica* (Gagnep.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Thorel 2145*, P – lectotype). Scale bar = 3 cm

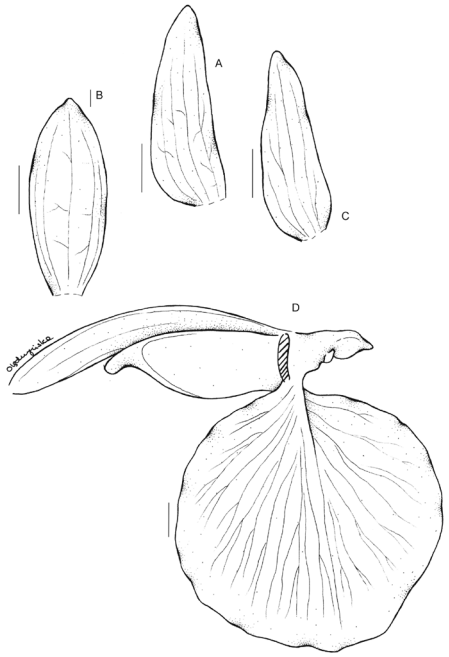

Fig. 19. *Phyllomphax laotica* (Gagnep.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Wang 75490,* AMES). Scale bar = 3 cm

Fig. 20. *Phyllomphax laotica* (Gagnep.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Wang 75463,* AMES). Scale bar = 3 cm

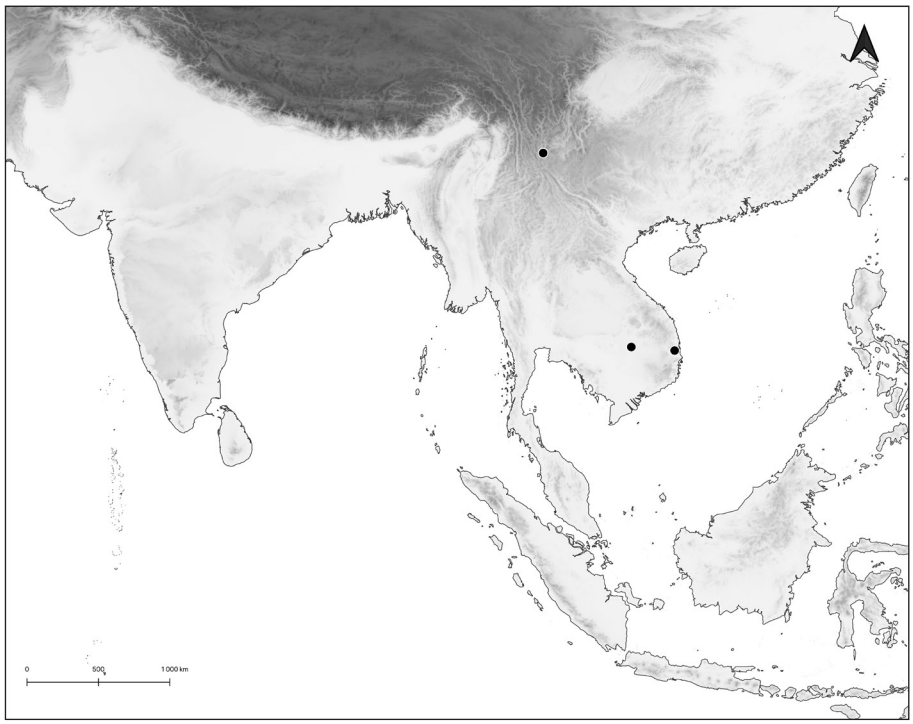

Fig. 21. Distribution map of *Phyllomphax laotica* (Gagnep.) Szlach.

which is deep purple and yellow spur entrance. Floral bract up to 80 mm long, leafy, lanceolate, acute. Pedicel and ovary 11.5-18 mm long, slender, twisted, glandular. Dorsal sepal 12-15 mm long, 4-5.7 mm wide, ovate-lanceolate, narrowly elliptic to ligulate, obtuse, 3- or 5-veined. Petals 10-14.7 mm long, 4-6.5 mm wide, narrowly ligulate to ovate-lanceolate, obtuse to subobtuse, subfalcate, 3(5)-veined. Lateral sepals 12-17 mm long, 5-5.5 mm wide, triangular-lanceolate, falcate, subacute, 3-veined. Lip 16-23 mm long, 16-23 mm wide, suborbicular-subquadrate in outline, truncate at the apex, with a pair of short and obscure keels at the spur entrance, margins shallowly erose. Spur ca 5-10 mm long, ca 2.5-4 mm in diameter at the base, narrowly conical with mamillate, bifid, blunt apex, divided inside into two compartments, glabrous. Gynostemium 3-5 mm long.

Ecology: Open to partly shaded, fire-damaged, degraded, deciduous, hardwood and bamboo forest.

Flowering time: July-August

General distribution: China, Cambodia, Vietnam. Alt.: 30 m.

Representative specimens: China: Yunnan, Aug. 1936, *Wang 75490* (AMES! 55610, UGDA-DLSz! – copy, drawing); *Same loc.*, Aug. 1936, *Wang 75463* (AMES! 55612, UGDA-DLSz! – copy, drawing). Cambodia: Prov. Stung Treng, 1866-1868, *Thorel 2145* (K!, P!, UGDA-DLSz! – copy, drawing). Vietnam: Pongour, near Djiring, *Evrard 1211* (P!).

Notes: *Phyllomphax laotica* is similar in habit, and relatively narrow leaves to the above presented *P. helferi*. Unlike the latter however, ovary of *P. laotica* is glandular (vs glabrous). It can be easily separated from recently described *P. neglecta* by the lip form and size, which is 16-22 × 16-23 mm wide, suborbicular-subquadrate in outline, truncate at the apex in the former, and (16)20.5-28 × (16.6)22.3-29.5 mm, transversely elliptic in outline, notched at the apex in the latter species. Plants collected in Yunnan, China, are somewhat larger plants than those from the southern part of geographical range of *P. laotica*.

6.1.1.8. *Phyllomphax henryi* Schltr. (Figs. 22-25)

Repert. Spec. Nov. Regni Veg. Beih. 4: 45. 1919; Type (*here designated*): CHINA, *Henry 11111* (B†; Lectotype: K!, Isolectotypes: AMES!, US!, UGDA-DLSz! – copy, drawing). ≡ *Platanthera dielsiana* Soó, Ann. Hist.-Nat. Mus. Nat. Hung. 26: 357. 1929. ≡ *Brachycorythis henryi* (Schltr.) Summerh., Kew Bull. 10(2): 235. 1955.

Tubers ovoid. Stem 10-25(30) cm tall, erect, slender, enveloped basally by bladeless leaves. Cauline leaves 4-6, arranged along the stem above the base, up to 2.5(4.2) cm long and 1.6(2) cm wide, usually smaller,

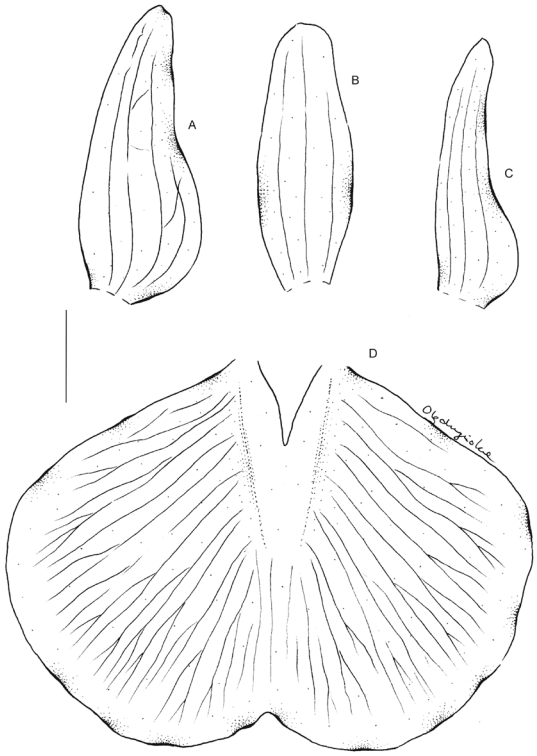

Fig. 22. *Phyllomphax henryi* Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Henry 11111,* K – lectotype). Scale bar = 3 cm

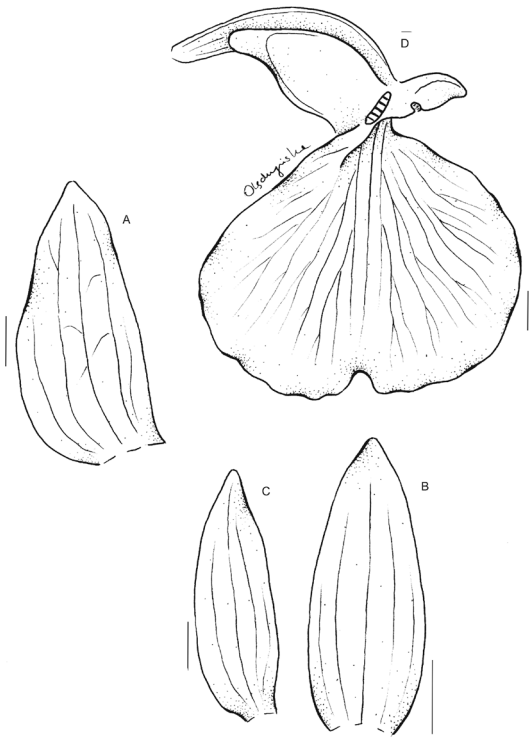

Fig. 23. *Phyllomphax henryi* Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Forrest 8180,* AMES). Scale bar = 3 cm

sessile, elliptic-ovate to ovate, acute, erect-spreading, almost the same size up the stem. Inflorescence in the apical half or third of the plant length, up to 10 cm long, laxly 3-5-flowered. Flowers relatively large, white or more or less pinkish overflushed, especially outside, or flower center purplish to pinkish, spur entrance yellow. Floral bract up to 25(45) mm long, similar to cauline leaves, elliptic-ovate, acute, papillate. Pedicel

Fig. 24. *Phyllomphax henryi* Schltr.
Explanations: habit (drawn from *Henry 12418*, K). Scale bar = 3 cm

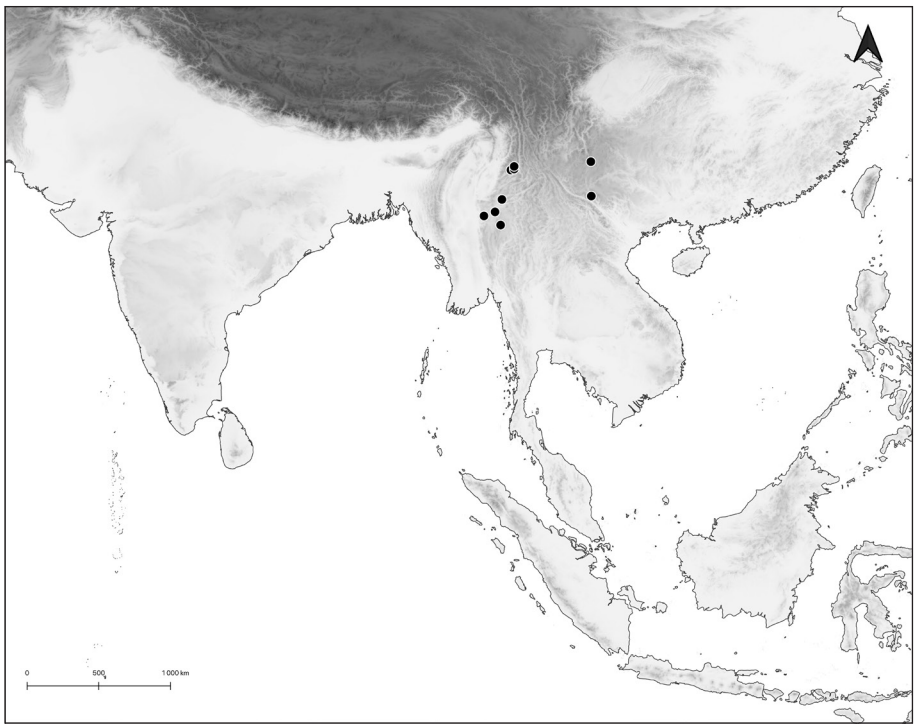

Fig. 25. Distribution map of *Phyllomphax henryi* Schltr.

and ovary 13-18 mm long, slender, twisted, ciliate. Dorsal sepal 8-14(15) mm long, 3-4.6(4.9) mm wide, lanceolate-ligulate to ovate-elliptic, obtuse at the apex, 3(5)-veined. Petals 7.3-12(14) mm long, 1.5-2.5(3.3) mm wide, narrowly ligulate, with outer margin much extended at the base, obtuse to subobtuse, subfalcate, 3-veined. Lateral sepals 8-15.5(20) mm long, 2.75-4.7(6) mm wide, obliquely ovate to ovate-lanceolate, obtuse, 3- or 5-veined. Lip 10.5-20(24) mm long and 10-17.5(27) mm wide, more or less transversely elliptic, pentagonal-orbicular or orbicular in outline, with a pair of short and obscure keels at the spur entrance, truncate at the apex, occasionally somewhat emarginated, sometimes with short projection in the bottom of sinus, margins more or less erose-undulate. Spur ca 9-11(12.7) mm long, 3-4 mm in diameter at the base, subcylindrical, apex digitate, blunt, divided inside into two compartments, papillate inside. Gynostemium 4-5.5(6.5) mm long.

Ecology: In open grassland, on margins of scrub, in moist pastures, on (grassy) hill slopes and grassy mountains, on open down, in open clayey meadows, in red soil. Flowering time: June-August.

General distribution: China, Myanmar (Burma). Alt. 780-3300 m.

Representative specimens: China: Prov. Yunnan, Mengzi, on grassy mountains, *Henry 11111* (B†, AMES!, K!, US! UGDA-DLSz! – copy, drawing); Same loc., on hill slopes, alt. 1710 m, Jun. 1893, *Hancock 41* (K!, UGDA-DLSz! – copy); Prov. Yunnan, Shweli-Salween Divide, 25°30'N, in open grassland on margins of scrub, alt. 3300 m, Aug. 1917, *Forrest 15880* (K!, UGDA-DLSz! – copy); Hills W of Tengyue, in moist pastures, alt. 1800 m, Jun. 1912, *Forrest 8180* (AMES!. K!, UGDA-DLSz! – copy, drawing); Around Tengyue, in open clayey meadows and slopes, alt. 1800 m, Jun. 1924, *Forrest 24583* (K!, BM!, UGDA-DLSz! – copy); Szemes, East Mountains, alt. 1350 m, *Henry 12418* (K!); Same loc., on grassy hills, *Henry 12418A* (K!, UGDA-DLSz! – copy); Kweichow, Lofou, S of Kweijang, 25°12'N, 106°52'E, Aug. 1909, *Cavalerie 3414* (K!, UGDA-DLSz! – copy). Myanmar (Burma): N. Shan States, Lashio, 780 m, Jun. 1912, *Lace 5837* (K!); Laikha State, 1350 m, on open down, in red soil, Jul. 1911, *Robertson 368* (K!); Wetwin, NE of Maymyo, Jun. 1927, *Clark s.n.* (K!); Maymyo Plateau, alt. 1050 m, Jun. 1911, *Lace 5304* (K!).

Notes: This species is characterized by relatively short and wide leaves and floral bracts and proportionately long spur. It can be distinguished from similar *Phyllomphax splendida* by longer and relatively narrower spur, which can be up to twice shorter than lip, and is similar in length to the pedicellate ovary. In *P. splendida* the spur is 2-4 times shorter than lip and 2-3 times shorter than pedicellate ovary.

6.1.1.9. *Phyllomphax splendida* (Summerh.) Szlach. (Figs. 26-29)

Richardiana 6(2): 78. 2006. ≡ *Brachycorythis splendida* Summerh., Kew Bull. 10(2): 240. 1955; Type: INDIA, *Wight 3025* (Holotype: K!, Isotypes: AMES!, BM!, W!, UGDA-DLSz! – copy, drawing).

Tubers ovoid to ellipsoid. Stem 10-36 cm tall, erect, slender, basally enveloped by bladeless leaves. Cauline leaves 5-10, arranged along the stem just above the base or above the basal third, often above the lower half, up to 4 cm long and 2 cm wide, usually smaller, sessile, elliptic to ovate-elliptic, acute, erect-spreading, gradually decreasing in size up the inflorescence. Inflorescence in the apical quarter to sixth of the plant length, lax, 1-15-flowered. Flowers medium-sized, sepals and petal deep purple or pink, lip pink to purple, spur entrance white. Floral bract up to 25 mm long, similar to cauline leaves, elliptic-lanceolate to ligulate-lanceolate, acute. Pedicel and ovary 8-14 mm long, slender, twisted. Dorsal sepal 6-9.4 mm long, 2.7-3.6 mm wide, elliptic-lanceolate, acute at the apex, 3-veined. Petals 6-9.6 mm long, 1.8-2.3 mm wide, narrowly ligulate-lanceolate, subobtuse, subfalcate, 3-veined. Lateral sepals 7-11 mm long, 2.5-4 mm wide, obliquely oblong lanceolate, acute, 3-veined. Lip 10-22.5 mm long, 12.3-23.5 mm wide, transversely elliptic in outline, more or less emarginated at the apex, with a pair of short

Fig. 26. *Phyllomphax splendida* (Summerh.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Hance 738*, BM). Scale bar = 3 cm

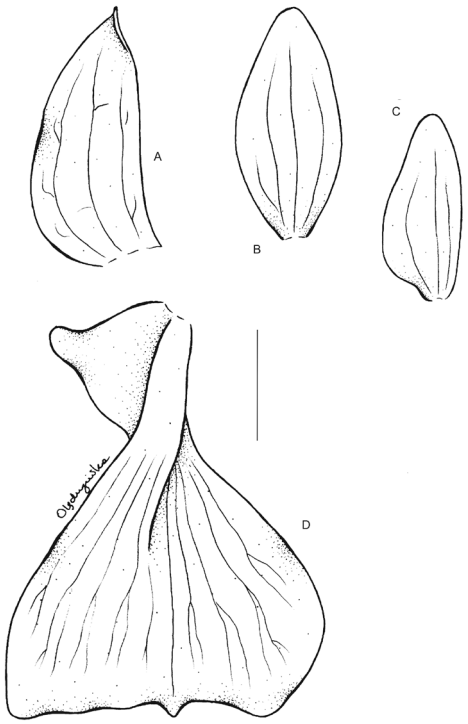

Fig. 27. *Phyllomphax splendida* (Summerh.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Wawra 770,* W). Scale bar = 3 cm

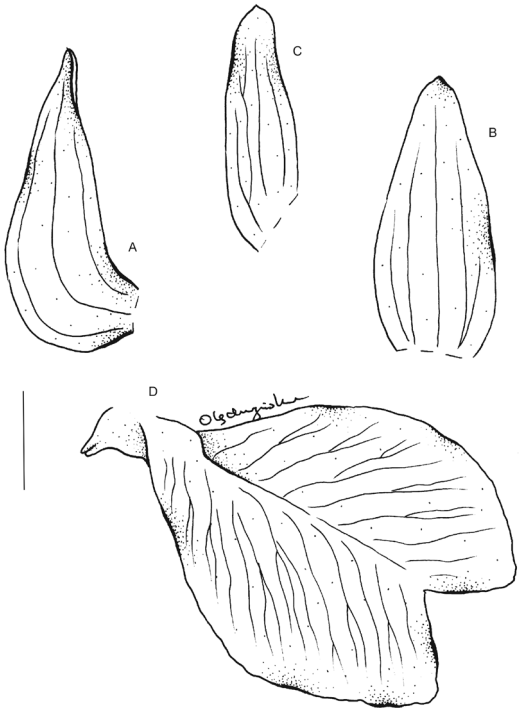

Fig. 28. *Phyllomphax splendida* (Summerh.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Wight 3025*, AMES – isotype). Scale bar = 3 cm

and very obscure keels at the spur entrance, margins irregularly erose. Spur up to ca 4-6 mm long, 1.8-4 mm in diameter at the base, conical-saccate, apex shallowly bilobed, each lobe blunt. Gynostemium 2.5-4.5 mm long.

Ecology: In grassland, on grassy hill slopes, on slopes at the head and river slopes. Flowering time: May-July, September.
General distribution: India, China. Alt. 1200-2100 m.

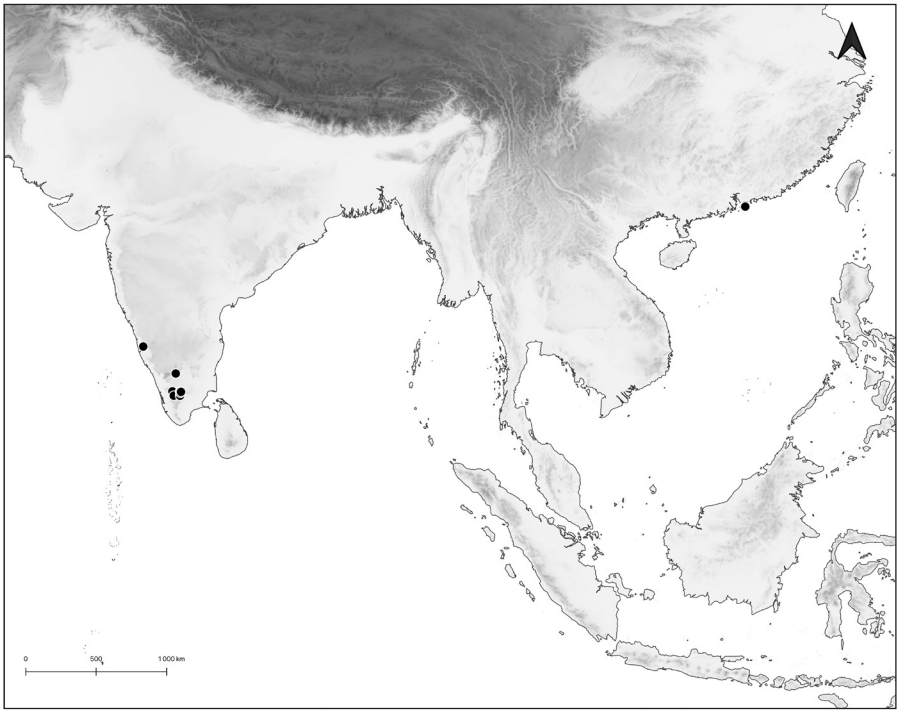

Fig. 29. Distribution map of *Phyllomphax splendida* (Summerh.) Szlach.

Representative specimens: China: Hongkong, 1853-1856, *Wight 525* (K!); Same loc., grassy hill slopes, Jun. 1885, *Sampson 659* (BM!); Same loc., *Sine coll. s.n.* (W!); Same loc., *Sine coll. s.n.* (W-R! 18861); Same loc., *Sine coll. s.n.* (W-R! 18862, UGDA-DLSz! – copy); Same loc., *Hance 105* (K!); Same loc., *Wawra 770* (W!, UGDA-DLSz! – copy, drawing); Same loc., Mt. Victoria, Jul. 1847, *Champion 270* (K!); Hongkong, *Hance 738* (BM!, K!, W!, UGDA-DLSz! – copy, drawing). India: Pulney Hills, Sept. 1826, *Wight 3025* (AMES!, BM!, K!, W!, W-R!, UGDA-DLSz! – copy, drawing); Same loc., alt. 2100 m, *Beddome 8072* (BM!); Same loc., Iantha swamp, Jul. 1899, *Bourne 2954* (K!, UGDA-DLSz! – copy); Same loc., Kodaikanal, Jul. 1897, *Bourne s.n.* (K!); Perumal-Malai, May 1897, *Bourne 155* (K!, UGDA-DLSz! – copy); Same loc., Arundina Path, 23 Jun. 1901, *Bourne 1537* (K!); Below Sidcot, Jul. 1898, *Bourne 1189* (K!, UGDA-DLSz! – copy); Bear Shola, slopes at the head, Jul. 1899, *Bourne 2953* (K!, UGDA-DLSz! – copy); Gundon Valley, river slopes, Jun. 1897, *Bourne 585* (K!, UGDA-DLSz! – copy); Shembaganur, alt. 1800 m, *Anglade 973* (K!, UGDA-DLSz! – copy); near Munnar, Travancore, grassland, 18 Sept. 1935, *Bartnes 1332* (K!, UGDA-DLSz! – copy); Anamalai Hills, alt. 1200 m, *Beddome 8073* (BM!).

Notes: *Phyllomphax splendida* has short leaves and relatively small floral bracts combined with short spur with wide orifice. Lip is more or less emarginate apically.

6.1.1.10. *Phyllomphax wightii* (Summerh.) Szlach. (Figs. 30-31, Plate II)

Richardiana 6(2): 78. 2006. ≡ *Brachycorythis wightii* Summerh., Kew Bull. 10(2): 242. 1955; Type: INDIA, *Wight 1031* (Holotype: K!, Isotype: BM!, UGDA-DLSz! – copy, drawing)

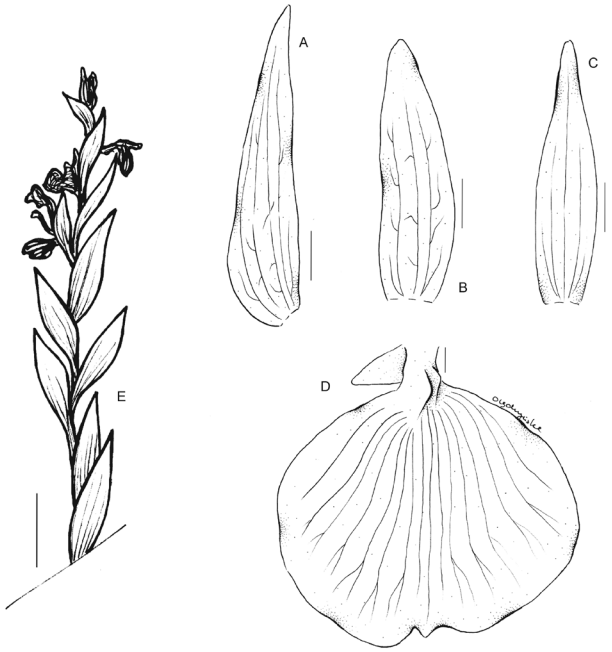

Fig. 30. *Phyllomphax wightii* (Summerh.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Bourdillon s.n.,* K). Scale bar = 3 cm

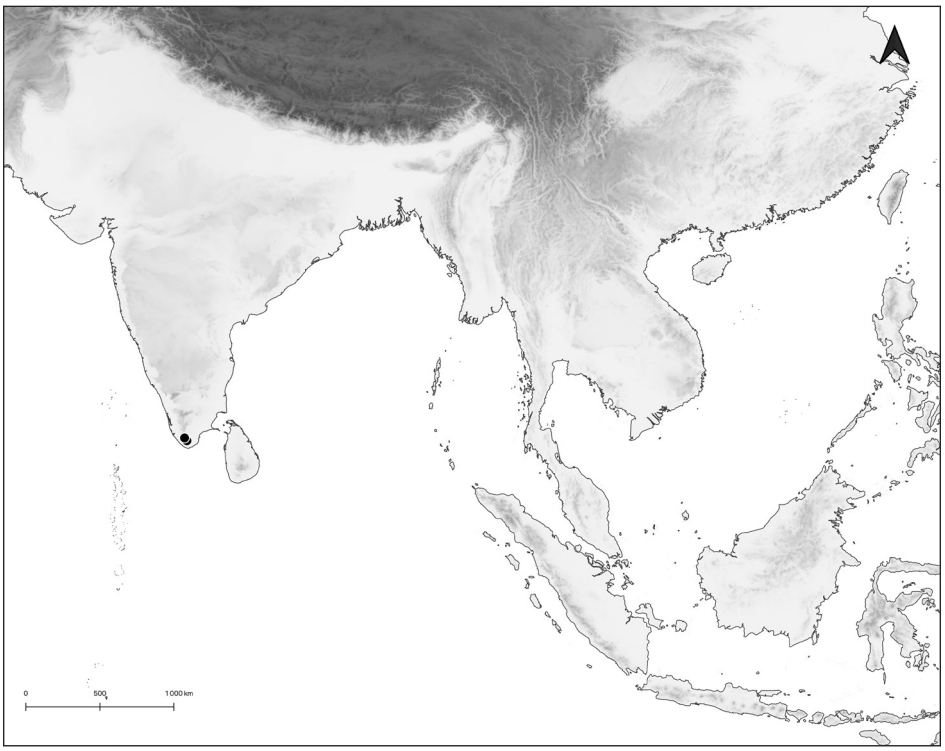

Fig. 31. Distribution map of *Phyllomphax wightii* (Summerh.) Szlach.

Tubers ovoid. Stem 18-40 cm tall, erect, slender, basally enveloped in bladeless leaves. Cauline leaves 8-15, arranged along the stem above the lower third or below, up to 7 cm long and 3 cm wide, usually smaller, sessile, elliptic, ovate to ovate-elliptic, acute, erect-spreading, almost the same size upwards. Inflorescence in the apical quarter to fifth of the plant length, laxly 5-8(20)-flowered. Flowers relatively large, sepals and petals purple or green-purple, with darker lines or dots, lip white with few lines of purple spots along the midvein. Floral bract up to 30 mm long, similar to cauline leaves. Pedicel and ovary 12-20 mm long, slender, twisted. Dorsal sepal 12-12.5 mm long, 3.5 mm wide, lanceolate-ligulate, obtuse at the apex, 3-veined. Petals 12.5 mm long, 2-3 mm wide, narrowly ligulate to narrowly lanceolate, obtuse to subobtuse, subfalcate, 3-veined. Lateral sepals 15-16.4 mm long, 3.5-3.9 mm wide, obliquely triangular-lanceolate, acute, 3-veined. Lip 17-22 mm long and wide, orbicular in outline, rounded, with more or less prominent triangular, acute apex, margins irregularly erose. Spur ca 4.7 mm long, 2 mm in diameter at the base, conical, apex blunt, divided inside in two chambers. Gynostemium 2.5-3.6 mm long.

Ecology: On the hills. Flowering time: July

General distribution: India. Alt.: not given.

Representative specimens: India: Travancore, 1836, *Wight 1031* (BM!, K!, UGDA-DLSz! – copy, drawing); Travancorne boundary, on the hills, Jul. 1886, *Bourdillon s.n.* (K!, UGDA-DLSz! – copy, drawing).

Notes: This species is characterized by large, orbicular lip and relatively short spur. It is somewhat similar to *Phyllomphax helferi*, but has distinctly shorter spur.

6.1.1.11. *Phyllomphax neglecta* (H.A. Pedersen) Olędrz. & Szlach., *comb. nov.* (Figs. 32-35)

Basionym: *Brachycorythis neglecta* H.A. Pedersen. Bot. J. Linn. Soc. 162(1): 71. 2010; Type: THAILAND, *Garrett 303* (Holotype: BKF; Isotypes: AMES!, K!, L!, UGDA-DLSz! – copy, drawing).

Tubers ellipsoid or obovoid. Stem 16-52 cm tall, erect, slender. Cauline leaves 5-11, arranged along the stem just above the base, 3.5-7.3 cm long and 1.3-2.8 cm wide, usually smaller, sessile, elliptic, acute, erect-spreading, almost the same size up the inflorescence, margins ciliate. Inflorescence in the apical quarter or fifth of the plant length, laxly 4-8-flowered. Flowers large, sepals and petals greenish to yellowish-green, lip pinkish with darker distal margins, and radiating lines of purple dots in the basal half, spur entrance yellow. Floral bract 25-65 mm long, similar to cauline leaves, ligulate-elliptic to elliptic, acute. Pedicel and ovary 11-16 mm long, slender, twisted, densely ciliolate. Dorsal sepal

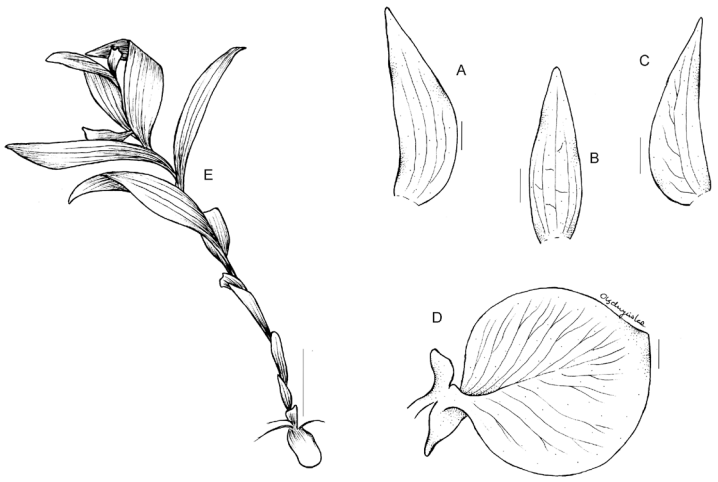

Fig. 32. *Phyllomphax neglecta* (H.A. Pedersen) Olędrz. & Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Kerr 478,* AMES*).* Scale bar = 3 cm

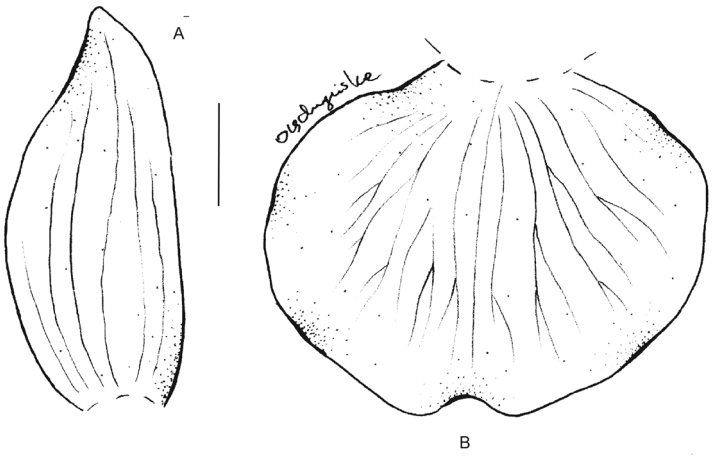

Fig. 33. *Phyllomphax neglecta* (H.A. Pedersen) Olędrz. & Szlach.
Explanations: A – lateral sepal, B – lip (drawn from Lakshnakara *1037,* K). Scale bar = 3 cm

Fig. 34. *Phyllomphax neglecta* (H.A. Pedersen) Olędrz. & Szlach.
Explanations: A – habit, B – flower (drawn from *Garret 303,* AMES – isotype). Scale bar = 3 cm

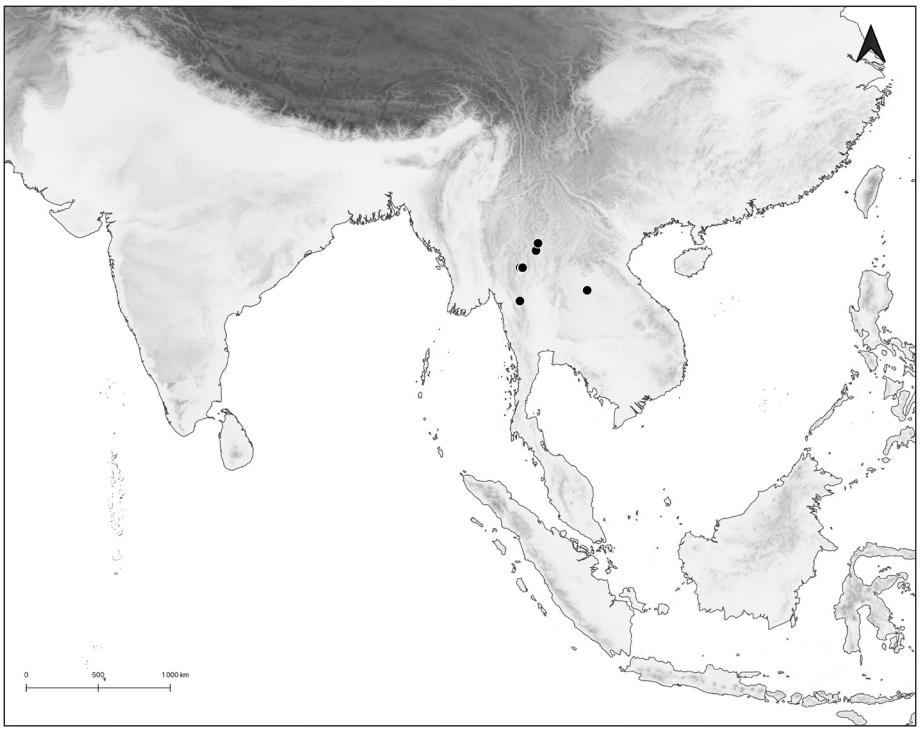

Fig. 35. Distribution map of *Phyllomphax neglecta* (H.A. Pedersen) Olędrz. & Szlach.

13-17 mm long, 2.5-5.2 mm wide, lanceolate-ligulate, obtuse at the apex, 3-5-veined. Petals 12-15.4 mm long, 2-4.5 mm wide, narrowly ligulate to lanceolate, obtuse, subfalcate to somewhat sigmoid, 3-veined. Lateral sepals 15-17 mm long, 4.5-6 mm wide, triangular-lanceolate, subobtuse, somewhat sigmoid, 3-5-veined. Lip (16)20.5-28 mm long, (16.6)22.3-29.5 mm wide, transversely elliptic in outline, emarginate at the apex, margins erose. Spur ca 7-8.5 mm long, 3.5 mm in diameter at the base, conical-saccate, apex digitate, blunt, divided into two compartments, densely glandular inside. Gynostemium 3-5 mm long.

Ecology: In shady places, on sandy soil. Flowering time: June-August.

General distribution: Thailand. Alt. 300-730 m.

Representative specimens: Thailand: Northern Floristic Reg., Prov. Chiang Rai, 1 km S of Chiang Rai, alt. ca 375 m, 8 Aug. 1926, *Garrett 303* (AMES! K!, L!, BKF, UGDA-DLSz! – copy, drawing); Nong Han, on shady, sandy soil, 3 Jul. 1932, *Lakshnakara* (K!); Mae Moei, alt. 300 m., 20 Jun. 1922, *Kerr 478* (AMES!, K!, P!, UGDA-DLSz! – copy); Doi Suthep, alt. 305–730 m, 13 Jul. 1909 , *Kerr 112* (K!, UGDA-DLSz! – copy); Doi Hua Mot, alt. 600 m, 13 Jun. 1922, *Kerr s.n.* (K!); Near Chiang Mai, 18 Aug. 1984, *Camber 1606* (K!); Chiang Mai, Doi Suthep, near foot, alt. 400 m, 20 Aug. 1951, *Garrett 1354* (K!, UGDA-DLSz! – copy); Me San (Noi), left Gank Me Iao, Me Kok, alt. 440 m, 23 Aug., 1923, *Garrett 189* (K!, UGDA-DLSz! – copy); *Sine loc.,* 8 Aug. 1921, *Kerr s.n.* (K!, UGDA-DLSz! – copy); *Sine loc.,* 12 Jul. 1988, *Camber 1754* (K!); *Sine loc., Parish s.n.* (K!, UGDA-DLSz! – copy).

Notes: This recently described species has the largest flowers in Asiatic representatives of the genus. Distinguishing characer of *Phyllomphax neglecta* is very large lip with prominent, conical-saccate spur. The flowers are supported by large, leafy bracts. Unlike *P. henryi* it has short and wide spur (4-6 × 1.8-4 mm vs 9-11 (12.7) × 3 mm).

Phyllomphax galeandra-group

This group of species can be defined by triangular to triangular-ovate lip, widest at the apex, usually truncate or sometimes with short apiculate apex in the middle.

6.1.1.12. *Phyllomphax iantha* Schltr. (Figs. 36-38)

Repert. Spec. Nov. Regni Veg. Beih. 4: 119, *in obs*. 1919. ≡ *Platanthera iantha* Wight, Icon. Ol. Ind. Orient. 5: t. 1692. 1851; Type: INDIA, *Wight s.n.* (Holotype: K!, Isotype: BM!, UGDA-DLSz! – copy). ≡ *Habenaria iantha* (Wight) Hook. f., Fl. Brit. India 6: 164. 1890. ≡ *Brachycorythis iantha* (Wight) Summerh., Kew Bull. 10(2): 238. 1955.

= *Platanthera affinis* Wight, Icon. Ol. Ind. Orient. 5: t. 1693. 1851; Type: not designated.

Tubers ovoid to ellipsoid. Stem 15-25 cm tall, erect, slender, basally enveloped with bladeless leaves. Cauline leaves 8-12, usually densely arranged along

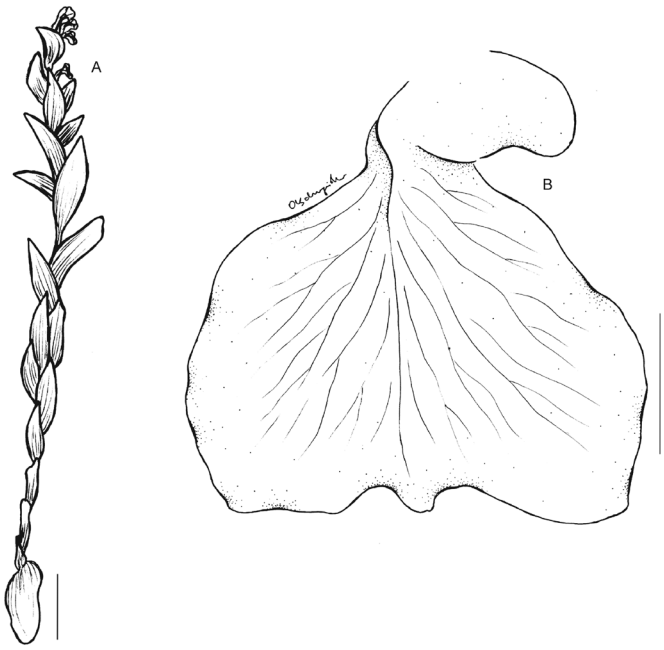

Fig. 36. *Phyllomphax iantha* Schltr.
Explanations: A – habit, B – flower (drawn from *Wight s.n.*, BM – isotype). Scale bar = 3 cm

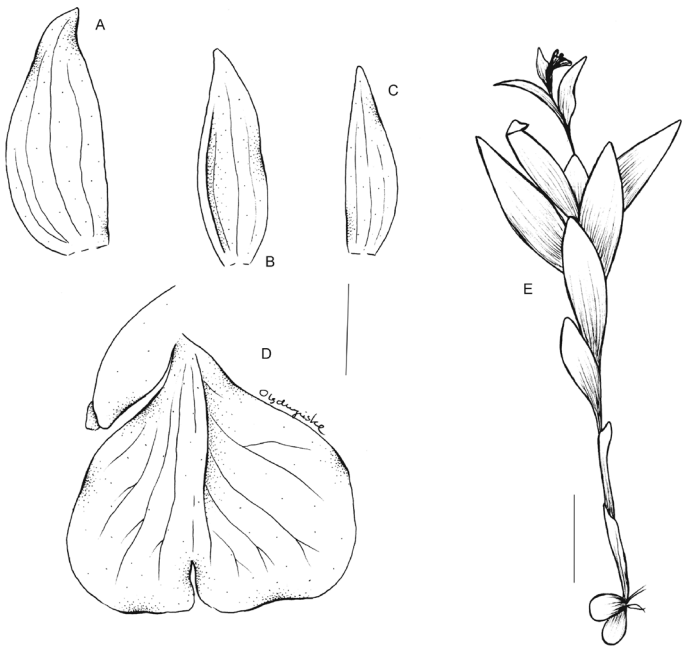

Fig. 37. *Phyllomphax iantha* Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Sebastine 16501,* L). Scale bar = 3 cm

the stem above the lower third, occasionally loosely leaved, up to 3 cm long and 2 cm wide, usually smaller, sessile, elliptic, triangular-ovate to broadly ovate, acute, erect-spreading, gradually decreasing in width up the inflorescence. Inflorescence ca third to half of the plant length, densely many-flowered, occasionally laxly few-flowered. Flowers relatively small, sepals and petals dirty green-purple, often with darker veins, lip pinkish with lighter central part and here with purple lines and dots. Floral bract up to 20 mm long, elliptic-lanceolate to ligulate-lanceolate, acute. Pedicel and ovary ca 10-12 mm long, slender, twisted. Dorsal sepal (5)6.8-7.5 mm long, 2.5-2.7 mm wide, lanceolate-ligulate, subobtuse to acute, 3-veined. Petals 6.5 mm long,

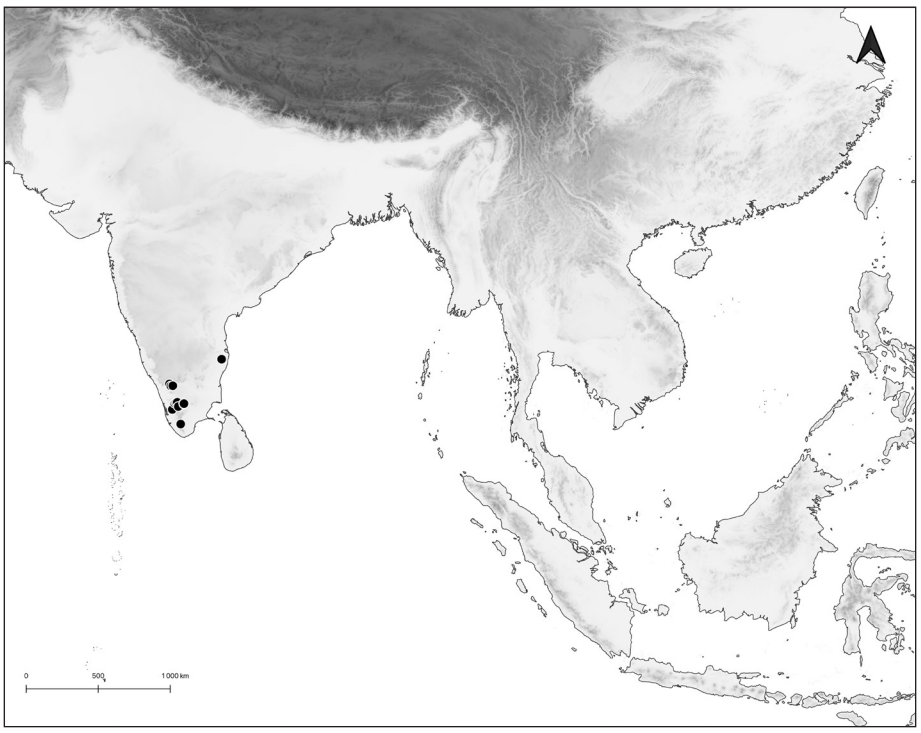

Fig. 38. Distribution map of *Phyllomphax iantha* Schltr.

2 mm wide, narrowly ligulate-lanceolate, subobtuse, obscurely 3-veined. Lateral sepals (6)7.7- 8.5 mm long, 2.5-3.4 mm wide, obliquely triangular-lanceolate, acute, 3-veined. Lip 6.7-10.5 mm long, 8.7-10.5 mm wide, transversely elliptic-triangular in outline, truncate, with more or less prominent triangular, obtuse apex or apically notched, margins more or less erose. Spur ca 3-5 mm long, 2.5-2.9 mm in diameter at the base, conical-saccate, apex bilobed, both lobes blunt. Gynostemium 3 mm long.

Ecology: In grassland, on path by stream. Flowering time: April, June-September, November.

General distribution: India. Alt. 900-2400 m.

Representative specimens: India: Nilgiri Hills, *Wight s.n.* (BM!, K!, UGDA-DLSz! – copy); Lockhert Gap – Devicolam, alt. 1675 m, 15 Jun. 1963, *Sebastine 16501* (L!, UGDA-DLSz! – copy); Ootacamund, alt. 2100 m, Jul. 1883, *Gamble 12871* (K!, UGDA-DLSz! – copy); Naduvatam, path by stream, Aug. 1913, *Bourne 6149* (K!); Pulney Hills, Kodaikanal, alt. 2250 m, Aug., *Anglade 2125* (K!); *Same loc.*, alt. 2160 m, Sep.1913, *Sauliere 109* (K!); *Same loc.*, alt. 2100 m, Jul., *Anglade 972* (K!); *Same loc.*, Bruce's Valley, Jun. 1901, *Bourne 1997* (K!); Ridge behind Sidcot, Jun. 1898, *Bourne 1188* (K!); Bear Shola Hill, Jun. 1897, *Bourne 442* (K!); Anamalai Hills, Jul. 1851, *Wight 3002* (K!); Same loc., in grassland, alt. ca 2400 m, Apr. 1915, *Fischer 3800* (K!); Same loc., alt. 900 m, *Beddome 8071* (BM!); Travancore, Nov. 1907, *Johnson 109* (K!); Courtallam, *Wight 912* (BM!, K!).

Notes: *Phyllomphax iantha* is geographically well separated from other genus representatives and is confined to the southern part of Indian Peninsula. *P. wightii* is known from the same area, but the plants are larger (18-40 cm vs 15-25 cm), with larger leaves (up to 7 × 3 cm vs up to 3 × 2 cm), and larger flowers. Its tepals can be twice larger, measuring 12-16.4 mm (vs (5)6.5-8.5 mm). The lip of *P. wightii* is 17-22 mm long and wide, orbicular in outline and ca 3-4 times longer than spur. In *P. Iantha*, lip is much smaller, 6.7-10.5 × 8.7-10.5 mm, transversely elliptic-triangular in outline, truncate, and ca twice longer than spur.

Platanthera iantha has been described based on plants characterized by densely leafy stem, relatively small leaves, densely arranged inflorescence and relatively wide lip. Most of the other collections we examined were loosely leaved and few-flowered plants.

6.1.1.13. *Phyllomphax obcordata* (Lindl. *ex* Wall.) Schltr. (Figs. 39-43)

Repert. Spec. Nov. Regni Veg. Beih. 4: 119. 1919. ≡ *Platanthera obcordata* Lindl. *ex* Wall., Numer. List: n. 7050. 1832; Type: NEPAL, *Wallich 7050A* (Holotype: K!, Isotypes: BM!, P!, UGDA-DLSz! – copy, drawing) ≡ *Gymnadenia obcordata* (Lindl. *ex* Wall.) Rchb.f.,

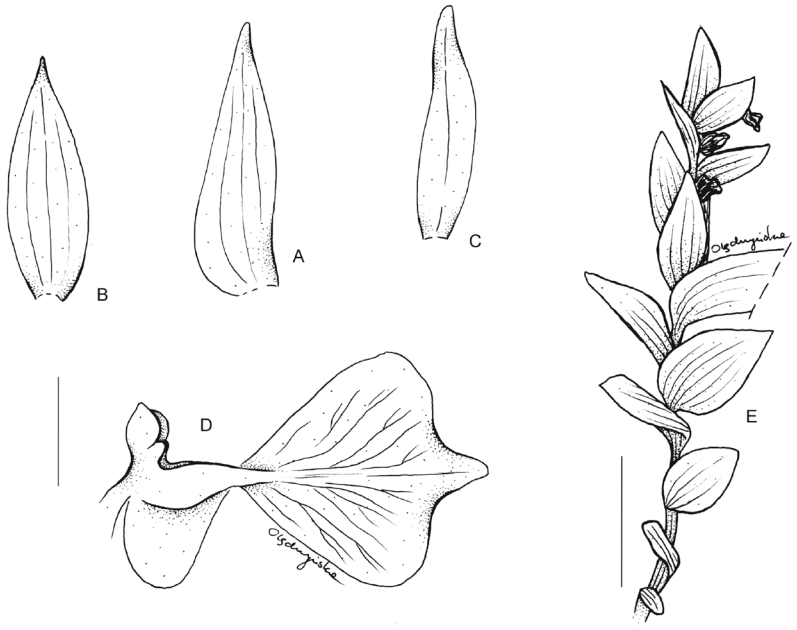

Fig. 39. *Phyllomphax obcordata* (Lindl. ex Wall.) Schltr.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Wallich 7050A,* K – holotype). Scale bar = 3 cm

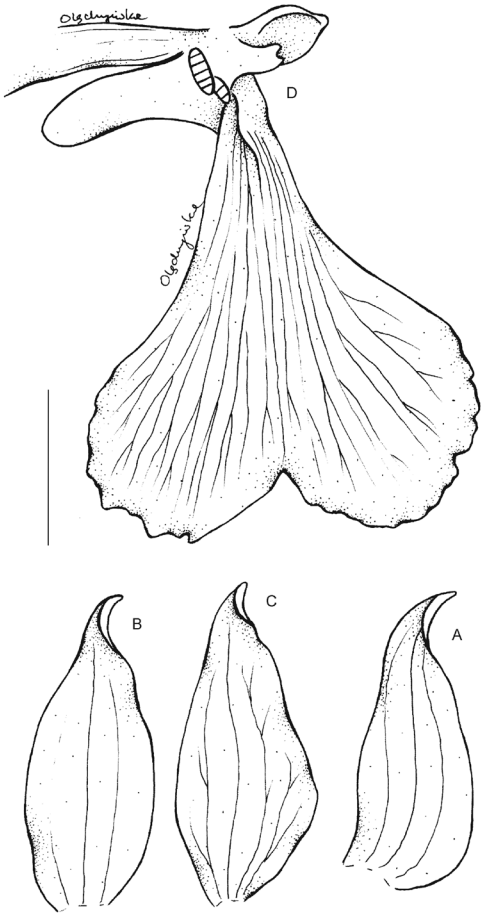

Fig. 40. *Phyllomphax obcordata* (Lindl. ex Wall.) Schltr.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Suzuki & al. 94855061,* AMES!). Scale bar = 3 cm

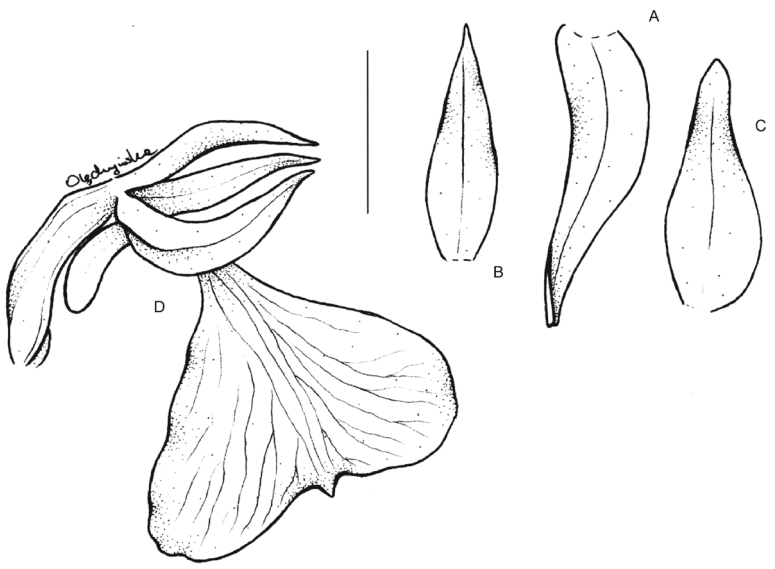

Fig. 41. *Phyllomphax obcordata* (Lindl. ex Wall.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Rechinger 60469*, W). Scale bar = 3 cm

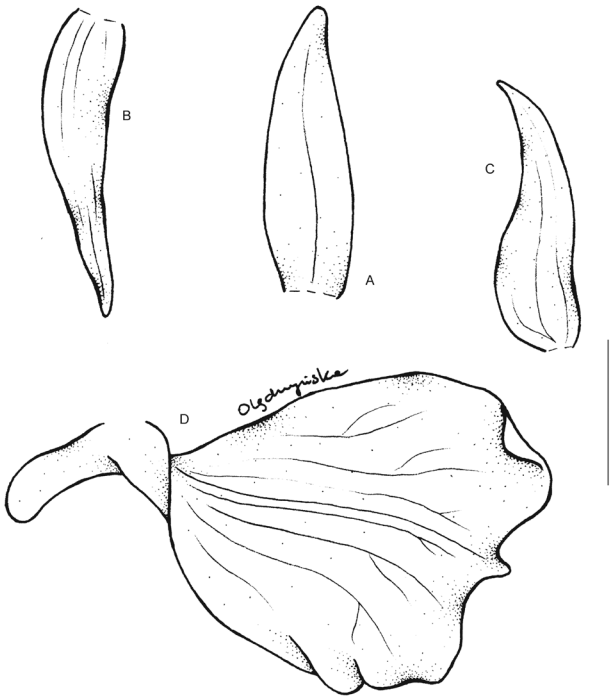

Fig. 42. *Phyllomphax obcordata* (Lindl. ex Wall.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Ludlow & Sherriff 315,* K). Scale bar = 3 cm

Otia Bot. Hamburg.: 32. 1878. ≡ *Habenaria obcordata* (Lindl. *ex* Wall.) Fyson, Fl. Nilgiri & Pulney Hill-Tops 1: 405. 1915. ≡ *Brachycorythis obcordata* (Lindl. *ex* Wall.) Summerh., Kew Bull. 10(2): 243. 1955.

Tubers ca 2 cm long and 1 cm in diameter, ovoid to ellipsoid. Stem 10-30 cm tall, erect, slender, basally enveloped in the bladeless leaves. Cauline leaves 5-10, arranged along the stem above the lower quarter or half, up to 4 cm long and 1.7 cm wide, usually smaller, sessile or occasionally subpetiolate, elliptic, ovate to ovate-elliptic, acute, erect-spreading, gradually decreasing or subsimilar in size up the inflorescence, margins ciliate. Inflorescence in the apical quarter of the plant length, up to ca 7 cm long, laxly to subdensely 5-10-flowered. Flowers small, sepals and petals pink or greenish-purple, lip pink with purple dots or lines near the base. Floral bract up to 25 mm long, similar to cauline leaves, elliptic-lanceolate to ligulate-lanceolate, acute. Pedicel and ovary 6-9 mm long, slender, twisted, ciliate. Dorsal sepal 4.5-7 mm long, 1.5-3.8 mm wide, lanceolate-ovate, lanceolate to ligulate, obtuse, acute to shortly acuminate at the apex, 1- or 3-veined. Petals (4.1)5-6.5 mm long, (0.5)1.2-1.8(2.5) mm wide, narrowly ligulate to ovate-lanceolate, obtuse to subobtuse, subfalcate to somewhat sigmoid, 1- to obscurely 3-veined. Lateral sepals (4.5)6-7.2 mm long, 1.6-3.2 mm wide, obliquely triangular-lanceolate, acute to acuminate, subsigmoid, 2- or 3-veined. Lip 6.3-8.5 mm long, 5-7.3 mm wide, triangular-ovate in outline, truncate or emarginated at the apex, with more or less prominent triangular, acute apex, basal part densely and shortly pubescent, margins more or less erose. Spur ca (1.5)3-4.25(7) mm long, (1)1.5-3 mm in diameter at the base, conical-saccate to cylindrical, apex blunt, with no mamillate projection, without prominent compartments inside. Gynostemium 1.8-2.1 mm long.

Ecology: On open (grassy) hillsides, in grass, on sunny slopes and open bared slopes, in open pasture or meadow, on grasslands with *Pinus* spp., in short herbage and grass and in turf of open place in forest. Flowering time: April, July-September.

General distribution: China, Nepal, Bhutan, India. Alt. 240-3750 m.

Representative specimens: China: *Sine loc., Fortune 1845* (K! – drawing). Nepal: Mulabari, open bared slope, 28°00'23"N, 84°55'18", alt. 1290 m, 18 Jul. 1994, *Suzuki et al. 94855061* (AMES!); E Laminanda Rock Garden, in short herbage and grass and favour, alt. 1500 m, *Sharma & White 601* (K!, UGDA-DLSz! – copy); Baitadi, on open hill side, alt. 1200 m, Jul. 1953, *Tyson 131* (BM!); Dor Chat, alt. 1050 m, Aug. 1935, *Bailey s.n.* (BM!); Between Syabrubensi and Syarpagoan, in grassy ground, alt. 1500-1650 m, Jul. 1949, *Polunin 1317* (BM!); Lekh Kharka, alt. ca 240 m, Apr. 1932, *Benaryil & Shakaya 5744* (K!); Kangra, 1921, *Sohni s.n.* (K!, UGDA-DLSz! – copy); *Sine loc.,* 1821, *Wallich 7050A* (BM!, K!, P!, UGDA-DLSz! – copy, drawing); *Sine loc., Wallich s.n.* (W!, UGDA-DLSz! – copy). Bhutan: Kuru Chu, near Lingtsi, on open hill side, alt. 2250 m, 23 Jul. 1933, *Ludlow & Sherriff 315* (K!, UGDA-DLSz! – copy, drawing); Punakla, alt. 1350 m, Aug. 1914, *Cooper 2411* (BM!); Tembje,

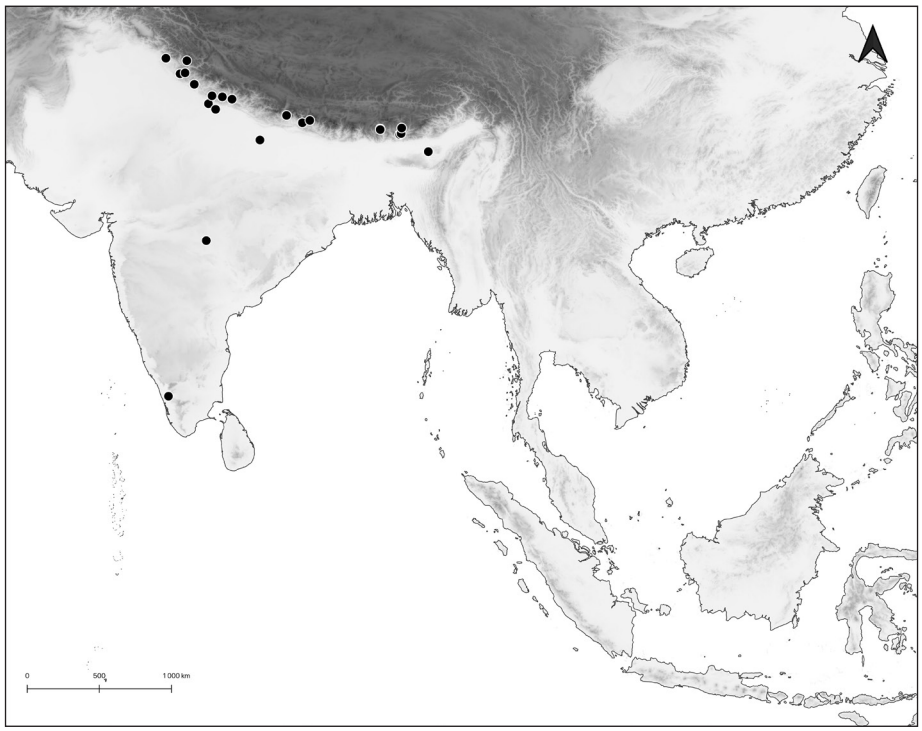

Fig. 43. Distribution map of *Phyllomphax obcordata* (Lindl. *ex* Wall.) Schltr.

Punakka, alt. 2100 m , Aug. 1914, *Cooper 2855* (BM!); Gichho Rinakho, alt. 2100 m, Aug. 1914, *Cooper 3163* (BM!); Valley of Kuru Chu, alt. 1800 m, in turf of open place in forest, Aug. 1915, *Cooper 4374* (BM!); Khoma, on open grassy hillsides, alt. 1350 m, *Ludlow, Sherriff & Hicks 20897* (BM!); *Sine loc., Falconer 1046* (K!, UGDA-DLSz! – copy). India: Kangra, Sahni, between Kalka and Ruen Kor Tal, 1885, *Drummond 26385* (K!, UGDA-DLSz! – copy); Simla, in grass on sunny slopes, alt. 1800 m, Aug. 1886, *Collet 348* (K!, UGDA-DLSz! – copy); Same loc., beyond Elysium, Jul. 1917, *Rich 664* (K!, UGDA-DLSz! – copy); Kunawar, NE of Simla, 1886, *Drummond 22256* (K!); Descent to Manglad Valley, NE of Simla, alt. 1500 m, Aug. 1847*, Thomson 1815* (K!, UGDA-DLSz! – copy); Bunasur, alt. 1680 m, 1844, *Edgeworth 35* (K!, UGDA-DLSz! – copy); Mussoorie, 1869, *King s.n* (BM); *Same loc.*, alt. 1650 m, Aug. 1898, *McKinnon 21755* (BM!, K!, UGDA-DLSz! – copy); Kumaon, 1832, *Wallich 7050B* (BM!, K!, UGDA-DLSz! – copy); Jagesu, alt. 2100 m, *Stachey & Winterbottom 40* (BM!, K!, UGDA-DLSz! – copy); Gari Valley, Aug. 1900, *Inayat 24064* (K!, UGDA-DLSz! – copy); Naini Tal, Shimala, Jul. 1900, *Inayat 8* (K!); Spiti Valley, between Naini Tal and Srinagar, alt. 3750 m, *Benham s.n.* (BM!); Assam, Rupa, Balipara Frontier Post, in open pasture or meadow, alt. 1800 m, Jul. 1938, *Ward 13914* (BM); Central Himalaya region, grasslands with *Pinus* spp., alt. 1800 m, 26 Aug. 1986, *G. & S. Miehe 9777* (K!, UGDA-DLSz! – copy); Uttar Pradesh, Kumaun, Distr. Naini Tal, near Bhim Tal, alt. 1400-1600 m, 21-27 Sep. 1982, *Rechinger 60469* (W!, UGDA-DLSz! – copy, drawing); Narkanda, *Stoliczka s.n.* (W!, UGDA-DLSz! – copy, drawing).

N o t e s : *Phyllomphax obcordata* is similar in size and habit to *P. iantha* and *P. thorellii*. Unlike both mentioned species, its spur is cylindrical, or conical-saccate with blunt apex. Additionally, the spur of *P. thorellii* has conical-cylindrical spur attenuate towards hooked apex, missing in *P. obcordata*. The lip of *P. iantha* is as long as wide, more or less transversely elliptic-triangular in outline (vs lip wider than long, triangular-ovate in outline).

6.1.1.14. *Phyllomphax thorelii* (Gagnep.) Tang & F.T. Wang (Figs. 44-45)

Bull. Fan Mem. Inst. Biol. Bot. 10: 27. 1940. ≡ *Habenaria thorelii* Gagnep., Bull. Soc. Bot. France 78: 74. 1931. ≡ *Brachycorythis thorelii* (Gagnep.) Summerh., Kew Bull. 10(2): 244. 1955; Type: LAOS, *Thorel 2238* (Holotype: P!, Isotype: P!, UGDA-DLSz! – copy, drawing).

Tubers oblongoid. Stem ca 15 cm tall, erect, slender. Cauline leaves 5, arranged along the stem above the lower third, up to 5 cm long and 1.7 cm wide, usually smaller, sessile, elliptic to ovate-elliptic, acute, erect-spreading, gradually decreasing in size up the inflorescence. Inflorescence in the apical quarter of the plant length, laxly 7-flowered. Flowers small. Floral bract up to 30 mm long, similar to cauline leaves, elliptic-lanceolate, acute. Pedicel and ovary slender, twisted. Dorsal sepal and petals unknown. Lateral sepals 7 mm

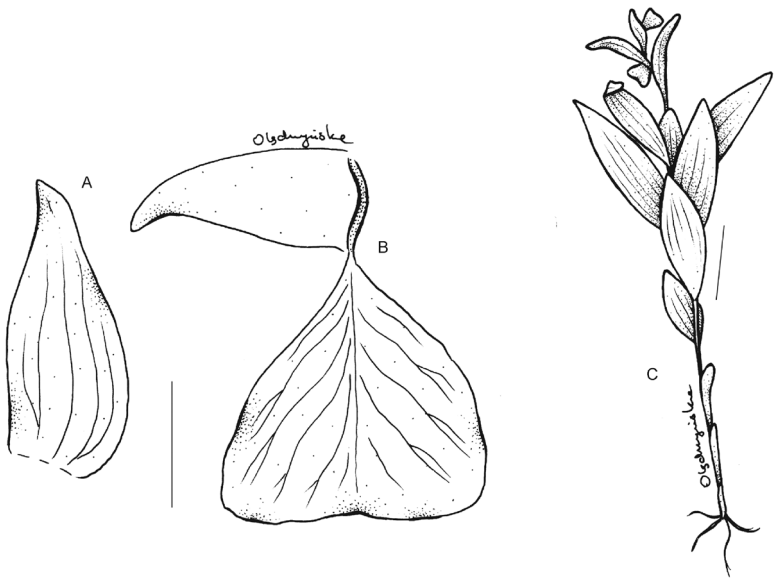

Fig. 44. *Phyllomphax thorelii* (Gagnep.) Tang & F.T. Wang
Explanations: A – lateral sepal, B – lip, C – habit (drawn from *Thorel 2238,* P – holotype). Scale bar = 3 cm

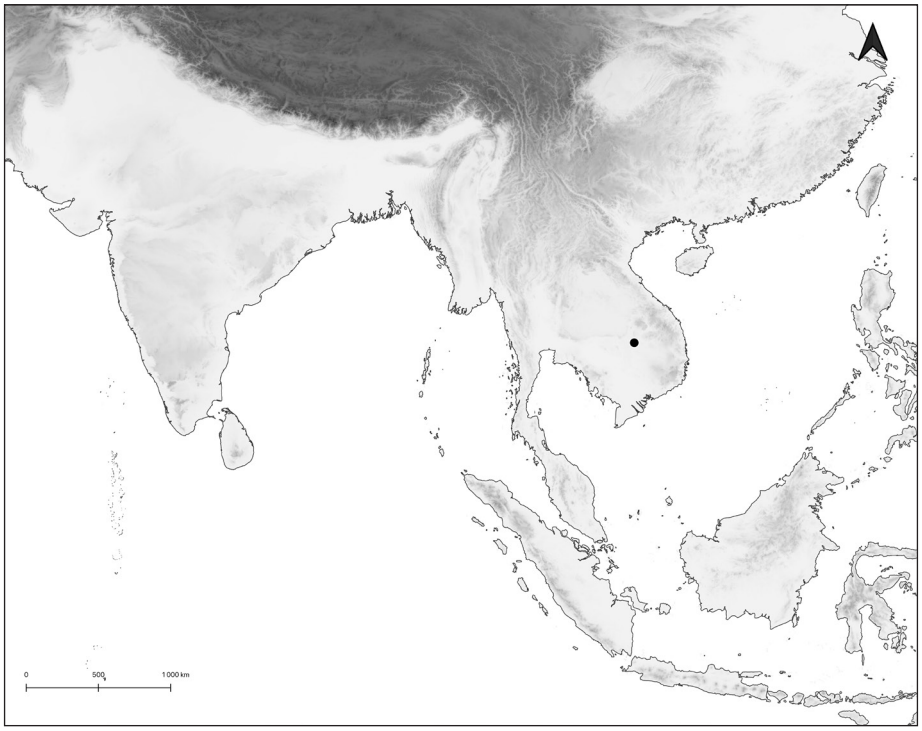

Fig. 45. Distribution map of *Phyllomphax thorelii* (Gagnep.) Tang & F.T. Wang.

long, 3 mm wide, obliquely ovate-lanceolate, acute, 3-veined. Lip 7 mm long, 6 mm wide, triangular-ovate in outline, truncate at the apex, margins more or less erose. Spur ca 5 mm long, 2.5 mm in diameter at the base, narrowly conical, apex elongate, digitate, subobtuse, somewhat hooked, divided into two, shallow compartments. Gynostemium 3 mm long.
Ecology: No data.
General distribution: Laos. Alt.: not given.
Representative specimens: Laos: Khon, Bassac, 1866-1868, *Thorell 2238* (P!, UGDA-DLSz! – copy, drawing).

Notes: This species is similar to *Phyllomphax obcordata* in the lip form, but has longer, narrower, conical spur with prominent digitate apex, divided inside into two compartments. It differs from *P. galeandra* by having glabrous stem and ovary.

6.1.1.15. *Phyllomphax galeandra* (Rchb. f.) Schltr. (Figs. 46-51)

Repert. Spec. Nov. Regni Veg. 16: 286. 1919. ≡ *Platanthera galeandra* Rchb.f., Linnaea 25: 226. 1852. ≡ *Habenaria galeandra* (Rchb.f.) Benth., Fl. Hongk.: 363.

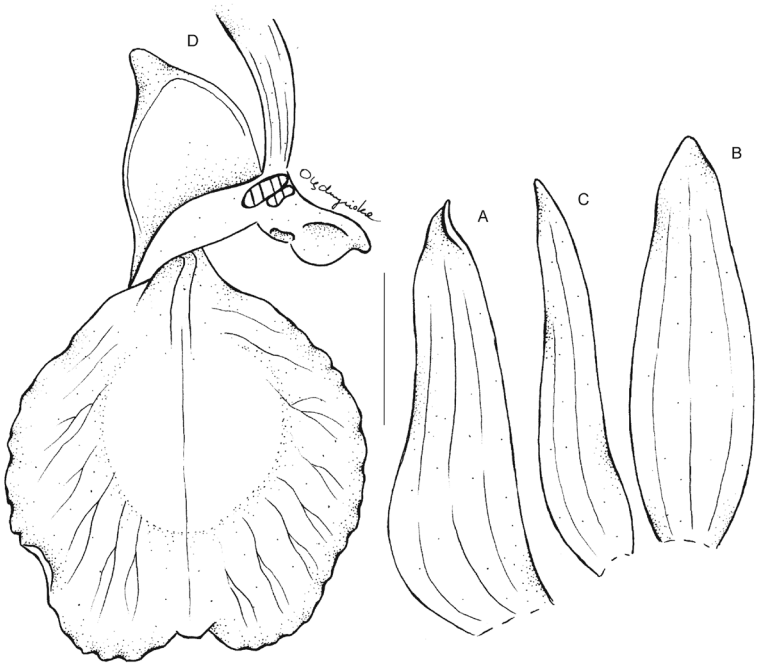

Fig. 46. *Phyllomphax galeandra* (Rchb. f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Kingdon-Ward 17726,* AMES). Scale bar = 3 cm

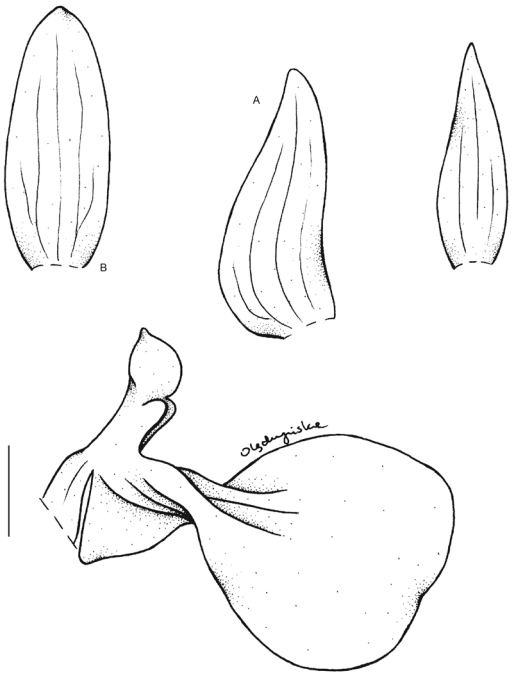

Fig. 47. *Phyllomphax galeandra* (Rchb. f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Fortune 78*, W – holotype). Scale bar = 3 cm

1861. ≡ *Gymnadenia galeandra* (Rchb.f.) Rchb.f., Otia Bot. Hamburg.: 33. 1878. ≡ *Brachycorythis galeandra* (Rchb.f.) Summerh., Kew Bull. 10(2): 241 (1955). TYPE: CHINA, *Fortune 78* (HOLOTYPE: W!, ISOTYPES: K!, BM!, P!, UGDA-DLSz! – copy, drawing).

Tubers ovoid to ellipsoid. Stem up to 25 cm tall, erect, slender, densely papillate or ciliate in the upper part, basally enveloped in bladeless leaves. Cauline

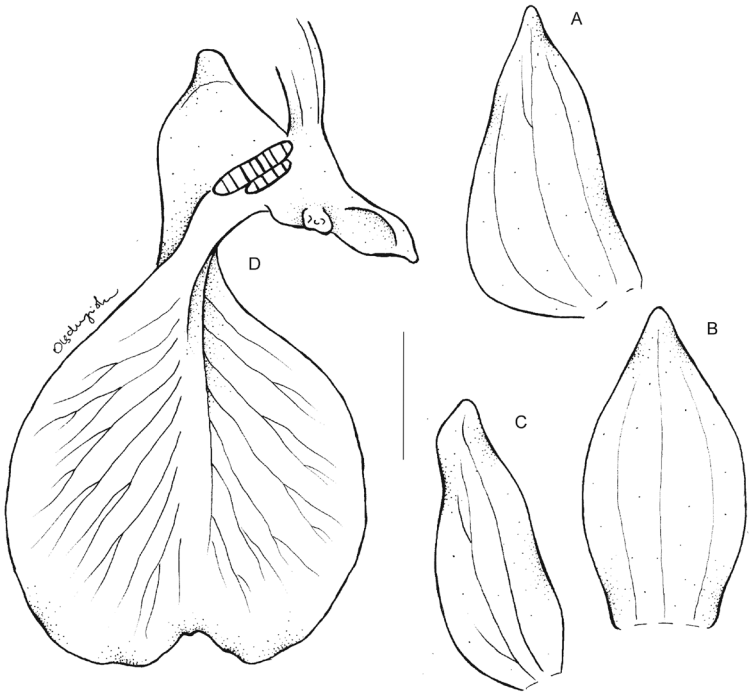

Fig. 48. *Phyllomphax galeandra* (Rchb. f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Wang 40872,* AMES). Scale bar = 3 cm

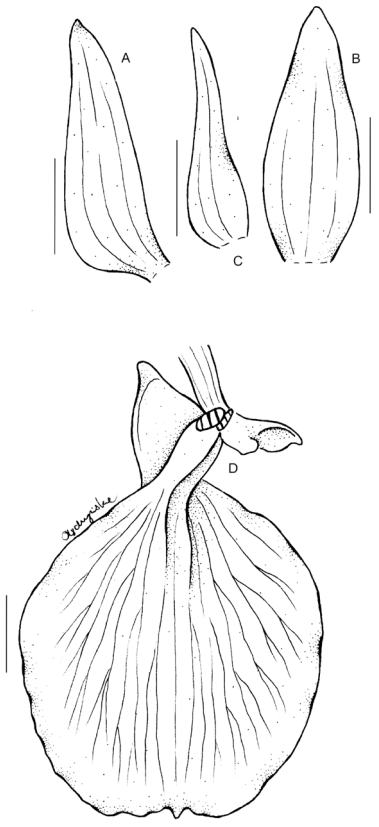

Fig. 49. *Phyllomphax galeandra* (Rchb. f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Belcher CC948*, AMES). Scale bar = 3 cm

Fig. 50. *Phyllomphax galeandra* (Rchb. f.) Schltr.
Explanations: habit (drawn from *Mann 1/80,* W). Scale bar = 3 cm

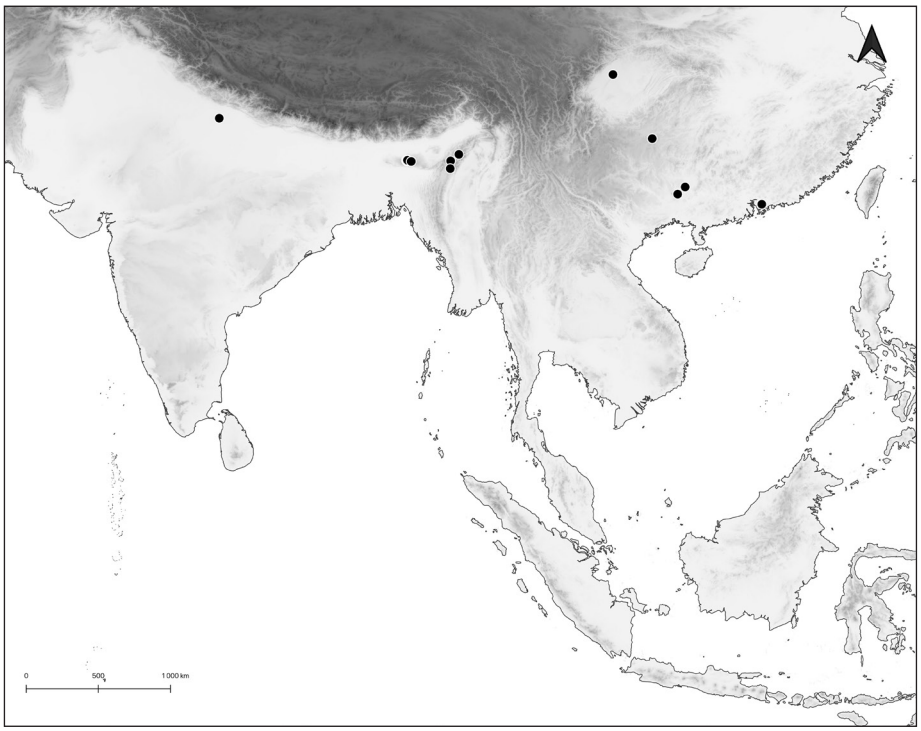

Fig. 51. Distribution map of *Phyllomphax galeandra* (Rchb. f.) Schltr.

leaves 4-10, arranged along the stem above the lower quarter, up to 6 cm long and 3 cm wide, usually smaller, sessile, ovate, elliptic to ovate-lanceolate, acute, erect-spreading, gradually decreasing in size up the inflorescence, ciliate along margins. Inflorescence in the apical half or third of the plant length, 6-8 cm long, laxly 2-7-flowered. Flowers rather small, sepals and petals white, green to magenta, sometimes with darker dots, lip white to pink with red or purple longitudinal lines and spots. Floral bract up to 35 mm long, similar to cauline leaves, elliptic-lanceolate to ligulate-lanceolate, acute. Pedicel and ovary 6-13(15) mm long, slender, twisted, papillate. Dorsal sepal 4.5-10 mm long, 1.5-3.5(4) mm wide, ovate, lanceolate to ligulate, obtuse, acute to shortly acuminate at the apex, 1- or 3-veined. Petals 4-7.5 mm long, 1.3-2.5 mm wide, obliquely linear-lanceolate or ovate in the lower half, narrowly ligulate in the apical part, or obliquely ovate-triangular, obtuse, 1- or 2-veined. Lateral sepals 5.2-9 mm long, 1.5-4 mm wide, obliquely lanceolate to ligulate, acute, 1- or 3-veined. Lip 7-13.5 mm long, 6.5-12.5 mm wide, triangular or ovate-orbicular in outline, truncate to emarginate at the apex, cuspidate or not, with a pair of keels in the basal part, margins erose-crenate, the central part more or less thickened. Spur 2.8-7 mm long, up to 4 mm in diameter at the base, conical, apex shallowly bilobed, each lobe mamillate, with prominent diaphragma inside dividing it into two chambers, glandular on the inner surface. Gynostemium 2-5 mm long.

Ecology: In open grassland, in grassy pastures, on grassy hill slopes, on mountains. Flowering time: January, June-August.

General distribution: China, India, Myanmar (Burma). Alt. 150-1800 m.

Representative specimens: China: Hongkong, 1845, *Fortune 78* (BM!, K!, P!, W!, UGDA-DLSz! – copy, drawing); Prov. Guizhou, alt. 900 m, 15 Jul. 1917, *Handel-Mazzetti 10790* (W!, UGDA-DLSz! – copy, drawing); Same loc., *He Ye s.n.* (MO!, UGDA-DLSz! – copy, drawing); Tze Poo, 90 mi N of Luchen, in open grassland, alt. ca 370 m, *Ching 5654* (W!, UGDA-DLSz! – copy); Kwangsi, Tze Poo, N of Luchen, alt. 365 m, 4 Jun. 1928, *Ching 658* (W!); Kwangsi, 17 Jan. 1939, *Wang 40872* (AMES!, UGDA-DLSz – copy, drawing). Bankingsin, on mountains, *Henry 850* (K!). India: Assam, Khasi Hills, alt. 900-1800 m, *Hooker & Thomson 249* (K!); Same loc., *Mann 12* (W!); Same loc., alt. ca 1500 m, *Hooker & Thomson s.n.* (W!, UGDA-DLSz! – copy, drawing); Same loc., alt. ca 1500 m, *Mann 1/80* (W!, UGDA-DLSz! – copy, drawing); Myrung, Jul. 1850, *Hooker & Thomson s.n.* (BM!, K!); Churra, Jun. 1850, *Hooker & Thomson 1013* (K!); Naga Hills, Kohima, Jul. 1886, *Prain 13* (K!); Khizobama, alt. 1500-1800 m, Jul. 1935, *Bor 5100* (K!); Shillong, alt. 1350 m, Jul. 1886, *Clarke 44281* (BM!), Same loc., alt. 1500 m, Jul. 1885, *Clarke 38345A* (BM!); Ukhrul, in grassy pastures, alt. 150 m, 24 Jun. 1948, *Kingdon-Ward 17726* (AMES! UGDA-DLSz – copy,

drawing). Myanmar (Burma): Kachin Hills, Aug. 1899, *Mokim 02* (W!); Vicinity of Myitkyina, 6 miles N, on E bank, 11 Jul. 1945, *Belcher CC948* (AMES!, UGDA-DLSz – copy, drawing). *Sine loc., Sine col.* (W! 10328).
Notes: This small-flowered species is fairly often found in collections and is often confused with *Phyllomphax obcordata*, but has spur very characteristic for this genus. Unlike this species the spur of *P. obcordata* is conical-saccate to cylindrical, with blunt apex, with no mamillate projection, and without prominent compartments inside.

6.1.1.16. *Phyllomphax menglianensis* (Y.Y. Qian) Olędrz. & Szlach., *comb. nov.* (Fig. 52)

Basionym: *Brachycorythis menglianensis* Y.Y. Qian, Acta Phytotax. Sin. 39(3): 278. 2001; Type: CHINA, *Y.-Y. Qian 2902* (Holotype: PE, Isotypes: HTBC, IBSC, SMAO). – Wu Zheng-Yi *et al.* Fl. China 25: 101. 2009.

Tubers 2-3 cm long, up to ca 1.5 cm in diameter, ellipsoid. Stem 14-25 cm tall, erect, rather slender, densely pubescent. Cauline leaves 4-7, spaced along the stem above the lower third, sessile, 1.2-4.5 cm long, 1-2.8 cm wide, ovate, acute to obtuse, gradually decreasing in size up the apex of inflorescence. Inflorescence ca third of the entire plant length, up to 8 cm long, laxly 4-7-flowered. Flowers relatively large, white marked with red-purple. Floral bract up to 30 mm long, similar to cauline leaves, ovate, acute, slightly pubescent abaxially and along margins. Pedicel and ovary up to 10 mm long, slender, twisted, slightly pubescent along ridges. Dorsal sepal 12-13 mm long, 4-4.5 mm wide, oblong elliptic to ligulate, obtuse at the apex, 5-veined. Petals 12-14 mm long, 2.4-2.6 mm wide, obliquely linear-lanceolate to narrowly ligulate, obtuse, 3-veined. Lateral sepals 12-13 mm long, 5-6 mm wide, subfalcate, oblong-elliptic to ligulate, acute to obtuse, 5-veined. Lip 18-20 mm long, 20-23 mm wide, more or less pentagonal, broadly elliptic, apex emarginate, shallowly bilobed, densely papillate adaxially. Spur 10-12 mm long, c56a 3.5 mm in diameter at the base, the basal part cylindrical-conical, the apex slender, finger-like, hooked, shallowly bilobed at the apex. Gynostemium 4 mm long.
Ecology: In grassland, under the open monsoon, in evergreen broad leaved forest. Flowering time: June-July.
General distribution: China. Alt. ca 1600 m.
Representative specimens: China: Yunnan, Menglian, in grassland, alt. 1600 m, 3 Jul. 1993, *Y.-Y. Qian* (HTBC, IBSC, PE, SMAO); Same loc., Mengma Town, under the open monsoon evergreen broad leaved forest, alt. 1560 m, 20 Jun. 2015, *Qiang Liu 203* (HITBC – photo seen).
Notes: *Phyllomphax menglianensis* appears to be similar to *P. galeandra* and can be treated as its larger flowered variant. It has slightly pubescent ovary along ridges (vs papillate ovary), and more or less pentagonal, broadly elliptic lip with emarginate, shallowly bilobed apex (vs lip triangular or ovate-orbicular in outline, truncate to emarginate at the apex). Taxonomic status of *P. menglianensis* requires further study.

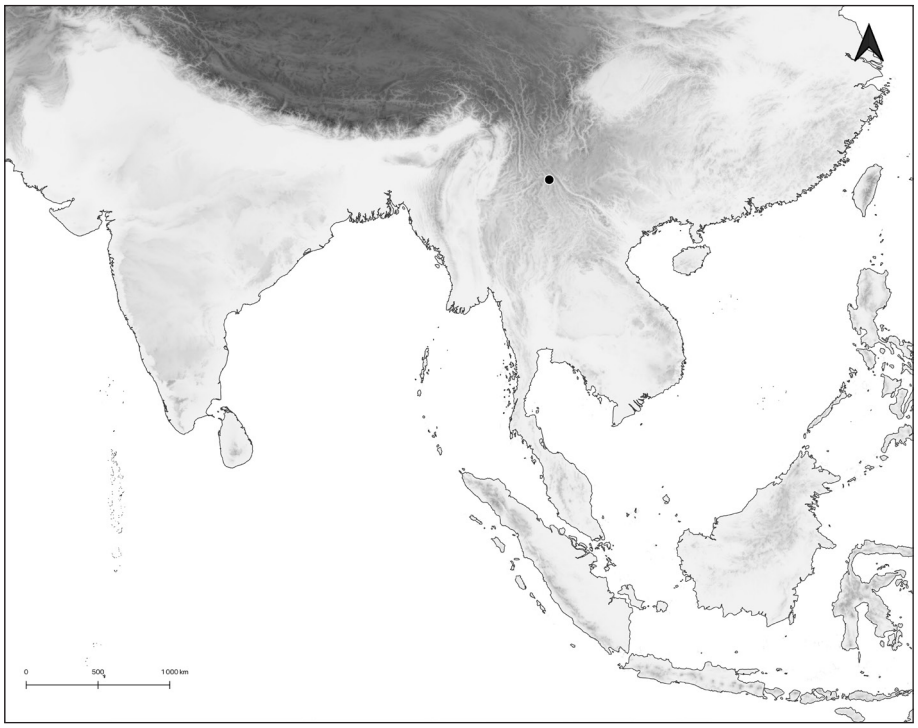

Fig. 52. Distribution map of *Phyllomphax menglianensis* (Y.Y. Qian) Olędrz. & Szlach.

Phyllomphax macrantha-group

This group can be characterized by deeply bilobed lip apex.

6.1.1.17. *Phyllomphax macrantha* (Lindl.) Summerh. (Figs. 53-55)

Bull. Misc. Inform. Kew 1938: 143. 1938. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 19. 2007. – Szlachetko, Orchid. Ivory Coast: 37. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 94. 2010. ≡ *Gymnadenia macrantha* Lindl., Gen. Sp. Orchid. Pl.: 279. 1835; Type (Szlachetko 2007: 19): SIERRA LEONE, *Turner s.n.* (Lectotype: K!). ≡ *Brachycorythis macrantha* (Lindl.) Summerh., Kew Bull. 9: 236. 1955. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 64. 1998. – Perez-Vera, Orchid. Côte d'Ivoire: 111. 2003. – Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid. 36(1): 18. 2004.

= *Eulophia helleborina* Hook.f., Bot. Mag.: tab. 5875. 1870; Type (Szlachetko *et al.* 2010: 94): SIERRA LEONE, *Bockstatt s.n.* (Lectotype: K!). ≡ *Habenaria helleborina* (Hook.f.) Nichols, Dict. Gard. 2: 107. 1885. ≡ *Platanthera helleborina* (Hook.f.) Rolfe, Fl. Trop. Afr. 7: 204. 1898. ≡ *Phyllomphax helleborina* (Hook.f.) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 4: 119. 1919.

Tubers few, 1.7-3.5 cm long, 0.7-1.5 cm in diameter, globose, oblong-ovoid to ellipsoid. Stem 20-65 cm tall, erect, rather slender, glabrous. Cauline leaves 6-8, arranged along the stem, sessile, 5-11 cm long, 2-4 cm wide, elliptic-lanceolate, broadly lanceolate to lanceolate, acute, spreading, gradually decreasing in size up the stem. Inflorescence 6.5-16 cm long, laxly 6-15-flowered. Flowers relatively large, glabrous, Sepals and petals greenish brown to purple, lip magenta or pinkish with white, purple spotted centre. Floral bract up to 38 mm long, leafy, broadly elliptic-ovate, acute to acuminate. Pedicel and ovary up to 17 mm long, slender, twisted. Dorsal sepal (7)9-13.3(15) mm long, 2.5-5 mm wide, oblong ovate-lanceolate, cucullate at the apex, obtuse, 3-veined. Petals 6-12 mm long, 1.8-4 mm wide, falcate, obliquely ovate in the lower part, ligulate-lanceolate above, subobtuse, 3-veined. Lateral sepals similar in size to petals, (8.5)9-13.2 mm long and 2.5-4.2(5.3) mm wide, sigmoid, oblong-lanceolate to ligulate, subacute to subobtuse, with revolute margins, 3-veined. Lip 15-24 mm long, 13-27 mm wide, broadly ovate, oblong-ovate to transversely elliptic, usually deeply split (up to 4 mm) at the apex, serrate or erose along margins, with a pair of prominent keels at the spur entrance. Spur 7-15 mm long, 3.5-5.5 mm in diameter at the base, the basal half swollen, cylindrical-saccate, the apical half slender, finger-like, hooked, with longitudinal membrane inside splitting

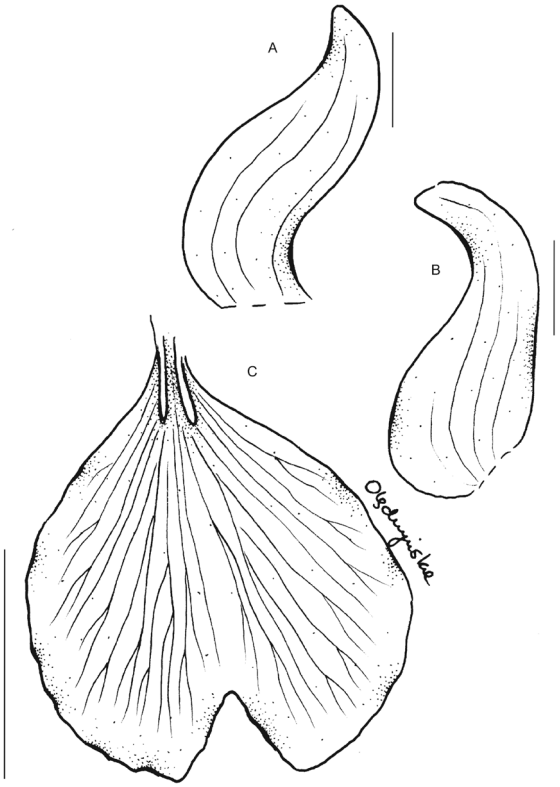

Fig. 53. *Phyllomphax macrantha* (Lindl.) Summerh.

Explanations: A – lateral sepal, B –petal, C – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

Fig. 54. *Phyllomphax macrantha* (Lindl.) Summerh.

Explanations: habit (drawn from *Thomas 2046*, K). Scale bar = 3 cm

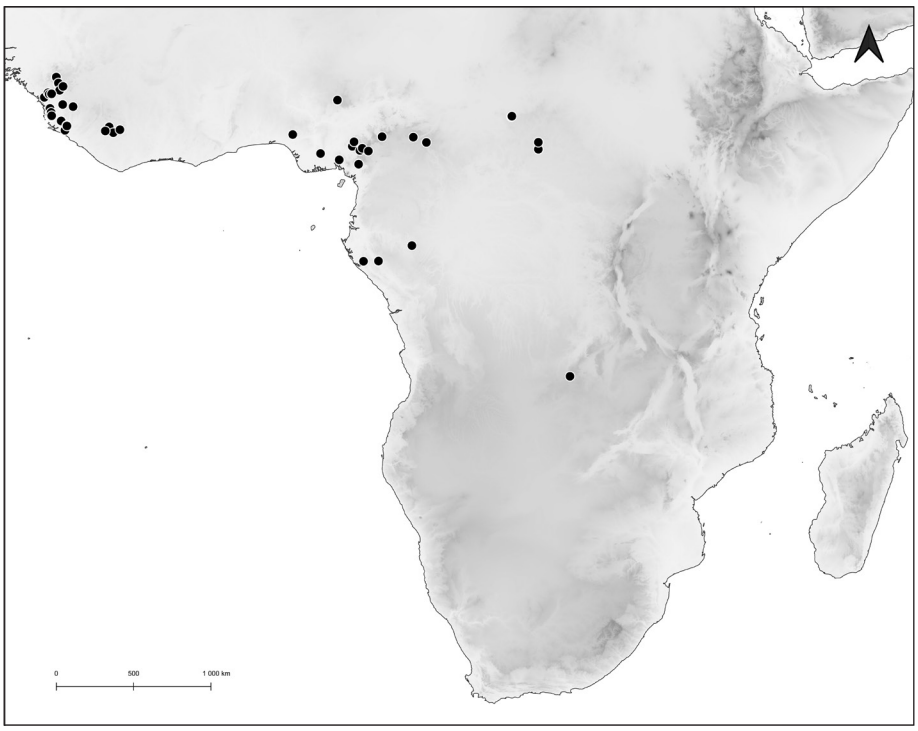

Fig. 55. Distribution map of *Phyllomphax macrantha* (Lindl.) Summerh.

the spur in two chambers. Gynostemium 4-5.5 mm long.

Ecology: On slopes and hillsides, in forests and at margin of fringing forest, in damp undergrowth, in edge of bush paths under *Mango* trees, in flat waterlogged lands by river, on gravelly soil, in shaded places. Flowering time: all year.

General distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Nigeria, Cameroon, Central African Republic, Gabon, Democratic Republic of the Congo (Zaire). Alt. 240-1600 m.

Representative specimens: Guinea: Timbo, Koumi River, Aug. 1907, *Pob*éguin *1671* (P!); Koumi River, Aug. 1907, *Pobèguin s.n.* (P!); Kouyeya, in damp undergrowth, Jul. 1898, *Maclaud* 274 (P!); Boiral de Mamou, Oct. 1898, *Maclaud 226* (P!); Fouta-Djalon, Ditinn, Sept. 1907, *Chevalier 18529* (P!, UGDA-DLSz! – copy, drawing); *Same loc.*, near the Ditinn waterfall, 19 Sept.1907, *Chevalier 18533* (P!); *Same loc.*, near Labé, 27 Jul. 1962, *Adames 303* (P!); Nimba Mts., in forests on slopes, Sept.1942, *Schnell 1857* (K!); 1 km of Kindia, alt. 1200 m, 6 Sept. 1968, *Kent 8* (K!); Envir. De Kindia*, Jacques-Felix s.n.* (P!); Kouria-Logwery road, 10 Aug. 1905, *Caille 14652* (P!, UGDA-DLSz! – copy, drawing); *Sine loc., Brun 1293* (P!, UGDA-DLSz! – copy, drawing). Sierra Leone: Foya (Kori), edge of bush path, Aug. 1953, *Deighton 5945* (K!); Baiima (Tankoro) in flat waterlogged land by river, Jul. 1949, *Deighton 5118* (K!); Baiima (Gbo), in forest, Aug. 1954, *Deighton 6105* (K!); Sugarloaf Mt., in shady places, Dec. 1891, *Scott Elliot 4061* (K!); junction of Port Loko and Kambia, roads, under Mango trees, Sept. 1951, *Adames 244* (K!); Freetown, Jamadu, York Pass, *Burbidge* 147 (K!, UGDA-DLSz! – copy, drawing); Above Freetown, on hillside, Sept.1941, *Milne-Redhead 5174* (K!); Kanike, alt. 240 m, Sept. 1914, *Thomas 2046* (K!, UGDA-DLSz! – copy, drawing); Jigaya, alt. 330 m, Sept. 1914, *Thomas 2738* (K!); Bagwema, Bafi River, Jul.-Aug.1923, *Dawe 547* (K!); Regent Road, alt. 270 m, Aug.1937, *Pelly 156* (K!, UGDA-DLSz! – copy, drawing); Mahinti (Tonko Limba), beside bush path in shade on gravelly soil, Sept. 1949, *Adames 195* (K!); Pujehun (Valunia), in forest, Jul. 1952, *Deighton 5795* (K!); Banana Islands, top of Prospect Hill, Oct. 1914, *Bunting 87* (BM!); Colony, 1958, *Melville & Hooker 9* (K!). Bathurst Village, Peninsula, 1967, *Morton & Jarr. SL 2173* (K!, GC, SL, WAG, FHI, IFAN for FHO); Piedmont E Loma, alt. 500 m , 9 Jul. 1964, *Jaeger 6759* (P!, UGDA-DLSz! – copy, drawing); *Sine loc., Turner s.n.* (K!). Liberia: Central Prov., near Sanokwele, Sept. 1947, *Baldwin 9536* (K!). Ivory Coast: Mont Tonkoui, Sept. 1955, *Nozaran s.n.* (P!, UGDA-DLSz! – copy, drawing); Near Danané, 10 Aug. 1975, *Perez-Vera 824* (K!, P!, UGDA-DLSz! – copy, drawing); *Sine loc., Scaetta 3285* (P!, UGDA-DLSz! – copy, drawing). Nigeria: Zaria Prov., Anara Forest Reserve, Rafin Makara, at margin of fringing forest, in shade, Jul. 1950, *Keay FHI 25960* (K!); Ondo Prov., Idanre Hills, in forest, in shade, Jul. 1950, *Hoskyn-Abrahall FHI 36068* (K!); Calabar Prov., Oban, 1911, *Talbot 869* (BM!); Kagoro, Jul. 1929, *Sharland*

570 (K!, UGDA-DLSz! – copy, drawing); Central Station, behind the Chemistry Lab., Nov. 1953, *Brunn 213* (K!, UGDA-DLSz! – copy, drawing); *Sine loc.,* 8 Aug. 1962, *Gillet 15312* (B!). Cameroon: Between Ngaoundere and Meiganga. Jun. 1939, *Jacques-Felix 4215* (K!, P!, UGDA-DLSz!); E side base N'lonako Mt., between Enyunguengue Ngalmoa and Quartier Ekanmbeng, 10 km SE of Nkongsamba, 4°54'N, 9°59'E, alt. 1100 m. 16 Sept. 1971, *Leeuwenberg 8386* (K!, WAG!, UGDA-DLSz! – copy); Gamti, 25 km NNW Banyo, 16 Jun. 1967, *Letouzey 8637* (P!, UGDA-DLSz! – copy, drawing); Mbam Menkoum Massif, alt. 1295 m, 20 km NW Yaounde.,18 Aug. 1972, *Letouzey 11640* (K!, P!, UGDA-DLSz! – copy, drawing); Road Baji-Tumbo, between Baji and riv. Chongbonbon, 55 km NNW Wum, *Letouzey 14025* (P!); Road Akwaya-Mamfe, Tinta-Atolo (Boka) route, 15 km S Akwaya, alt. 800 m, 26 Jul. 1975, *Letouzey 14102* (K!, P!, UGDA-DLSz! – copy, drawing); Bambui near Bamenda, alt. 1600 m. 20 May 1963, *Brunt 1136* (K!); Fonfaka near Bamenda, alt. 1000 m, Jun. 1931, *Maitland 1639* (B!, K!, UGDA-DLSz! – copy, drawing); Road Nabemo-Ngaouni, bridge on Ngou vicinity, 75 km NE Meiganga. 7 Jul. 1986, *Satabie 830* (P!). South, grassland, 13 Sept. 1958, *Rendin-Jagher 43* (K!). Central African Republic: Manovo-Gounda-St. Floris Natl. Park, 2 km S of the Pende-Koumbala confluence on W side of the Koumbala river, 8°24'N, 21°16'E, 14 Jul. 1985, *Fay 7290* (K!, MO); Near the above loc., 8°26'N, 21°18'E, 590 m, 23 Jul. 1985, *Fay 7321* (K!, MO!, P!); Upper Oubangui, Yalinga region, Yalinga. 18 & 19 Jul. 1922, *Le Testu 4008* (BM!, P!, UGDA-DLSz! – copy, drawing); Doudo, 31 Mar. 1926, *Le Testu 5880* (BM!, BR!, P!, UGDA-DLSz! – copy, drawing); Ile de la Louetsye, près Makouti. 5 Apr. 1927, *Le Testu 6471* (BM!, UGDA-DLSz! – copy); Buar, 6°N, 15°35'E, alt. 1000 m, May 1914, *Mildbraed 9472* (BM!, K!). Gabon: Leyala, 27 Apr. 1931, *Le Testu 8777* (BM!, K!, P!); Doudou Mts., on W flanc, 2°15'S, 10°20'E, 7 Dec. 1984, *Arends, Louis & De Wilde 689* (WAG!, LBV); Bongolo, beneath Protestant Mission on steep bank of the Louetsi River, 2°14'S, 11°27'E, 7 Feb. 1991, *De Wilde & Sosef 10409* (WAG!, LBV); Upper Ngounye, Doudou, 31 Dec. 1926, *Le Testu 5880* (BM!, BR!, K!, P!). Democratic Republic of the Congo (Zaire): Lufupa waterfalls in muso-hantan about 53 km SW of Kolwezi, on the ground in the forest gallery bordering the Lufupa river, 25 Dec. 1982, *Schaijes 1699* (BR!).

N o t e s : This common, African genus representative is easily separated from all other species by relatively large lip deeply split apically into two lobes combined with long spur, which is swollen in the basal half, with finger-like, slender, hooked apical half.

6.1.1.18. *Phyllomphax tanganyikense* (Summerh.) Szlach. (Figs. 56-57)

Richardiana 6(2): 78. 2006. ≡ *Brachycorythis tanganyikensis* Summerh., Kew Bull. 16: 257. 1962; Type: TANZANIA, *Drummond & Hemsley 1871* (Holotype: K!, Isolectotypes: AMES!, UGDA-DLSz! – copy, drawing). – Summerhayes, FTEA, Orchid. 1: 24. 1968.

Tubers 1-3, 1-3 cm long, 0.5-1.2 cm in diameter, ovoid to ellipsoid. Stem 12-26 cm tall, erect, slender, glabrous, enveloped in the basal half in bladeless leaves. Cauline leaves (2)3-7, arranged along the stem in the upper half, petiolate; petiole up to 2 cm long, canaliculated; blade up to 9 cm long and 3.5 cm wide, ovate to ovate-lanceolate, acute, erect-spreading, usually the middle one the largest, gradually decreasing in size up the inflorescence. Inflorescence in the apical quarter or third of the plant length, ca 3-7 cm long, laxly 2-7-flowered. Flowers small, green, spur white, lip white with purple markings. Floral bract up to 40 mm long, similar to cauline leaves, elliptic-lanceolate to ligulate-lanceolate, acute. Pedicel and ovary 6-8 mm long, slender, twisted, glabrous. Dorsal sepal 4.5-5.5 mm long and 2.5-5.5 mm wide, elliptic-suborbicular, acute to shortly acuminate at the apex, cochleate, 5-veined. Petals 3-4 mm long, 1.5-1.9 mm wide, obliquely elliptic-ovate, shortly acuminate, 1- or 2-veined. Lateral sepals 5-6 mm long, 1.9-3 mm wide, obliquely lanceolate, acute, recurved, 1- or 3-veined. Lip 6-12 mm long, 5-6.7 mm wide, triangular-ovate in general outline, deeply and very unequally 3-lobed; middle lobe 1 mm long, shortly ligulate, obtuse; lateral lobes much larger, ca 3 mm long, semilunate, attenuate toward the apex, obtuse.

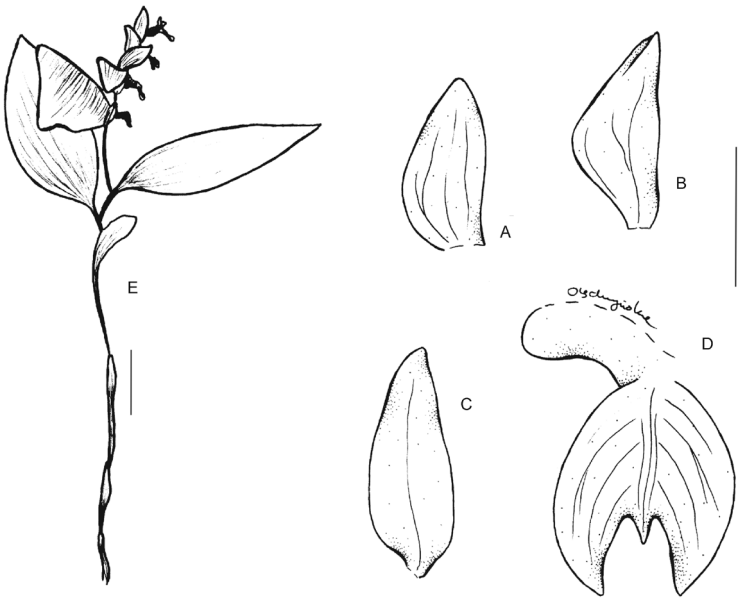

Fig. 56. *Phyllomphax tanganyikense* (Summerh.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Lovett & Congdon 3060,* K – holotype). Scale bar = 3 cm

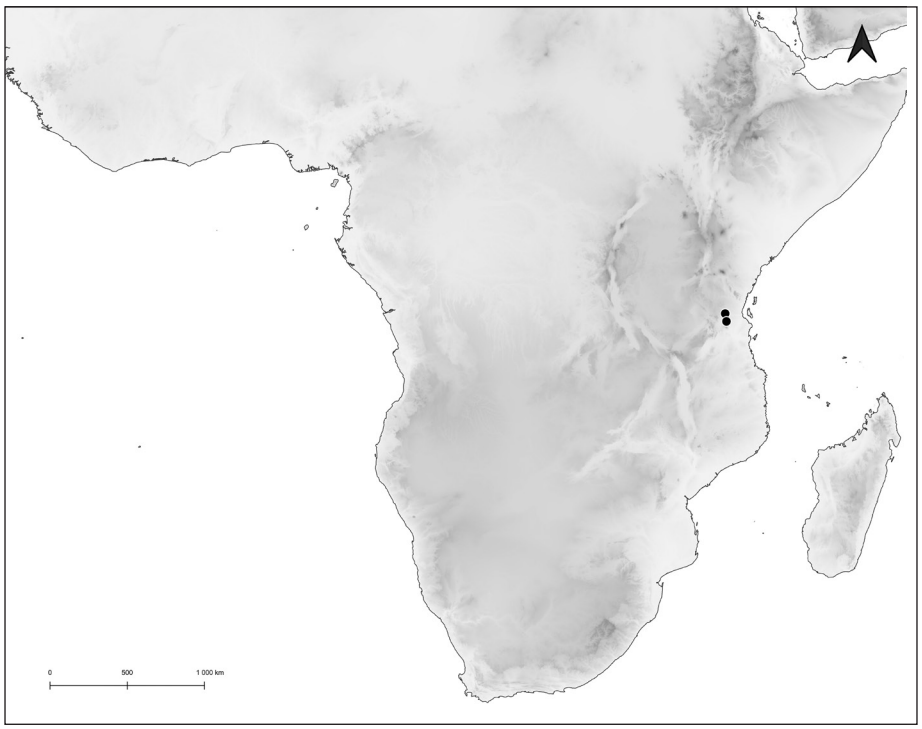

Fig. 57. Distribution map of *Phyllomphax tanganyikense* (Summerh.) Szlach.

Spur 4-5.5 mm long, 2-3 mm in diameter at the base, cylindrical-saccate, apex blunt, divided inside into two compartments. Gynostemium 2 mm long.
Ecology: In moist forest. Flowering time: March.
General distribution: Tanzania. Alt. 950-1250 m.
Representative specimens: Tanzania: Morogoro Distr., alt. 1250 m, 29 Mar.1953, *Drummond & Hemsley 1871* (AMES!, K!, UGDA-DLSz! – copy, drawing); Morogoro, Mvomero Distr., Nguru Mts., forest above Mhonda Mission, Turiani, moist forest, 6°08'S, 37°33"E, alt. 950 m, *Lovett & Congdon 3060* (K!, MO!, UGDA-DLSz! – copy, drawing).
Notes: This species is easily separated from all other genus representatives by having petiolate leaves gathered mostly near the middle of the stem, cylindrical-saccate, blunt spur and deeply and very unequally 3-lobed lip, with large, semilunate lateral lobes.

6.1.2. *THULINIA* P.J. Cribb

Kew Bull. 40: 401. 1985. Generitype: *Thulinia albolutea* P.J. Cribb. – Pridgeon *et al.*, Gen. Orchid. 2(1): 375. 1999. – Szlachetko & Rutkowski, Acta Bot. Fenn. 169: 123. 2000.

Terrestial plants. Tubers ovoid, pubescent. Stem erect or subpendulous, delicate. Leaves 5-8, spreading-recurved, spirally arranged in the lower part of the stem or along its length, lanceolate to linear-lanceolate, acuminate, sheathing at the base. Inflorescence erect-flexuose, laxly few-flowered. Peduncle wiry. Flowers glabrous, held horizontally, forming a pendent recame. Floral bracts lanceolate. Dorsal sepal and lateral sepals subsimilar, not spreading widely, free. Petals slighty shorter than sepals. Lip flabellate, with emarginated margins and verruculose callus along midvein. Spur connate to the ovary. Gynostemium short, relatively massive, deflexed, joined with petals at the base only. Anther situated above the stigma and the rostellum, bent backwards at an angle of ca. 45°, ellipsoid-ovoid, 2-locular. Connective narrow, very thick at the base, apiculate. Pollinia 2, sectile, oblong. Caudiculae 2, interlocular, filiform. Auriculae set apart from the anther, conspicuous, irregulary ellipsoid, formed from swollen, large cells. Stigma ventral, 3-lobed, confluent, large, broadly cordate-obovate, somewhat pad-like; both lateral lobes rather large, produce a major part of the receptive surface, only basal part of middle lobe fertile. Rostellum 3-lobed, perpendicular to the stigma; the middle one prominent, pleated, protrudes in front of the anther; lateral lobes small, canaliculate. Viscidia 2, close to each other, detachable, cellular, more or less obovate, thin.

A monotypic genus, endemic to Nguru Mountains in Tanzania, easily distinguishable from other *Brachycorythis*-alliance representatives by complete fusion between spur and ovary combined with irregular, verruculose callus running from the base down to the lip apex.

6.1.2.1. *Thulinia albolutea* P.J. Cribb (Figs. 58-59)

Kew Bull. 40: 401. 1985; Type: TANZANIA, *Thullin & Mboro 3060* (Holotype: K!, Isotype: UPS)

Plant 8-37 cm tall, arising from a basal tuber, erect, slender. Leaves 5-8, distantly arranged along stem or gathered at the base, 6.5-10 cm long, up to 0.7 cm wide, suberect to arcuate, narrowly lanceolate to linear-lanceolate, acuminate, sheathing at the base. Inflorescence ca 9 cm long, erect, few-flowered. Peduncle and rhachis slender, wiry. Flowers held horizontally, white, with a yellow marks on the lip, ascending. Floral bracts up to 10 mm long, lanceolate, acuminate. Pedicellate ovary up to 20 mm long, very slender, erect. Dorsal sepal 5.4-6 mm long, 2.8-3.5 mm wide, elliptic to ovate, rounded at the apex, somewhat concave near the center, 3-veined. Petals 5.5-6 mm long, 2.2-3.5 mm wide, obliquely ovate-elliptic or broadly ovate, rounded at the apex, obscurely 3-veined. Lateral sepals 6.5-13 mm long, 2.4-3.5 mm wide, oblong-elliptic to oblong ovate, obtuse, 3-veined. Lip 10-12 mm long in total, 8 mm wide when spread, flabellate, apically 3-lobed, emarginate at the apex, with prominent, irregular callus verruculose along midvein tapering from the base to the lip apex; middle lobe obscure, mucronate in apical sinus; lateral lobes rhombic, margins erose. Spur 4.5 mm long, cylindrical, connate to the ovary. Gynostemium more than 3 mm long.

Ecology: In xerophytic scrub, ericaceous bushland, on rocky summit, with abundant xerophytes. Flowering time: February-March, June.

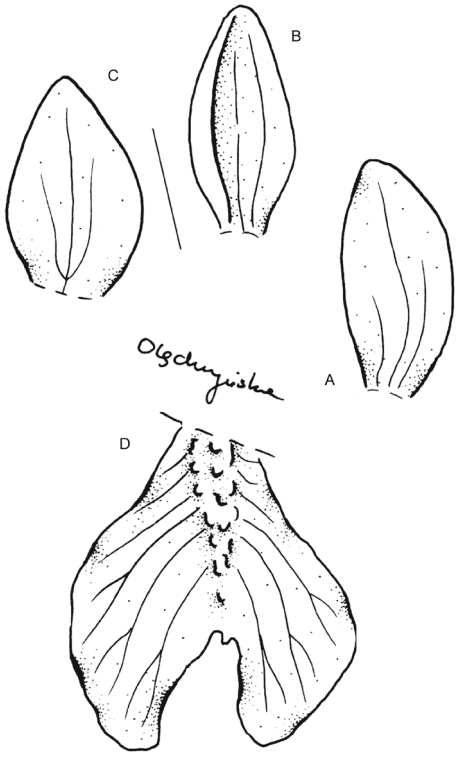

Fig. 58. *Thulinia albolutea* P.J. Cribb

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

General distribution: Tanzania (Nguru Mts.). Alt. 380-2100 m.

Representative specimens: Tanzania: Nguru Mts., Mabega Mt., near Maskati Mission, 6°05'S, 37°27'E, alt. 1700 m, 8 Jun. 1970, *Thullin*

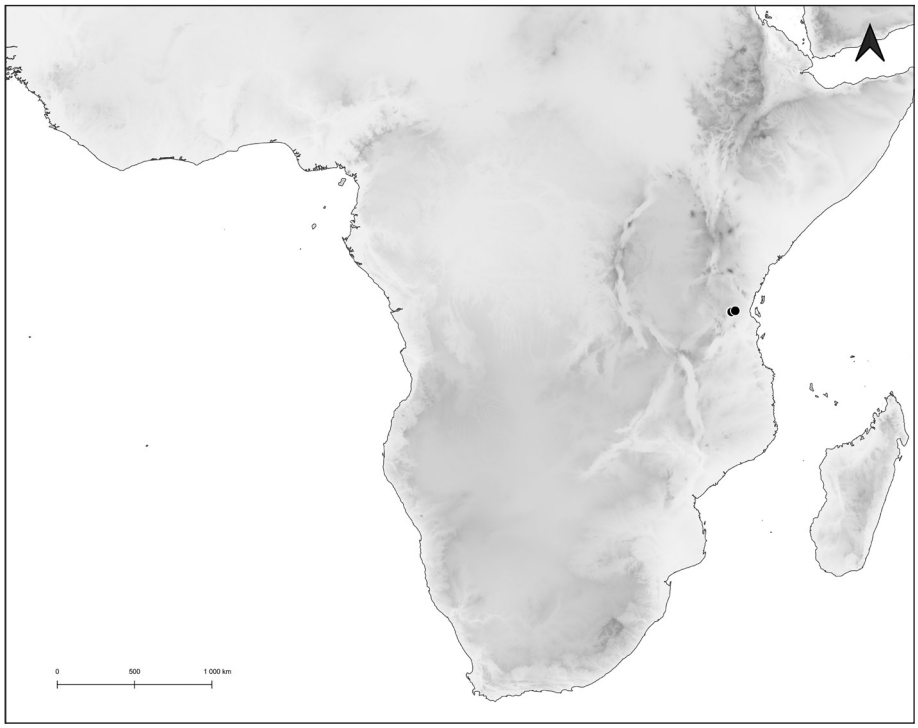

Fig. 59. Distribution map of *Thulinia albolutea* P.J. Cribb.

& Mhoro 3060 (K!, UGDA-DLSz! – copy, drawing); Nguru Mts., in xerophytic scrub, 6°S, 37°43'E, alt. 380-1250 m, 15 Feb. 1988, *Lovett & Congdon 3093* (K!, UGDA-DLSz! – copy, drawing); Same loc., ericaceous bushland, on rocky summit, with abundant xerophytes, 6°05'S, 37°25'E, alt. 2100 m, 16 Mar. 1988, *Bidgood, Pocs, Mwasumbi & Vollesen 520* (K!).

6.1.3. *GYALADENIA* Schltr.

Beih. Bot. Centralbl. 38(11): 124. 1921; Generitype: *Gyaladenia macowaniana* (Rchb.f.) Schltr. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 21. 2007. – Szlachetko, Orchid. Ivory Coast: 35. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 95. 2010.
Incl. *Diplacorchis* Schltr., Beih. Bot. Centralbl. 38(2): 127. 1921; Generitype: *Diplacorchis tenuior* (Rchb.f.) Schltr. – Summerhayes, FWTA ed. 1, 2: 405. 1936. – Perrier de la Bathie, Fl. Madagascar, Orchid. 1: 9. 1939.

Tuber single or few, ovoid, clustered. Stem densely or loosely leafy through its length, glabrous. Leaves usually numerous and sessile, glabrous, elliptic to lanceolate, alternate. Inflorescence densely or laxly multi-flowered. Flowers resupinate, rather small, usually broadly opened. Floral bracts leaf-like. Sepals subsimilar in size, but dissimilar in form. Lip 3-lobed, lateral lobes distinctly smaller than the middle one, occasionally lip unlobed. Spur elongate, cylindrical to cylindrical-conical, spur orifice decrurrent on the lip into more or less prominent keels. Anther erect, connective narrow, blunt, locules close to each other, parallel. Pollinia massulate, caudicles shorter than pollen mass. Stigma entire, ovate to elliptic, slightly concave in the centre. Rostellum tongue-like, the middle lobe pleated, both lateral lobes in close contact to each other. Viscidia naked. Auricles prominent.

The genus includes about 10 species known from Africa, but taxonomic status of some of them requires further study. Species belonging to *Gyaladenia* have sepals subsimilar in size, cylindrical, elongate, prominent spur, and unequally 3-lobed lip, with lateral lobes usually smaller than the middle one. Basal part of the lip is adorned by two obscure keels. Spur is not divided into two chambers, which character differs clearly *Gyaladenia* from *Phyllomphax*. *Brachycorythis* species similar in many respects to *Gyaladenia*, unlike the latter have no spur. The basal part of their lip is more or less concave, but it is not elongate to form any spur.

Gyaladenia can be divided into two subgenera, depending on the fusion between lip and spur orifice.

Key to the species:

1. Decurrent sides of the spur orifice terminating abruptly above the lip base .... subgen. *Diplacorchis* (2)
1. Decurrent sides of the spur orifice disappearing gradually at the lip base ... subgen. *Gyaladenia* (5)
2. Lip unlobed, or obscurely 3-lobed 3
2. Lip distinctly 3-lobed 4
3. Spur cylindrical, slightly swollen and curved down at the obtuse apex ..... *G. rhomboglossa*
3. Spur apically bilobed, attenuate towards acute apex, the middle part swollen and its base contracted ..... *G. disoides*
4. Lip rather obscurely and very unequally 3-lobed above the base, lateral lobes 1-1.5 mm long, 3 mm wide, triangular to triangular-ovate, rounded at the apex .....*G. tenuior*
4. Lip distinctly and unequally 3-lobed above base, lateral lobes 2-4.5 mm long, 1.8-4 mm wide, obliquely triangular to rhombic, obtuse to subacute, margins more or less dentate or erose, somewhat undulate ..... *G. engleriana*
5. Lip prominently 3-lobed 6
5. Lip unlobed or obscurely 3-lobed 8
6. Lip very unequally 3-lobed, the middle lobe much larger than laterals, both lateral lobes ligulate, petals obtuse ..... *G. friesii*
6. Lip lobes subequal in size, both laterals rhombic-ovate 7
7. Plants glabrous, dorsal sepal rounded with short apiculus, lip middle lobe ovate, truncate .... *G. rhodostachys*
7. Plants glabrous in the lower part, glandular in the upper half, dorsal sepal obtuse, lip middle lobe obovate, obtuse ..... *G. mac-owaniana*
8. Lip rhombic to spatulate in outline, obscurely 3-lobed ..... *G. youngii*
8. Lip neither rhombic nor spatulate 9
8. Lip lunate in general outline, notched at the apex, both lateral lobes rhombic, acute .... *G. lisowskiana*
8. Lip orbicular to elliptic in general outline ..... *G. conica*

Subgenus *Gyaladenia*

Species classified in this subgenus can have leaves either distantly or densely arranged along stem or in its lower part. Their common character is a pair of obscure keels at the lip base formed by sides of the spur orifice gradually disappearing on the lamina.

This group embraces 6 species. *Gyaladenia macowaniana*, *G. rhodostachys* and *G. friesii*, can be defined by deeply 3-lobed lip with the middle lobe being larger than both laterals. In contrary, *G. youngii*, *G. conica* and *G. lisowskiana* have lip either unlobed or obscurely 3-lobed at the apex only.

6.1.3.1. *Gyaladenia friesii* (Schltr.) Schltr.
(Figs. 60-66)

Beih. Bot. Centralbl. 38(2): 126. 1921. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 98. 2010. ≡ *Platanthera friesii* Schltr. *in* R.E.Fr., Wiss. Erg. Schwed. Rhod.-Kongo-Exped. 1911-12, 1: 240, Fig. 22. 1916; Type (Szlachetko *et al.* 2010: 128): BURUNDI, *Fries 2010* (Lectotype: S!, UGDA-DLSz! – copy). ≡ *Brachycorythis friesii* (Schltr.) Summerh., Kew Bull. 10(2): 246. 1955. – Summerhayes, FTEA, Orchid. 1: 18. 1968. – Geerinck, Fl. Afr. Centr., Orchid. 1: 32. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 17. 1995.

Tubers 1-3 cm long, ellipsoid to ovoid. Stem 6-24 cm tall, erect or flexuose, delicate, glabrous, distantly leafy throughout its length. Leaves 4-14, 1.5-4 cm long and up to 0.8 cm wide, linear to lanceolate, acute, glabrous, erect to suberect, decreasing its size up the stem. Inflorescence up to 7 cm long, laxly up to 15-flowered. Flowers small, white, mauve or purple, lip white purplish spotted. Floral bracts up to 16 mm long, ovate-lanceolate, acuminate, glabrous. Pedicel and ovary 6-12 mm long, glabrous. Dorsal sepal (3)4-7.7 mm long, 2-3.1 mm wide, elliptic-lanceolate, convex, acute, 3-veined. Petals (3.5)5-6.6 mm long, 2-3.2 mm wide, oblong-elliptic, basally auriculate, sigmoid, obtuse to truncate, 3-veined. Lateral sepals 5-7.5(9.3) mm long, 2.3-3.8 mm wide, obliquely oblong-ovate to lanceolate, subacute, 3-veined. Lip distinctly and unequally 3-lobed just above the base, 4-6.5 mm long and (3)3.5-7.5 mm wide in total, minutely papillate; middle lobe 3-5.5 mm long and wide, almost orbicular to subquadrate, obtuse, with two obscure, decurrent keels terminating gently in front; lateral lobes ca 2-3 mm long, 0.5-0.6 mm wide, ligulate, obtuse, spread. Spur 3-4.5 mm long, cylindrical, obtuse, curved down at the apex. Gynostemium 2-3 mm long, erect.

Ecology: In swampy grassland, in treeless alpine meadows, rocky steppe, in peaty soil of seepage zone, in miombo woodland, in grassland with orchids, *Trachycalymna*, *Ascolepis*, etc., on black soil, in swampy grassland, in dambo and among rocks on upper slope, quartzite sandy pools on rocks, on rocks, in sandy terrace, seasonally flooded, with short grasses and other herbs, in shallow soil over granite outcrops, in wet grassland, at the top of the Escarpment, on open sandy ground, *Uapaca* and *Protea* bushes, in very sandy open

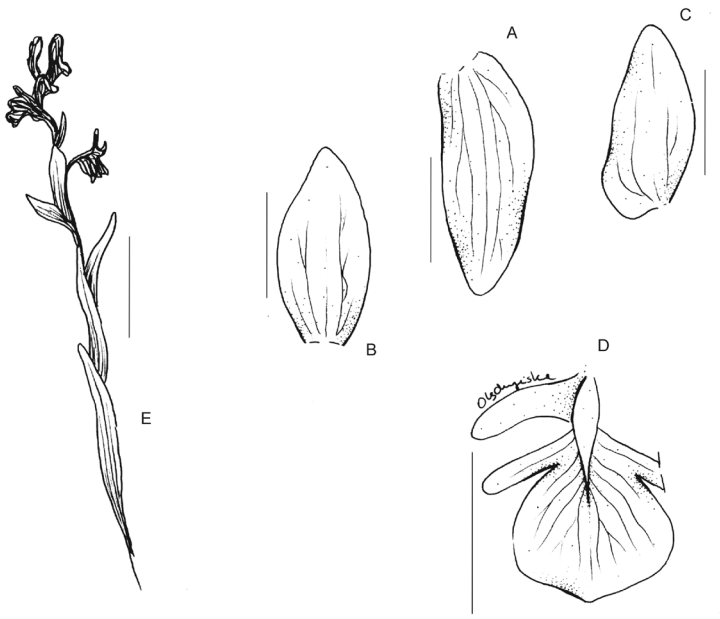

Fig. 60. *Gyaladenia friesii* (Schltr.) Schltr. var. *friesii*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Reekmans 6725*, BR). Scale bar = 3 cm

Fig. 61. *Gyaladenia friesii* (Schltr.) Schltr. var. *friesii*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Lisowski 65563,* UGDA-DLSz). Scale bar = 3 cm

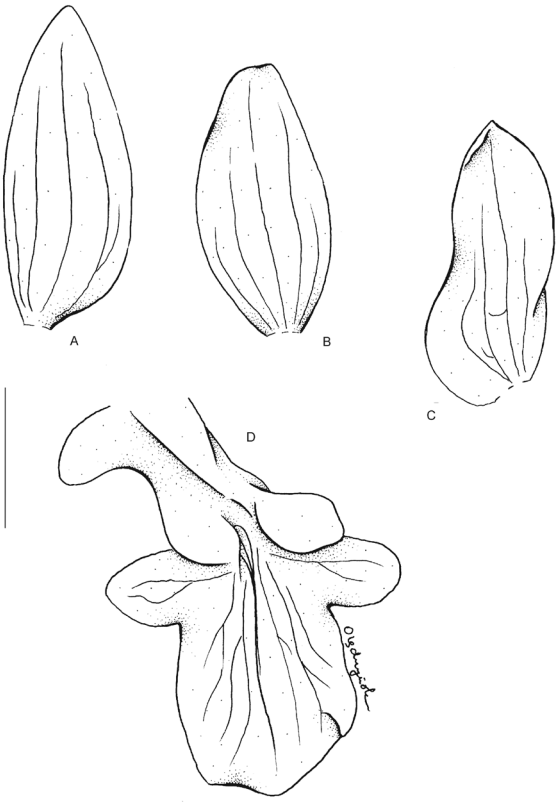

Fig. 62. *Gyaladenia friesii* (Schltr.) Schltr. var. *friesii*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Odgers 250,* K). Scale bar = 3 cm

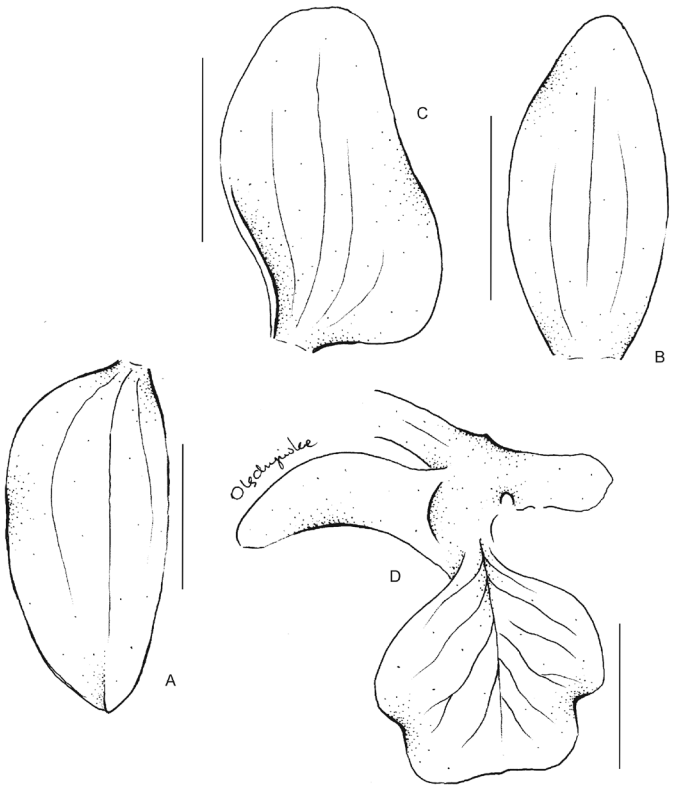

Fig. 63. *Gyaladenia friesii* (Schltr.) Schltr. var. *friesii*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Harder, Merello & Nkhoma 2251,* K). Scale bar = 3 cm

ground – among grass, in sandy soil over rock slabs, open spaces in bush. Flowering time: January, April, October-December.

General distrribution: The Democratic Republic of the Congo (Zaire), Burundi, Tanzania, Angola, Zambia. Alt. 1250-2400 m.

Notes: This species is characterized by peculiar lip form, which is very unequally 3-lobed, with the middle lobe being much larger than laterals, and both lateral lobes ligulate. Its habit is also unique in the genus with delicate, usually flexuose stem, with distantly arranged leaves.

It can be divided into two varieties:

var. *friesii*

Lateral lobes much smaller than the middle one, obliquely linear-ligulate.

Representative specimens: Democratic Republic of the Congo (Zaire): Upper Shaba, Kundelungu Plateau, 10 km N from Lualala, Munua river bank, alt. 1600 m, 10 Jan. 1971, *Lisowski 65563* (UGDA-DLSz!); Haut Shaba, Plateau des Kundelungu, 2 km a l'E, des sources de la Lutschipuka, alt. 1600 m. 8 Jan. 1971, *Lisowski 65971* (UGDA-DLSz!); Upper Shaba, Marungu Plateau, near Luonde station, Mare Mufufu, 12 Jan. 1970, *Lisowski 66154* (UGDA-DLSz!); Katanga, Marungu Plateau, Mt. Lusale, alt. 2400 m, 26 Nov. 1969, *Lisowski, Malaisse & Symoens 882* (UGDA-

Fig. 64. *Gyaladenia friesii* (Schltr.) Schltr. var. *friesii*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Richards 3739,* K). Scale bar = 3 cm

Fig. 65. *Gyaladenia friesii* (Schltr.) Schltr. var *friesii*

Explanations: habit (drawn from *Richards 7347,* K). Scale bar = 3 cm

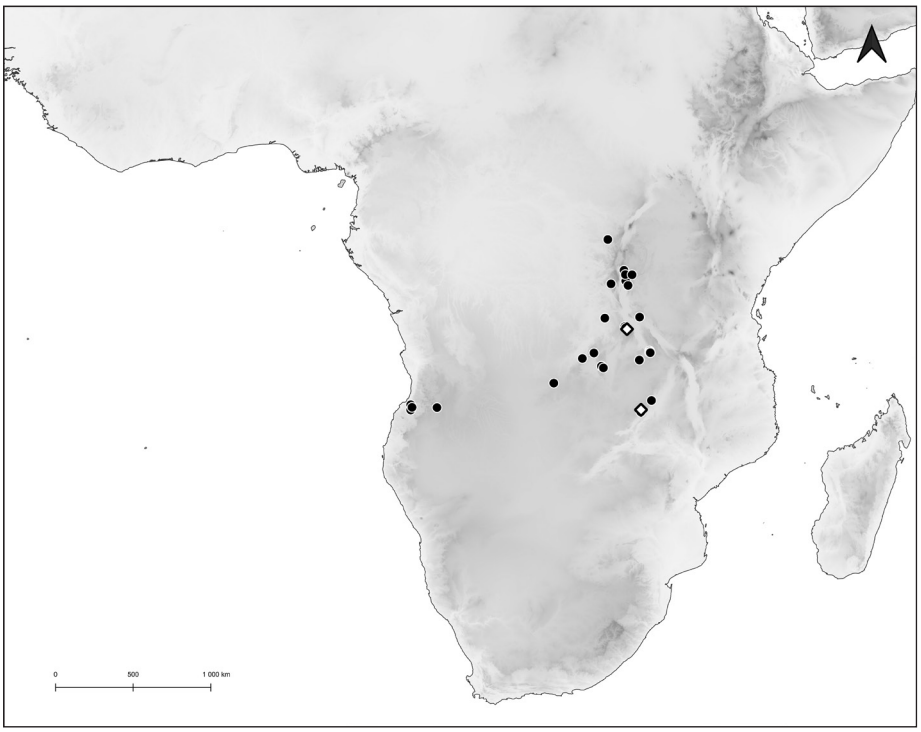

Fig. 66. Distribution map of *Gyaladenia friesii* (Schltr.) Schltr.: circle – var. *friesii,* square – var. *kornasii* Szlach.

DLSz!); Katanga, Kibara Plateau, near Lusinga, alt. 1780 m, 14 Apr. 1969, *Lisowski, Malaisse & Symoens 4739g* (UGDA-DLSz!). Burundi: Mountains S of L. Kivu, in treeless alpine meadows, Dec. 1911, *Fries 2010* (S!, UGDA-DLSz! – copy); Bubanza Prov., Rwegure-Ndora, km 15, alt. 2400 m, 19 Oct. 1976, *Reekmans 5443* (K!, MO!); Munini, Bururi Prov. 4°S, 29°45'E, alt. 1900 m, 13 Dec.1977, *Reekmans 6725* (BR!, MO!, P!, UGDA-DLSz! – copy, drawing); Env. De Bugenyuzi, Kitega, alt. 1800 m, 7 Jan. 1958, *van der Ben 1744* (K!, UGDA-DLSz! – copy, drawing); Bururi Prov., Mt. Tora, alt. 2100 m, steppe rocheuse, *Reekmans 4* (MO!, UGDA-DLSz! – copy, drawing). Tanzania: Kigoma Distr., Tanganyika, Uvinza-Mpanda road, mile 26, in peaty soil of seepage zone, in miombo woodland, 23 Nov. 1962, *Verdcourt 3437* (BR!, UGDA-DLSz! – copy, drawing); Buha, Distr. Tanganyika, Manyovo to Kasulu, mile 6, alt. 1524 m, in grassland with orchids, *Trachycalymna*, *Ascolepis*, etc., on black soil, *Verdcourt 3421* (K!, UGDA-DLSz! – copy). Angola: Benguella, Vale do Cuiriri, Cassuango, Monongua, Bic., Oct. 1906, *Gossweiler 3205* (K!); *Same loc*., 7 Nov. 1906, *Lisowski, Malaisse & Symoens 3906* (BM!, K!); Canjangue, near Caala, alt. 2100 m, 5 Dec. 1959, *Stopp BO131* (K!); Benguella, country of the Ganguellas and Ambuellas, *Gossweiler 3906* (K!, UGDA-DLSz! – copy). Zambia: Central Prov., Serenje Distr., Kundalila Falls, near Serenje, 13°09'S, 30°42'E, alt. 1500-1550 m, swampy grassland, 17 Jan. 1972, *Kornaś 0876* (KRA!, UGDA-DLSz! – copy, drawing); Serenje Distr., Kundalila Falls, 13°09.3'S, 30°43.0'E, alt. 1494 m, 14 Jan. 2001, *Bingham & Zukas 12298* (K!, UGDA-DLSz! – copy, drawing); Muramvya Prov., Teza, Mt. Ngoma, 3°12S, 29°33E, alt. 2400 m, *Reekmans 8513* (K!, UGDA-DLSz! – copy, drawing); Mporokoso Distr., along Mporokoso-Kasama Road, 59.9 km ESE of intersection of Mporokoso-Nsama-Kasama Roads, N of Mporokoso, at bridge over Kasanshi River, in dambo and among rocks on upper slope, 9.29.26.5°S, 30.34.38°E, alt. 1470 m, 9 Dec. 1933, *Harder, Merello & Nkhoma 2251* (K!, UGDA-DLSz! – copy, drawing); Mpika Distr., Nchekuju, 35 mls S of Mpika, quartzite sandy pools on rocks, Dec. 1967, *Williamson & Simon 650* (K!, UGDA-DLSz! – copy, drawing); Kanono, Kundalila Falls, rocks, *Odgers 250* (K!, UGDA-DLSz! – copy, drawing); Chinsali Distr., Mansha River, Kapisha, sandy terrace, seasonally flooded, with short grasses and other herbs, 11°10.2'E, 31°36.1'E, alt. 1383 m, *Bingham & Zukas 12320* (K!); 6 km N of Kalene Hill, Mwinilunga Distr., shallow soil over granite outcrops, 12 Dec. 1963, *Robinson 5899* (B!, UGDA-DLSz! – copy, drawing); Aberoorn Distr., Kambole Escarpment, in wet grassland, at the top of the Escarpment, alt. 1500 m, 29 Jan. 1964, *Richards 18869* (K!, MO!, UGDA-DLSz! – copy, drawing); Abercorn Distr., top of Escarpent, Cilongolwelo, old Katwi Road, alt. 1500 m, open sandy ground, *Uapaca* and *Protes* bushes, *Richards 7347* (K!, UGDA-DLSz! – copy); Chilongowelo, top of Escarpment, alt.

1524 m, in very sandy open ground – among grass, 22 Dec.1954, *Richards 3739* (K!, UGDA-DLSz! – copy, drawing); Escarpment above Chilongowelo, alt. 1524 m, in sandy soil over rock slabs, open spaces in bush, 15 Dec. 1951, *Richards 37* (K!, UGDA-DLSz! – copy).

var. *kornasii* Szlach.
Richardiana 10(3): 128. 2010; Type: ZAMBIA, *Kornaś 0876b* (Holotype: KRA!). – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 97. 2010.

Lateral lobes slightly smaller than the middle lobe, obliquely elliptic to elliptic-obovate.
Representative specimens: Democratic Republic of the Congo (Zaire): Katanga, Marungu Plateau, 2 km E from Luonde, on border of mare Mufufu, alt. 1900 m. 27 Nov. 1969, *Lisowski, Malaisse & Symoens 8241* (UGDA-DLSz!). Zambia: Central Prov., Serenje Distr., Kundalila Falls near Serenje, 13°09'S, 30°42'E, alt. 1500-1550 m, swampy grassland. 17 Jan. 1972, *Kornaś 0876b* (KRA!).

6.1.3.2. *Gyaladenia mac-owaniana* (Rchb.f.) Schltr. (Figs. 67-70)

Beih. Bot. Centralbl., Abt. 2, 38(1): 125. 1921. ≡ *Brachycorythis mac-owaniana* Rchb.f., Otia Bot. Hamburg.: 104. 1881; Type: CAPE PROVINCE, *MacOwan 2627* (Holotype: K!, Isotypes: BOL!, W-R!, UGDA-DLSz! – copy, drawing). – Linder & Kurzweil, Orch. South. Afr.: 81. 1999. ≡ *Habenaria mac-owaniana* (Rchb.f.) Rchb.f., Gard. Chron., ser. 3, 5: 168. 1889. ≡ *Gymnadenia mac-owaniana* (Rchb.f.) Schltr., Verh. Bot. Vereins Prov. Brandenburg 35: 46. 1893. ≡ *Platanthera mac-owaniana* (Rchb.f.) Schltr., Beibl. Bot. Jahrb. Syst. 50: 12. 1895.

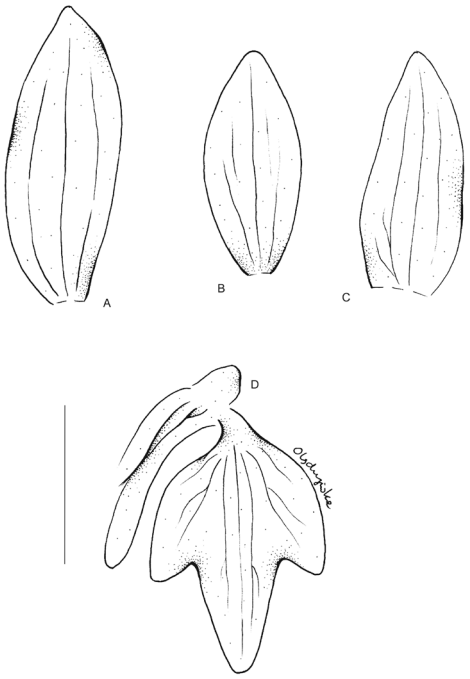

Fig. 68. *Gyaladenia mac-owaniana* (Rchb.f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Newdigate 1733*, K). Scale bar = 3 cm

Fig. 67. *Gyaladenia mac-owaniana* (Rchb.f.) Schltr.
Explanations: A – habit, B – flower (drawn from *MacOwan 2627*, K – holotype). Scale bar = 3 cm

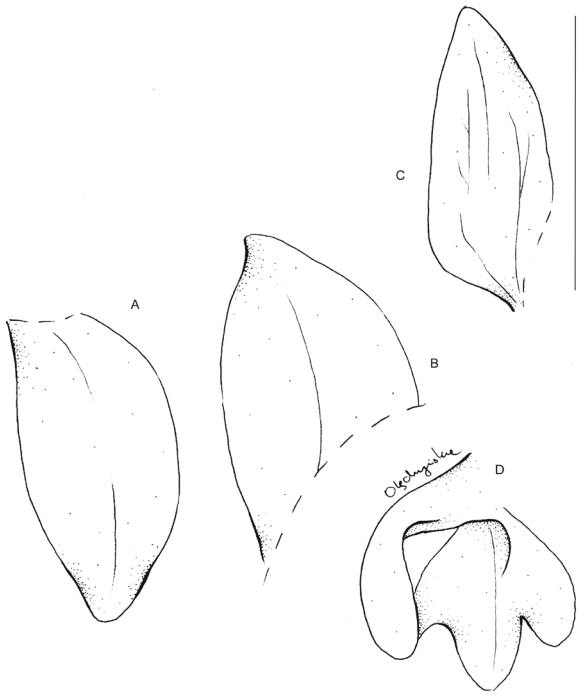

Fig. 69. *Gyaladenia mac-owaniana* (Rchb.f.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Juck s.n.,* K). Scale bar = 3 cm

Fig. 70. Distribution map of *Gyaladenia mac-owaniana* (Rchb.f.) Schltr.

Tubers 1-1.5 cm long, 0.5 cm in diameter, ellipsoid. Stem (7)10-15 cm tall, erect, delicate, glabrous in the lower part, glandular in the upper half, leafy throughout its length. Leaves numerous, up to 5 cm long and 0.8 cm wide, oblanceolate, lanceolate to narrowly lanceolate, acute, erect to suberect, decreasing in size up the stem. Inflorescence 3-6 cm long, densely or subdensely many-flowered. Flowers small, sepals brownish to brownish-purple, petals dull green, lip green, lateral lobes and spur white. Floral bracts up to 19 mm long, linear-lanceolate, acuminate. Pedicel and ovary 7-9 mm long, glabrous. Dorsal sepal 3-4.1 mm long, 1.9-2.6(3.4) mm wide, elliptic-ovate, convex, obtuse, 1-, 3- or 5-veined. Petals 3-4.5 mm long, 1.5-2.5 mm wide, oblong-ovate, somewhat oblique, obtuse, 3- or 4-veined. Lateral sepals 4-5 mm long, 1.9-2.5 mm wide, obliquely elliptic-ovate, acute to shortly apiculate, 1- or 3-veined. Lip distinctly 3-lobed near the apex, 2.4-3.5 mm long in total and wide when spread, lobes dissimilar; middle lobe 1-1.5 mm long and wide, obovate, obtuse; lateral lobes ca 0.5-0.6 mm long, 1 mm wide, semi-ovate-rhombic, obtuse. Spur 2.5 mm long, 1.3 mm in diameter, cylindrical-clavate, blunt, almost straight. Gynostemium 1.3-1.9 mm long, erect.

Ecology: In highlands, in grassland at summit and grassy mountains, on (weathered shale, sandy, stony, gentle) slopes, in fire-damaged areas. Flowering time: January, November-December.

General distribution: South Africa. Alt. 300-750 m.

Representative specimens: South Africa: Albany Div., Grahamstown, Featherstone's Kloof, in grassland at summit, alt. 660 m, Nov. 1865, *MacOwan 2627* (BOL!, K!, W-R!, UGDA-DLSz! – copy, drawing); Grahamstown Distr., highlands area, alt. 610 m, 18 Dec. 1965, *O'Brien s.n.* (NBG! – photo seen); Grahamstown, *Tuck s.n.* (K!); Same loc., 8 Jan. 1889, *Juck s.n.* (K!, UGDA-DLSz! – copy); Riversdale Div., slopes of Langeberg Range near Riversdale, alt. 300 m, Nov. 1892, *Schlechter 1900* (K!, P!, UGDA-DLSz! – copy, drawing); Knysna Div., grassy mountain near Knysna, alt. 300 m, Nov. 1893, *Newdigate 1733* (K!, P!, W!, UGDA-DLSz! – copy, drawing); Knysna Div., Knysna, 1894, *Penther 283* (W!); Howison's Poor Hills, alt. 660 m, 16 Dec. 1898, *Galpin 3090* (K!); Western Cape, George, first year after fire, on Goundi weathered shale, sandy, stony, gentle W facing slope, 33.5300°S, 22.2595°E, alt. 750 m, *Bytebier 2739* (BR!, UGDA-DLSz! – copy, drawing).

Notes: *Gyaladenia mac-owaniana* appears to be very similar to *G. rhodostachys* and can be treated as a smaller variant of the latter. Both species share similar flower segments size and morphology. The lip of *G. mac-owaniana* is usually more deeply 3-lobed with more prominent lobes than those observed in *G. rhodostachys*. The plants are usually smaller with stem glandular in the upper part and narrower leaves, which are usually densely arranged along stem. Further studies are needed to resolve taxonomic status of both species.

6.1.3.3. *Gyaladenia rhodostachys* (Schltr.) Schltr. (Figs. 71-74)

Beih. Bot. Centralbl. 18(2): 126. 1921. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 99. 2010. ≡ *Platanthera rhodostachys* Schltr. *in* Warb., Kunene-Sambesi-Exped. Baum: 203. 1903; Type: ANGOLA, *Baum 381* (Syntype: B†, Isosyntypes: BM!, W!, UGDA-DLSz! – copy). ≡ *Gyaladenia rhodostachys* (Schltr.) Schltr., Beih. Bot. Centralbl. 38(2): 126. 1921. ≡ *Brachycorythis rhodostachys* (Schltr.) Summerh., Kew Bull. 10(2): 246. 1955. – Summerhayes, FTEA, Orchid. 1: 18. 1968. – Geerinck, Fl. Afr. Centr., Orchid. 1: 39. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 17. 1995.

Tubers 3-4 cm long, ellipsoid. Stem 20-45 cm tall, erect or slightly flexuose, delicate, glabrous, distantly leafy throughout its length. Leaves 5-13, up to 5.5 cm long and 1.2 cm wide, lanceolate to ovate-lanceolate, acute, glabrous, erect to suberect, decreasing in size up the stem. Inflorescence 4-8 cm long, densely or subdensely up to 20-flowered. Flowers small, pinkish, reddish to purple-mauve, the lip whitish marked with mauve. Floral bracts up to 13 mm long, lanceolate, acute, glabrous. Pedicel and ovary 7.5-10 mm long, glabrous. Dorsal sepal 3-4 mm long, 1.3-2.3 mm wide, elliptic-ovate, convex, rounded with short apiculus, 3-veined. Petals 2.4-4.3 mm long, 1-2 mm wide, oblong to oblong-obovate, oblique, subacute to subobtuse, 1-veined. Lateral sepals 3.4-4.5 mm long, 1.5-2.3 mm wide, obliquely elliptic-ovate, rounded, shortly apiculate or acute, 3-veined. Lip more or less 3-lobed near the apex, (2)2.7-4 mm long in totaland (2)2.9-4.5 mm wide when spread, minutely papillate, lobes subsimilar; middle lobe 1-1.9 mm long, (0.6)1.1-1.5(2.5) mm wide, obovate, truncate or rounded; lateral lobes ca. 0.5-1 mm long, 1.5-2 mm wide, semi-ovate-rhombic, obtuse. Spur 3-4 mm long, cylindrical-clavate, blunt, slightly curved down at the apex or straight. Gynostemium 1.5-3.1 mm long, erect.

Notes: As mentioned above, *Gyaladenia rhodostachys* is very similar to *G. mac-owaniana* and both species differ in the habit rather than flower morphology. Stem of the former species is usually longer, glabrous, distantly leafy throughout its length.

G. rhodostachys can be divided into two varieties:
var. *rhodostachys*

Lip 3-lobed, lobes subsimilar.

Ecology: On humid steppe, in (wet) meadow grassland, in (wet and permanently wet) dambo, in wet swamp, in boggy grassland by stream, in damp peaty marsh, among coarse grass, among tall grass in swamp, close to the river and at the edge of river. Flowering time: January-February, October-December.

General distribution: Democratic Republic of the Congo (Zaire), Tanzania, Angola, Zambia, Malawi. Alt. 1050-2100 m.

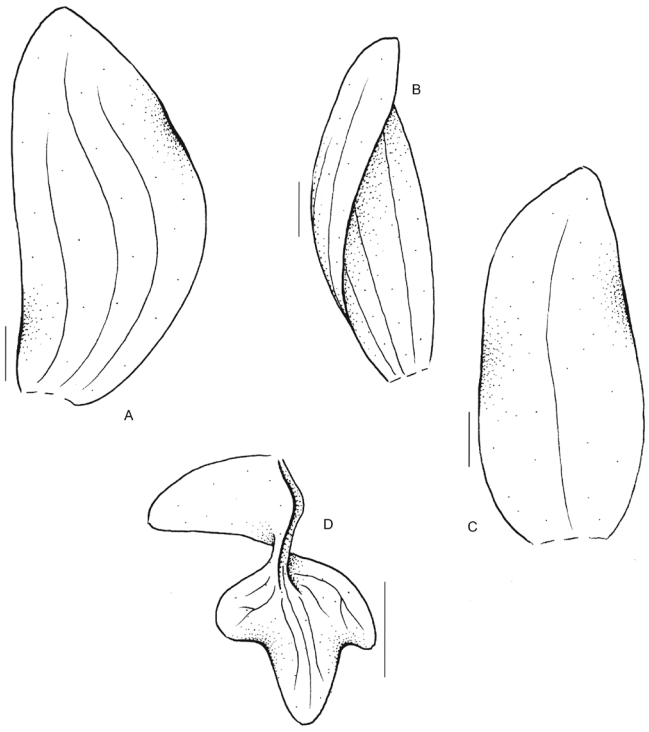

Fig. 71. *Gyaladenia rhodostachys* (Schltr.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Cribb & Grey-Wilson, 10543,* K). Scale bar = 3 cm

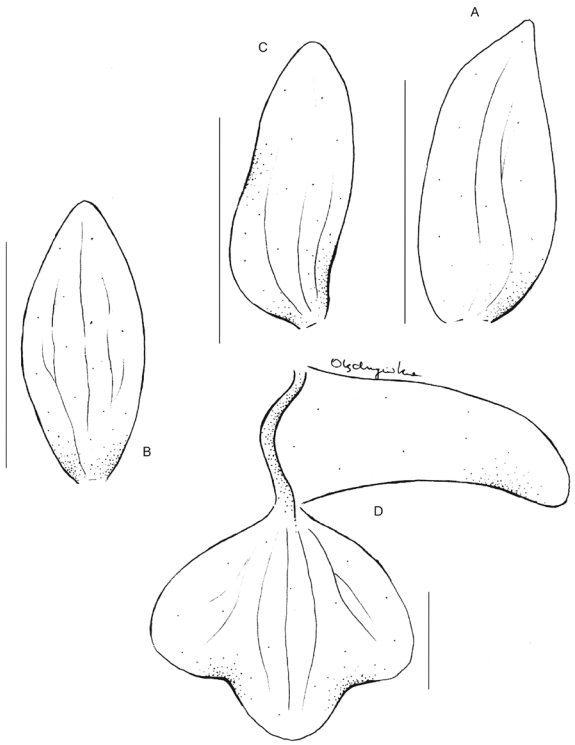

Fig. 72. *Gyaladenia rhodostachys* (Schltr.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Richards 15415*, K). Scale bar = 3 cm

Fig. 73. *Gyaladenia rhodostachys* (Schltr.) Schltr.

Explanations: habit (drawn from *Watermayer 242*, K). Scale bar = 3 cm

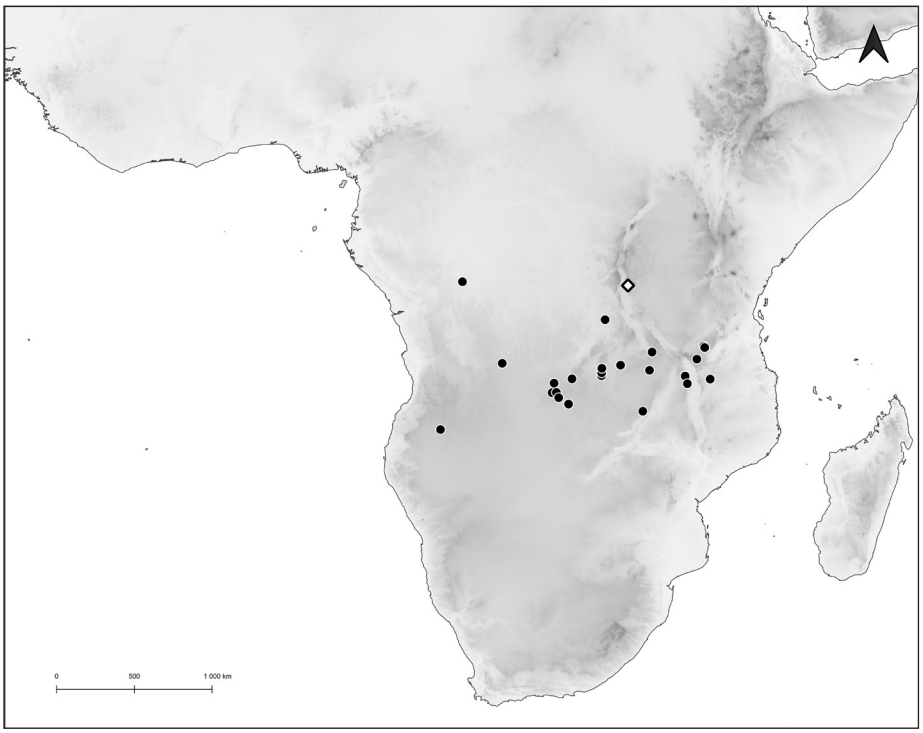

Fig. 74. Distribution map of *Gyaladenia rhodostachys* (Schltr.) Schltr.

Explanations: circle – var. *rhodostachys,* square – var. *lisowskii* Szlach.

Representative specimens: Democratic Republic of the Congo (Zaire): Upper Shaba, Kundelungu Plateau, 2 km E of Lutshipuka source, mare on the steppe, alt. 1600 m. 8 Jan. 1971, *Lisowski 66304* (UGDA-DLSz!); Upper Shaba, Kundelungu Plateau, Kalembe river bank, humid steppe, alt. 1600 m. 8 Jan. 1971, *Lisowski 65579* (UGDA-DLSz!); Katanga, Kundelungu Plateau, 2 km a l'E Lutshipuka sources, mare on the steppe, alt. 1600 m. 8 Jan. 1971, *Lisowski, Malaisse & Symoens 12543* (UGDA-DLSz!); Bao Congo, Wombali, R. Kasai, *Van Tilborg s.n.* (BR!); 6.0 km N of the Katshupa Trail, 26 Jan. 1967, *Malaisse 4920* (BR!); [Zilewe] valley, 20 km south of Kolwezi, in meadow, 11 Nov. 1981, *Schaijes 1117* (BR!). Tanzania: 90 km past Iringa, on road to Mbeya, in wet dambo, 4 Feb.1976, *Cribb & Grey-Wilson, 10543* (K!, UGDA-DLSz! – copy, drawing); Njombe Distr., Mwakete-Njombe road, 2100 m, in wet swamp, 17 Jan. 1957, *Richards 7852* (K!); Iringa Region, Mufindi Distr., Ngwazi swamp, wet, meadow grassland, alt. 1830 m, 8°30'S, 35°15'E, *Lovett 1187* (K!); Tanganyika, Iringa Distr., *Watermayer 242* (K!, UGDA-DLSz! – copy); Tanganyika, Songea Distr., about 15 km E of Songea, in boggy grassland by stream, alt. 1050 m , *Milne-Redhead & Taylor 8346* (K!, UGDA-DLSz! – copy). Angola: Cuando-Cubango; Kueio, Kubango, alt. 1120 m, 8 Nov. 1899, *Baum 381* (B†, BM!, W!, UGDA-DLSz! – copy); "Am Longa bei Chijija", alt. 1200 m, 5 Jan. 1900, *Baum 629* (W!); Saurimo, 23 Oct. 1932, *Young 1139* (K!). Zambia: Kundalilafalls, 1967, *Williamson 631* (K!, UGDA-DLSz! – copy); Upper end Lake Chila, in damp peaty marsh, among coarse grass, 29 Jan.1955, *Richards 4278* (K!); 6 km N of Kalene Hill, Mwinilunga Distr., permanently wet dambo, 12 Dec.1963, *Robinson* 5910 (K!); Mwinilunga Distr., Sinkabolo Dambo, in boggy grasslands, Nov. 1937, *Milne-Redhead* 3203 (BM!, K!, UGDA-DLSz! – copy); Mwinilunga Distr., Sinkabolo Swamp, alt. 1200 m, growing among tall grass in swamp, 20 Nov. 1962, *Richards 17435* (K!); NW Prov., Mwinilunga Distr., 20 Oct. 1958, *Holmes 074* (K!, UGDA-DLSz! – copy, drawing); Mwinilunga Distr., Zambesi River Rapids, 4 mls. from Kalene Mission, alt. 1290 m, in wet grassy swamp, close to river, 9 Nov. 1962, *Richards 16993* (K!, UGDA-DLSz! – copy); Kawambwa Distr. M'tunatusha River, alt. 1290 m, in grassland at edge of river, 28 Nov., 1961, *Richards 15415* (K!, UGDA-DLSz! – copy, drawing); Kasama Distr., 8 km N of Kasama, perennially damp ground, 6 Dec. 1960, *Robinson 4154* (K!, UGDA-DLSz! – copy); *Sine loc.,* 28 Oct. 1966, *Leach & Williamson 13520* (K!). Malawi: N Region, Suth Viphya Mts., alt. 1300 m, 4 Jan. 1983, *La Croix 393* (K!); Nyika, dambo, Dec. 1966, *Williamson 207* (K!).

var. *lisowskii* Szlach.

Richardiana 10(3): 130. 2010; Type: DEMOCRATIC REPUBLIC OF THE CONGO (ZAIRE), *Lisowski 575* (Holotype: UGDA-DLSz!, Isotype: BR!). – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 100. 2010.

Lip unlobed, ligulate to oblong-ovate.
Ecology: No data. Flowering time: November.
General distribution: Democratic Republic of the Congo (Zaire), Burundi. Alt. not given.
Representative specimens: Democratic Republic of the Congo (Zaire): *Sine loc., Lisowski 575* (UGDA-DLSz!). Burundi: Nyamikungu River; comm. Giharo (=Kiharo), 11 Nov. 1990, *Arbonnier 120* (BR!).

6.1.3.4. *Gyaladenia youngii* Szlach., Mytnik, Rutk., Jerch. & Baranow (Figs. 75-76)

Richardiana 10(3): 127. 2010; Type: ANGOLA, *Young 1166* (Holotype: BM!, UGDA-DLSz! – copy, drawing). – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 100. 2010.

Stem 25-45 cm tall, erect, delicate, leafy throughout its length. Leaves numerous, up to 7 cm long and 1.5 cm wide, lanceolate, elliptic- to oblong lanceolate, acute to subacute, erect, decreasing in size upwards. Inflorescence up to 12 cm long, usually densely many-flowered, occasionally relatively lax. Flowers small, white tinged purple, lip marked with purple spots. Floral bracts to 15 mm long, leafy, decreasing in size upwards. Pedicel and ovary 8-10 mm long. Dorsal sepal 3.5-4 mm long, 1.5-2 mm wide, ovate to ovate-elliptic, subacute to subobtuse, concave at the base, 3-veined. Petals 3.5-4 mm long, 1-1.5 mm wide, obliquely ovate-lanceolate to ligulate, obtuse, sigmoid, 2-veined. Lateral sepals 3.5-4 mm long, 2 mm wide, obliquely elliptic-ovate to broadly ovate, acute to obtuse, 3-veined. Lip 3-4 mm

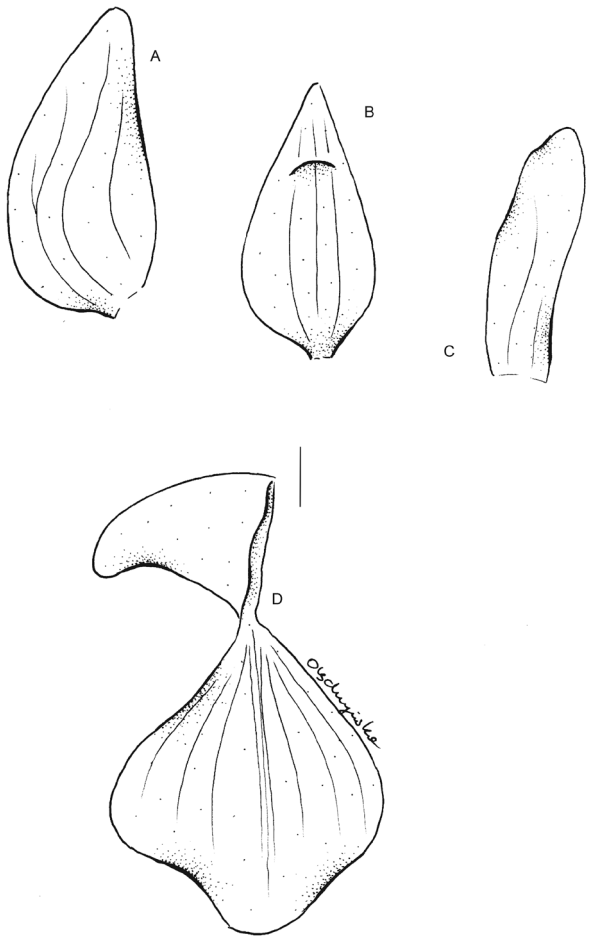

Fig. 75. *Gyaladenia youngii* Szlach., Mytnik, Rutk., Jerch. & Baranow
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Young 1166,* BM – holotype). Scale bar = 3 cm

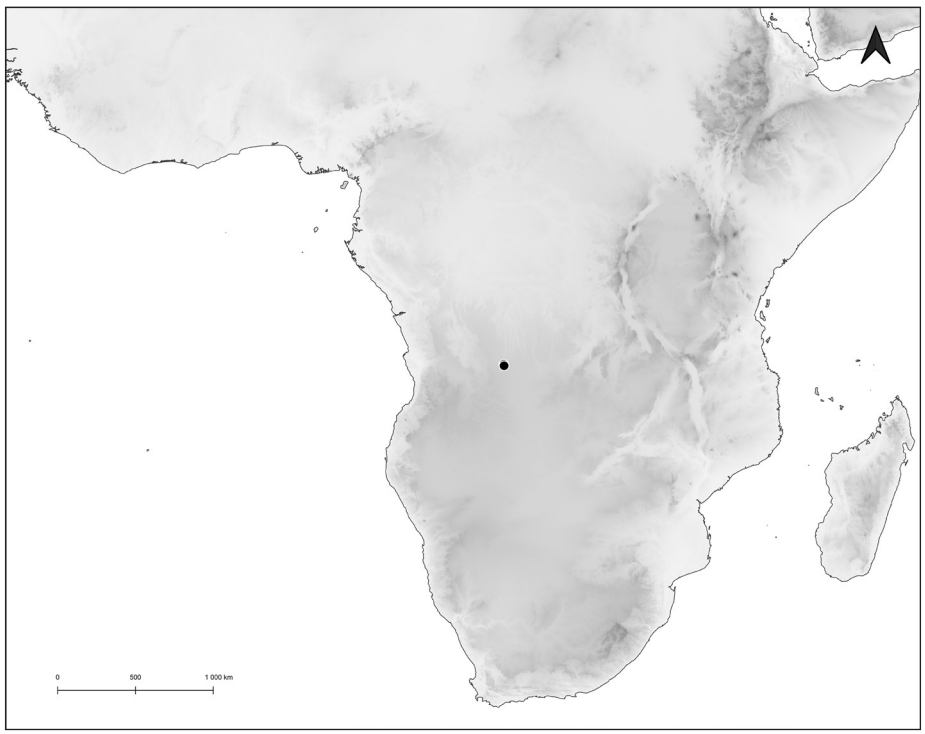

Fig. 76. Distribution map of *Gyaladenia youngii* Szlach., Mytnik, Rutk., Jerch. & Baranow.

long, 2-3 mm wide, rhombic to spathulate in outline, obscurely 3-lobed, widest near or at the middle, apex rounded, base narrow. Spur 2 mm long, cylindrical-conical, falcate, blunt.

Ecology: Terrestrials. Flowering time: October. Known so far from Angola only.

Representative specimens: Angola: Saurimo, 25 Oct. 1932, *Young 1166* (BM!, UGDA-DLSz! – copy, drawing); Saurimo, 27 Oct. 1932, *Young 1199* (BM!).

Notes: *Gyaladenia youngii* shares similar habit to *G. rhodostachys*, *G. conica* and *G. lisowskiana*, but can be easily separated from all mentioned species by the lip form. The lip base of the former species is narrow, lip lamina is rhombic to spathulate in outline, obscurely 3-lobed, and widest below the middle. Flowers of *G. rhodostachys* are similar in size, but the lip is more or less 3-lobed near the apex, with subsimilar lobes. Flower segments of *G. lisowskiana* are ca twice larger than in *G. youngii*, lip is lunate in general outline, thickened along mid-vein, minutely papillate on both surfaces, notched at the apex, both lateral lobes are rhombic, acute, divergent, irregulary dentate or erose along margins. Moreover, petals of *G. lisowskiana* are truncate at the apex. Flowers of *G. conica* are 2-3 times larger than in *G. youngii*, the lip is orbicular to elliptic in general outline, apically emarginated with or without short apiculus at the apex, with a pair of short keels at the base of spur orifice, thickened along the mid-vein, with margins more or less erose.

6.1.3.5. *Gyaladenia conica* (Summerh.) Szlach. (Figs. 77-84)

Richardiana 4(2): 79. 2006. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 21. 2007. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 101. 2010. ≡ *Diplacorchis conica* Summerh., Bull. Misc. Inform. Kew 1938: 141. 1938; Type: GABON, *Le Testu 5088* (Holotype: K!, Isotypes: BM!, P!, UGDA-DLSz! – copy, drawing). ≡ *Brachycorythis conica* (Summerh.) Summerh., Kew Bull. 10: 244. 1955. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Williamson, Orchid. S. Centr. Afr.: 31. 1977. – Geerinck, Fl. Afr. Centr., Orchid. 1: 40. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 16. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 74. 1998. – Linder & Kurzweil, Orch. South. Afr.: 81. 1999. – Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid. 36(1):16. 2004.

Roots fusiform, tuberous. Stem 18-50 cm tall, erect, rather delicate, entirely glabrous, rather distantly leafy throughout its length. Leaves 8-15, 2-7 cm long, 0.8-2.5 cm wide, lanceolate to broadly lanceolate, acute, sessile, longer than internodes, the uppermost decreasing in size up the stem. Inflorescence 4-16 cm long, 5-30-flowered, dense. Flowers small, purple-pink to whitish-mauve, the lip with darker marks. Floral bracts up to 30 mm long, oblong-lanceolate, acute to acuminate, the lowermost longer than flowers. Pedicel

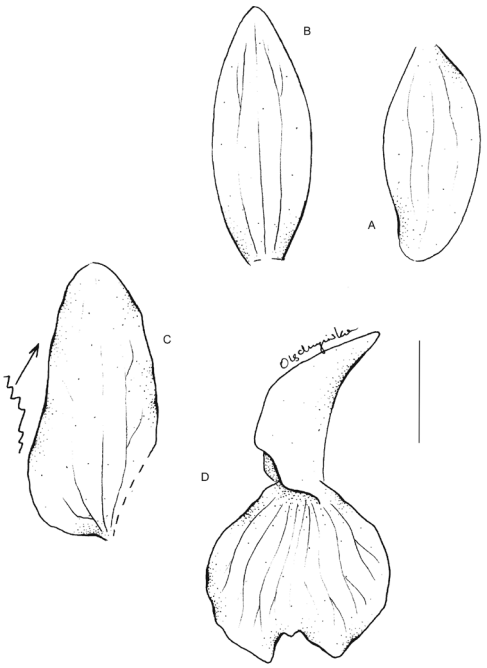

Fig. 77. *Gyaladenia conica* (Summerh.) Szlach. ssp. *conica*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Le Testu 5088,* K – holotype). Scale bar = 3 cm

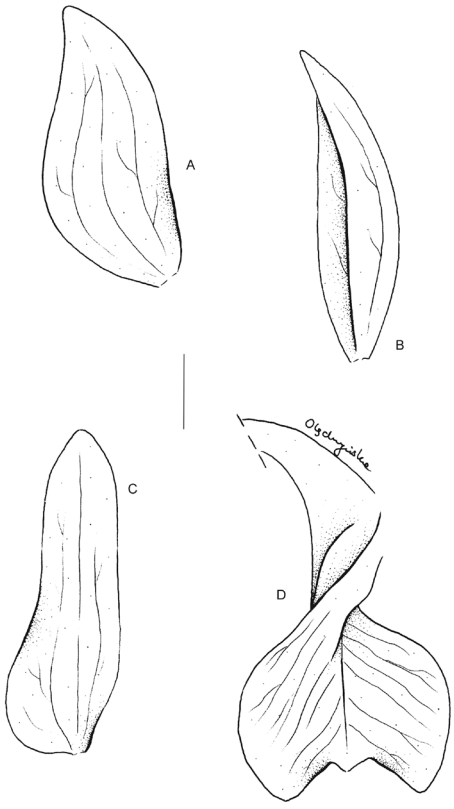

Fig. 78. *Gyaladenia conica* (Summerh.) Szlach. ssp. *conica*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Lejoly 82/755,* BR). Scale bar = 3 cm

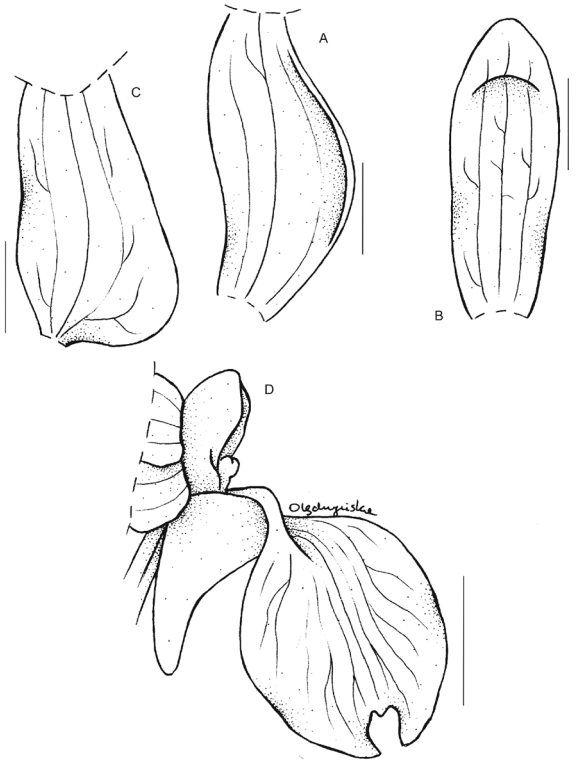

Fig. 79. *Gyaladenia conica* (Summerh.) Szlach. ssp. *conica*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Makany 1247,* P). Scale bar = 3 cm

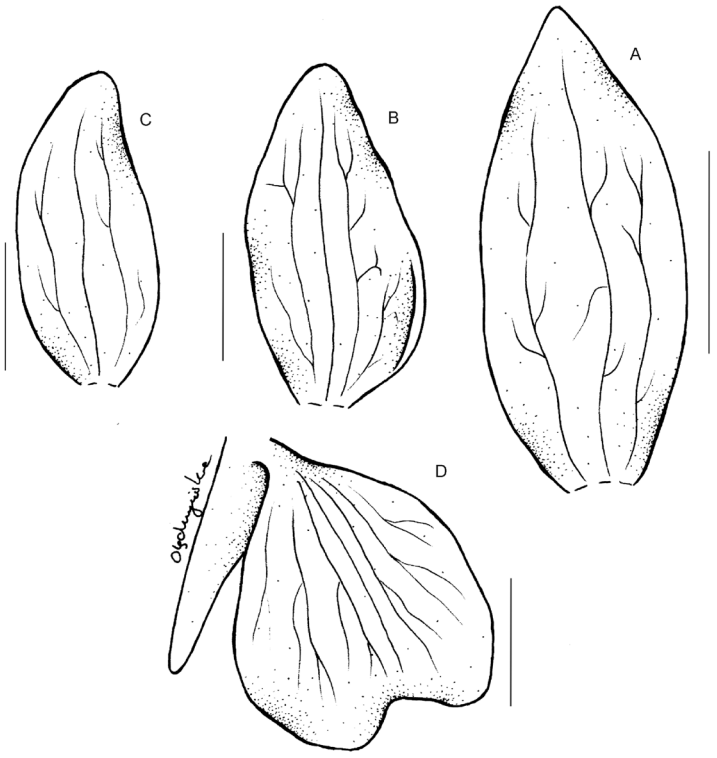

Fig. 80. *Gyaladenia conica* (Summerh.) Szlach. ssp. *conica*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Makany 1217,* P). Scale bar = 3 cm

and ovary 8-12(16) mm long, glabrous. Dorsal sepal 6.5-12 mm long, 2-5.7 mm wide, oblong-ovate to oblong-lanceolate, obtuse, convex, 3-veined. Petals 6.3-12 mm long, 2-4.7(6) mm wide, obliquely oblong-ovate, subauriculate, obtuse, margins more or less erose, 3-veined. Lateral sepals 5.2-12.5 mm wide, 1.9-5 mm wide, obliquely oblong-lanceolate, subobtuse, 3-veined. Lip (5)9-10 mm long, (3)4.8-7 mm wide, orbicular to elliptic in general outline, apically emarginated with or without short apiculus at the apex, with a pair of short skeels at the base of spur orifice, thickened along the mid-vein, margins more or less erose. Spur 3.8-9 mm long, conical, subobtuse. Gynostemium 3-6(9) mm long.

N o t e s : This species is rather easily separated from its congeners by having the largest flowers and lip form, which is orbicular to elliptic in general outline, apically emarginated with or without short apiculus at the apex.

Gyaladenia conica is quite variable species, what is reflected in its infraspeciific classification. According to la Croix & Cribb (1995) it can be didvided into three subspecies. Ssp. *conica* is known from Nigeria, Gabon, the Republic of Congo and the Democratic Republic of the Congo (Zaire), ssp. *longilabris* – from Zambia, and ssp. *transvaalensis* – from the Republic of South Africa.

ssp. *conica*

Slender plants. Leaves laxly arranged. Lip as long as wide, with emarginate apex divided into three very short lobes, the margins usually slightly sinuate.

E c o l o g y : In swampy ground, among grass *Xyris* sp. and other orchids, on the edge of marsh, on annually burned open slope, leading to creek lower down, on herb savanna, steppe savanna and in marshy herb savanna on white sand. Flowering time: January-February, June, November-December.

G e n e r a l d i s t r i b u t i o n : Nigeria, Gabon, Republic of Congo, Democratic Republic of the Congo (Zaire). Alt. 400-1700 m.

R e p r e s e n t a t i v e s p e c i m e n s : Nigeria: NE State, Mambilla Plateau, in swampy ground, among grass *Xyris* sp. and other orchids, 23 Jun. 1972, *Chapman 2911* (WAG!); Adamawa Prov., Mambilla Plateau, Likitaba to Gembu, on the edge of marsh, alt. ca 1700 m, 17 Jun. 1958, coll.? (K!). Gabon: Haute-Ngounye, Plaine Pangani, 20 Nov. 1924, *Le Testu 5088* (BM!, K!, P!, UGDA-DLSz! – copy, drawing); Ngounye River, between Monila and Missonnera. 19 Dec. 1924, *Le Testu 5143* (BM!, K!). Ogooué, Ivindo, Lopé Reserve, annually burned open slope, leading to creek lower down, 0°31.3'S, 11°42.9'E, alt. 400 m, 29 Dec. 1996, *De Wilde & De Wilde-Bakhuizen 11877* (MO!, UGDA-DLSz! – copy, drawing). The Republic of Congo: Batekes

Fig. 81. *Gyaladenia conica* (Summerh.) Szlach. ssp. *conica*
Explanations: habit (drawn from *Callens 3815*, BR). Scale bar = 3 cm

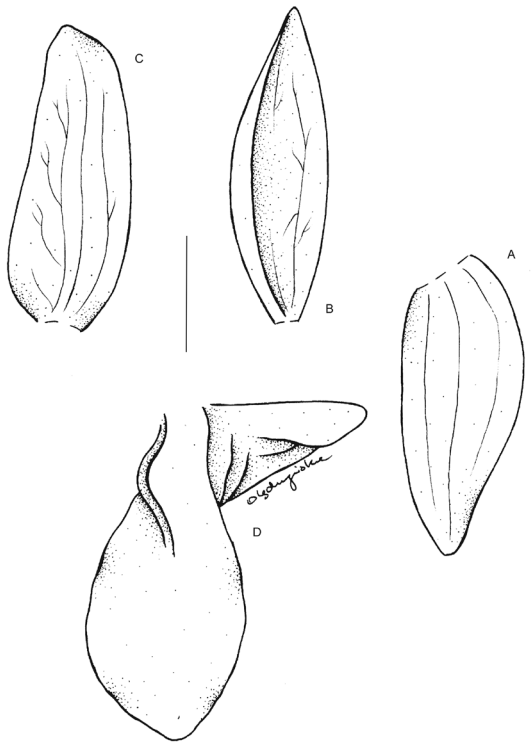

Fig. 82. *Gyaladenia conica* (Summerh.) Szlach. ssp. *longilabris* (Summerh.) Szlach., Mytnik, Rutk., Jerchewicz & Baranow
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Williamson 440,* K). Scale bar = 3 cm

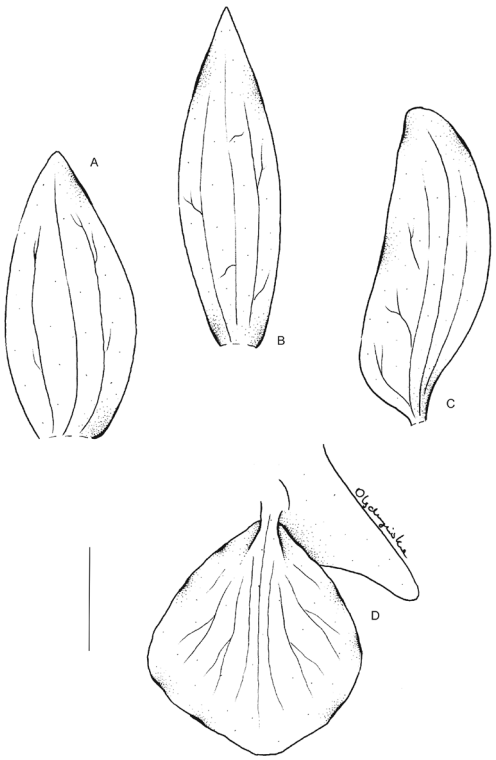

Fig. 83. *Gyaladenia conica* (Summerh.) Szlach. ssp. *longilabris* (Summerh.) Szlach., Mytnik, Rutk., Jerchewicz & Baranow
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Hooper & Townsend 598,* K). Scale bar = 3 cm

Plateau, 35 km N Brazzaville, alt. 950 m, 8 Dec. 1969, *Makany 1217* (P!, UGDA-DLSz! – copy, drawing); Batekes Plateau, 40 km N Brazzaville, alt. 550 m, 23 Dec. 1969, *Makany 1247* (P!, UGDA-DLSz! – copy, drawing). Democratic Republic of the Congo (Zaire): Upper Shaba, Kundelungu Plateau, 10 km NW from Lualala vicinity, Nungwe, alt. 1675 m, 19 Feb. 1969, *Lisowski 66146* (UGDA-DLSz!); Region de Bandundu, Zona de Kenge, Plateau de Natake, pres de la route Kenge-Nankana, 4 km a l'Ede la limite occidentale de la Region, savanna herbeuse, 5 Dec. 1982, *Lisowski 85791* (UGDA-DLSz!); Katanga, Manika Plateau, vicinity 4 km SW of Katema village, 21 Jan. 1969, *Lisowski, Malaisse & Symoens 379* (UGDA-DLSz!); Katanga, Kundelungu Plateau, 4.5 km SSE of Lualala station, alt. 1700 m., 16 Feb. 1969, *Lisowski, Malaisse & Symoens 2068* (UGDA-DLSz!); Plateau Batéké, zone Kenge, 2 km E of Bationgo, steppe savanna, 4°39'S, 16°22' E, *Lejoly 82/755* (BR!, UGDA-DLSz! – copy, drawing); Mayombe, Luvu, just S of Tshela, in marshy herb savanna on white sand, Dec. 1952, *Callens 3815* (BR!, K!, YBI – photo seen, UGDA-DLSz! – copy).

ssp. *longilabris* (Summerh.) Szlach., Mytnik, Rutk., Jerchewicz & Baranow
Richardiana 10(3): 131. 2010. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 102. 2010. ≡ *Brachycorythis conica* (Summerh.) Summerh. ssp. *longilabris* Summerh., Kew Bull. 10: 245. 1955; Type: ZAMBIA, *Milne-Redhead 3941* (Holotype: K!, ISOTYPES: BR!, PRE – photo seen; UGDA–DLSz! – copy, drawing). – la Croix & Cribb, Fl. Zambes., Orchid. 1: 16. 1995.

Robust plant. Leaves densely imbricating. Inflorescence dense, many-flowered. Floral bracts much longer than flowers. Lip about twice as long as wide.
Ecology: In open grassland and rough grassland, in damp ground, on sandy plain in open area, in dry sandy dambo. Flowering time: January, March.
General distribution: The Democratic Republic of the Congo (Zaire), Zambia. Alt. 1380-1670 m.
Representative specimens: Democratic Republic of the Congo (Zaire): Shaba Prov. (Katanga), Kundellungu Plateau, ca 4 km S of Katwe, National Park, in rough grassland, in damp ground, alt. 1670 m, 6 Mar.1975, *Hooper & Townsend 598* (K!, UGDA-DLSz! – copy, drawing). Zambia: Mwinilunga Distr., half a mile SW of Dobeka Bridge, on sandy plain in open area, Jan. 1938, *Milne-Redhead 3941* (BR!, K!, PRE – photo seen, UGDA-DLSz! – copy, drawing); North-West Prov., Mwinilunga Distr., by Mwinilunga airfield, 10 km N of town, dry sandy dambo, alt. 1400 m, 20 Jan. 1975, *Brummitt, Chisumpa & Polhill 13881* (K!, UGDA-DLSz! – copy, drawing); North-West Prov., Mwinilunga Distr., 34 km W of Mwinilunga,

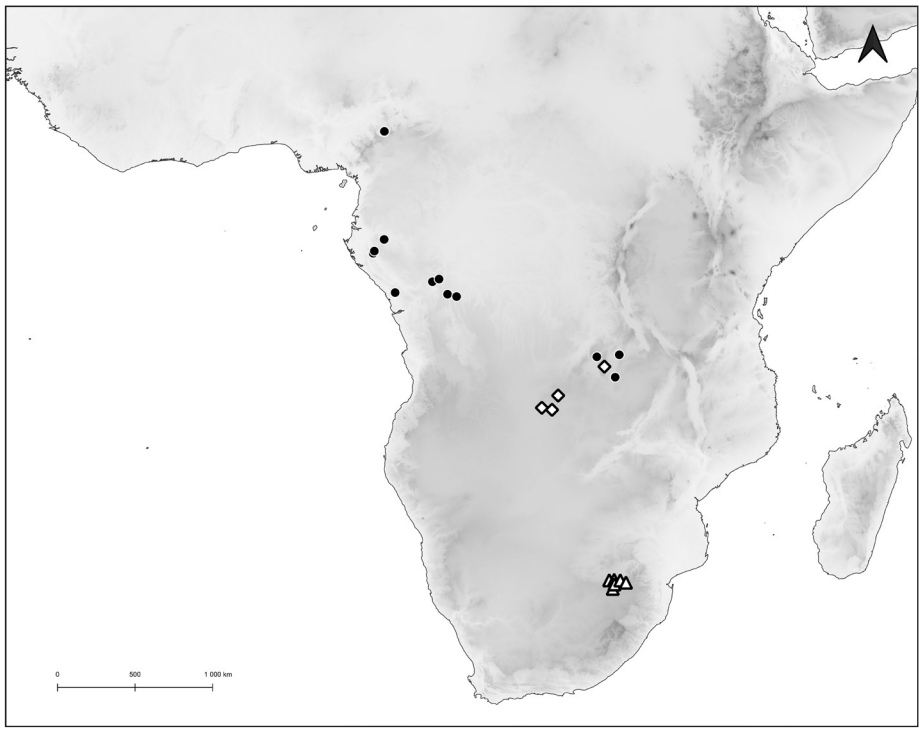

Fig. 84. Distribution map of *Gyaladenia conica* (Summerh.) Szlach.
Explanations: circle – ssp. *conica,* square – ssp. *longilabris* (Summerh.) Szlach., Mytnik, Rutk., Jerchewicz & Baranow, triangle – ssp. *transvaalensis* (Summerh.) Szlach.

on Matonchi road, dry sandy dambo, alt. 1380 m, 24 Jan. 1975, *Brummitt, Chisumpa & Polhill 14084* (K!, UGDA-DLSz! – copy, drawing); near Matonchi farm, open grassland, Dec.1968, *Williamson 440* (K!, UGDA-DLSz! – copy, drawing).

ssp. *transvaalensis* (Summerh.) Szlach.
Richardiana 10(3): 131. 2010. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 102. 2010. ≡ *Brachycorythis conica* (Summerh.) Summerh. ssp. *transvaalensis* Summerh., Kew Bull. 10: 245. 1955; Type: SOUTH AFRICA, *Nouhuys 8460* (Holotype: K!, Isotypes: PRE – photo seen; UGDA-DLSz! – copy).

Similar in general appearance to ssp. *longilabris*. Lip relatively broad, usually shortly 3-lobed at the apex.
Ecology: In grassland on tops of hills, in sandy gravels, in moist swampy ground near stream, on hillside, among grass. Flowering time: January-February, April, November
General distribution: South Africa. Alt. no data.
Representative specimens: South Africa: Pretoria Distr., between Ashbury and Zwartkop Aerodrome, in grassland on tops of hills, in sandy gravels, Apr. 1930, *Nouhuys 8460* (K!, PRE – photo seen, UGDA-DLSz!– copy); Pretoria, 20 Feb. 1944, *Crundall s.n.* (K!, PRE, UGDA-DLSz! – copy); Irene, just S of Pretoria, Nov. 1923, *Pole-Evans s.n.* (K!, PRE, UGDA-DLSz! – copy); Middelburg Distr., Ross Senekal, Jan. 1918, *Leipoldt 17074* (K!, PRE, UGDA-DLSz! – copy); Donkerhoek, in moist swamy ground near stream, Jan. 1940, *Repton 1309* (K!, PRE); Water Kloof, on hillside, among grass, Feb. 1920, *Verdoorn 90* (K!, PRE, UGDA-DLSz! – copy).

6.1.3.6. *Gyaladenia lisowskiana* (Szlach. & Olszewski) Szlach. (Figs. 85-86)

Richardiana 4(2): 79. 2006. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 102. 2010. ≡ *Brachycorythis lisowskiana* Szlach. & Olszewski, Fl. Cam., Orchid. 34(1): 76. 1998; Type: THE REPUBLIC OF CONGO, *Makany 1437* (Holotype: P!, UGDA-DLSz! – copy, drawing).

Roots fleshy, thick, clustered. Stem 26 cm tall, erect, delicate, glabrous. Leaves 10-12, up to 3.5 cm long and up to 1.5 cm wide, sessile, ovate-lanceolate to lanceolate, acute, glabrous, suberect, longer than internodes, decreasing in size up the stem. Inflorescence 8-9 cm long, 20-25-flowered, dense. Floral bracts up to 16 mm long, lanceolate, acute, glabrous, the lower one distinctly longer than flower, the upper equal flowers. Pedicel and ovary 10 mm long. Dorsal sepal 7-8 mm long, 4 mm wide, oblong-ovate, subobtuse, concave. Petals 7-8 mm long, 4 mm wide, obliquely oblong, truncate at the apex, sparsely erose along outer margin. Lateral sepals 7-8 mm long, 3.8 mm wide, obliquely oblong-ovate, concave, obtuse and cucullate at the

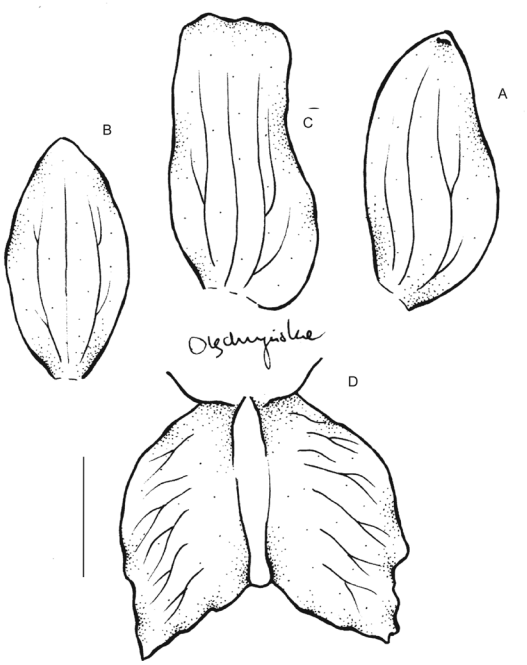

Fig. 85. *Gyaladenia lisowskiana* (Szlach. & Olszewski) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

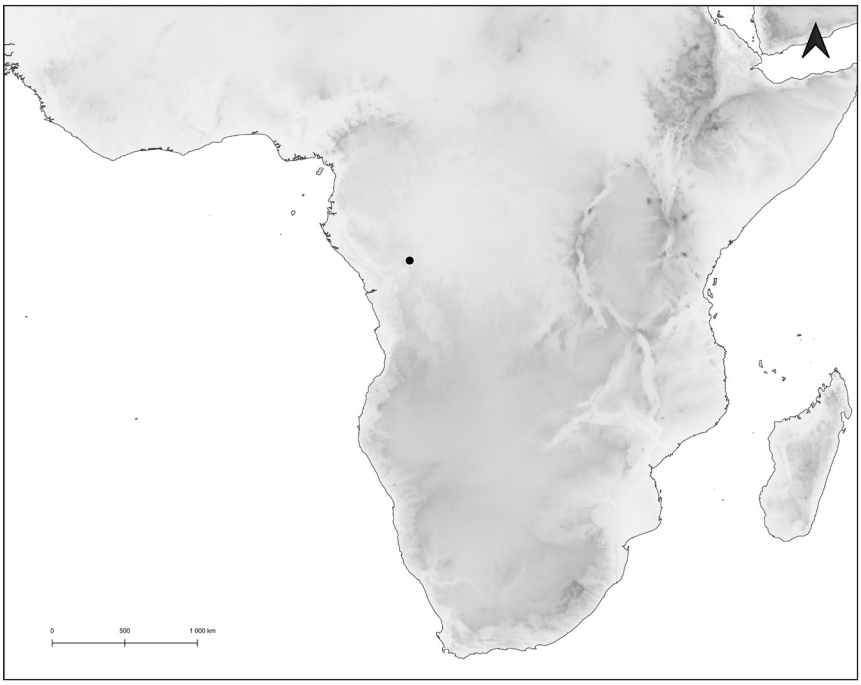

Fig. 86. Distribution map of *Gyaladenia lisowskiana* (Szlach. & Olszewski) Szlach.

apex. Lip 6 mm long, 6.7 mm wide, lunate in general outline, thickened along mid-vein, minutely papillate on both surfaces, notched at the apex, both lateral lobes rhombic, acute, divergent, irregulary dentate or erose along margins. Spur 6.-7 mm long, conical, slightly curved down, obtuse. Gynostemium ca 3 mm long.

Ecology: Sandy savanna. Flowering time: January.

General distribution: Known so far from The Republic of Congo only. Alt. 650 m.

Representative specimens: The Republic of Congo: Batekes Plateau, Ngokouba, alt. 650 m, 16 Jan. 1970, *Makany 1437* (P!, UGDA-DLSz! – copy, drawing).

Notes: This species appears to be related to *Gyaladenia conica*, from which it is easy to distinguish by smaller flowers, the lunate lip form, truncate petals apex and spur ca. two/third of the ovary and pedicel length.

Subgenus *Diplacorchis*

Beih. Bot. Centralbl. 38(2): 127. 1921. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 96. 2010.

Species classified to this subgenus have similar habit, i.e. elongate stem with usually numerous leaves of similar size, with little larger near the middle of the stem, and usually elongate, many-flowered and rather dense inflorescence. Their common character is connection between spur and lip lamina. Sides of the spur orifice are decurrent as a pair of prominent keels on the lip lamina and abruptly terminated above the lip base.

Only 4 species belong to this group.

6.1.3.7. *Gyaladenia disoides* (Ridl.) Szlach. (Figs. 87-90)

Richardiana 6: 8. 2006. ≡ *Habenaria disoides* Ridl., J. Linn. Soc., Bot. 21: 511. 1885. ≡ *Brachycorythis disoides* (Ridl.) Kraenzl., Orchid. Gen. Sp.: 543. 1898. ≡ *Diplacorchis disoides* (Ridl.) Schltr., Beih. Bot. Centralbl. 38(2): 131. 1921. Type: MADAGASCAR, *Deans Cowan s.n.* (Holotype: BM!, UGDA-DLSz! – copy).

Stem 15-36 cm tall, erect, delicate or relatively robust, glabrous, leafy throughout its length. Cauline leaves numerous, usually densely arranged along stem, alternate, 2.5-5 cm long and 1-1.2 cm wide, ovate, elliptic-ovate to lanceolate, acute to acuminate, glabrous. Inflorescence 7.5-15 cm long, densely, many-flowered. Flowers rather small, purple, rose or white-rose. Floral bracts up to 20 mm long, elliptic-ovate, acuminate, lower one longer than the pedicel and ovary, glabrous, leaf-like. Pedicel and ovary 8-15 mm long, glabrous. Dorsal sepal 6-10 mm long, 2.5-4.5 mm wide, ovate-lanceolate, obtuse, concave below the middle, 3-veined. Petals 5-10 mm long, 2.9-5 mm wide, oblong elliptic, somewhat sigmoid, basally subauriculate, obtuse, 3-veined. Lateral sepals 6.5-9.6 mm long, 3-5 mm wide, oblique, narrowly oblong to elliptic-ovate, obtuse, 3-veined. Lip 6-8 mm long and 5-6.5 mm wide, obscurely 3-lobed to entire, widest at the base, cordate, ovate to elliptic, obtuse, basaly contracted, with sides of spur orifice forming prominent keels on the lamina. Spur 5-7.5 mm long, cylindrical, dorsiventrally compressed, contracted basally, swollen near

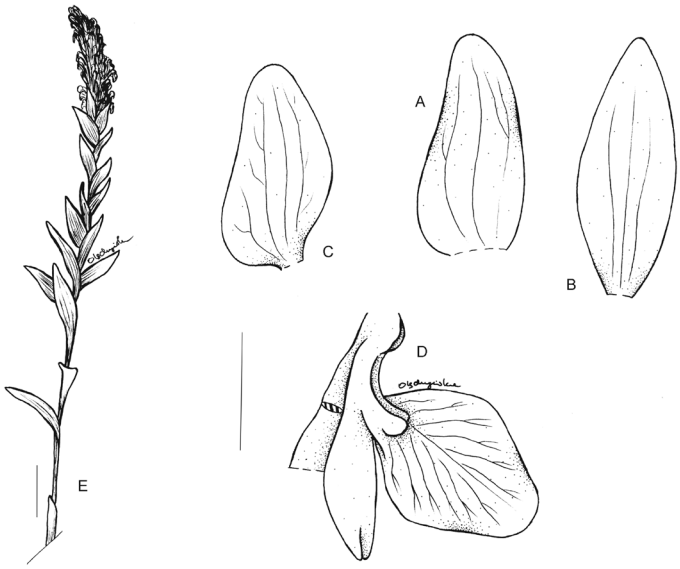

Fig. 87. *Gyaladenia disoides* (Ridl.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Perrier de la Bathie 8094,* K). Scale bar = 3 cm

the middle and prominently bilobed at the apex, acute. Gynostemium 3.2-5 mm long.

Ecology: In marsh, among grass on summits, on savanna. Flowering time: January-March.

General distribution: Madagascar. Alt. 1614-2200 m.

Representative materials: Madagascar: Ankafana, 1880, *Deans Cowan s.n.* (BM!, UGDA-DLSz! – copy); Betsileo-land, *Baron 194* (K!, UGDA-DLSz! – copy, drawing); Near Antsirabe, in marsh, alt. 1900 m, Jan. 1914, *Perrier de la Bathie 8094* (K!, P!, UGDA-DLSz! – copy, drawing); Near Ambatolampy, alt. 1800 m, Feb. 1925, *Perrier de la Bathie 17907* (K!, P!, UGDA-DLSz! – copy, drawing); Above Manjakatompo, Ankaratra, alt. 2200 m , Mar. 1961, *Bosser 15034* (P!, UGDA-DLSz! – copy, drawing); Ankaratra–Gebinge, *Hildebrandt 4210* (W!, UGDA-DLSz! – copy, drawing); Ankaratra Mts., among grass on summits, Feb., *Scott-Elliot 169* (K!); Fianarantsoa, Amoron'i Mania Region, savanna, 20°47'40"S, 47°20'10"E, alt. 1614 m, *Andriamihajarivo & Razafindrakoto & Nirima 1863* (MO!, UGDA-DLSz! – copy, drawing); *Sine loc., Bonet s.n.* (P!, UGDA-DLSz! – copy, drawing).

Notes: *Gyaladenia disoides* appears to be similar to its continental African congener, *G. rhomboglossa*, but has slightly larger flower segments, and different spur form. In the former species the spur is apically bilobed, attenuate towards acute apex, the middle part of the spur is swollen and its base is contracted. The spur of *G. rhomboglossa* is simple, i.e., cylindrical, slightly swollen and curved down at the obtuse apex. It seems the spur form is a permanent character discriminative

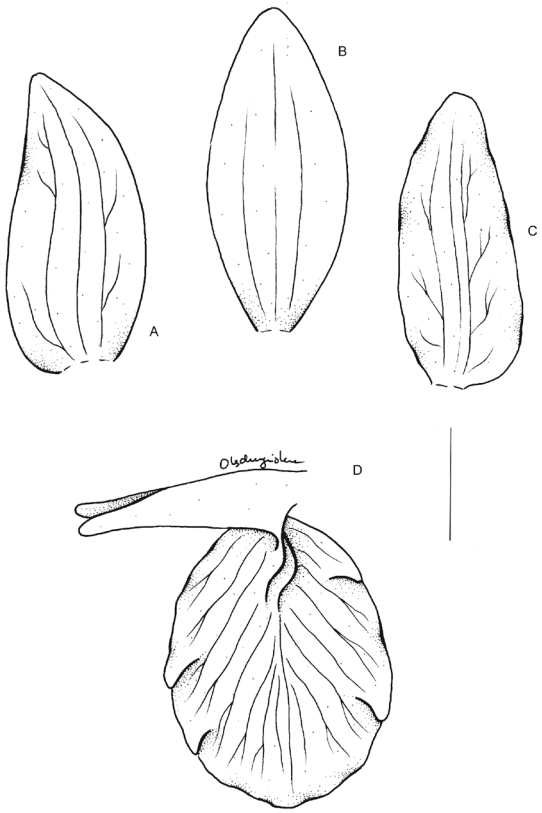

Fig. 88. *Gyaladenia disoides* (Ridl.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Bonet s.n.,* P). Scale bar = 3 cm

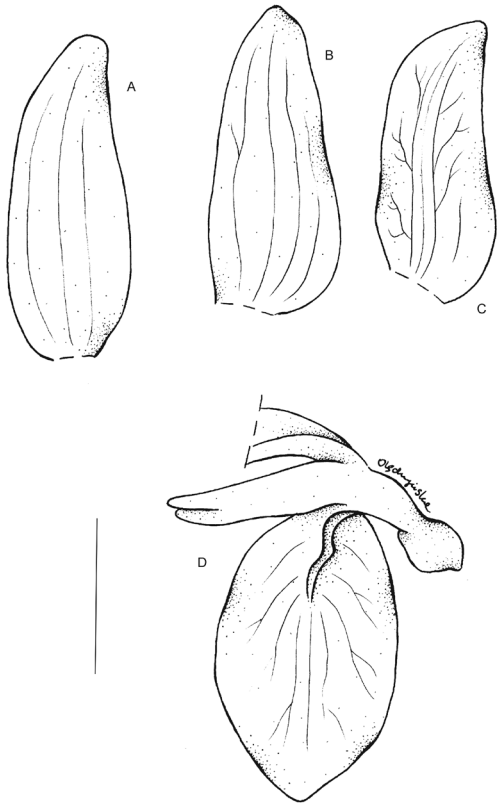

Fig. 89. *Gyaladenia disoides* (Ridl.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip *(drawn from Perrier de la Bathie 17907,* K). Scale bar = 3 cm

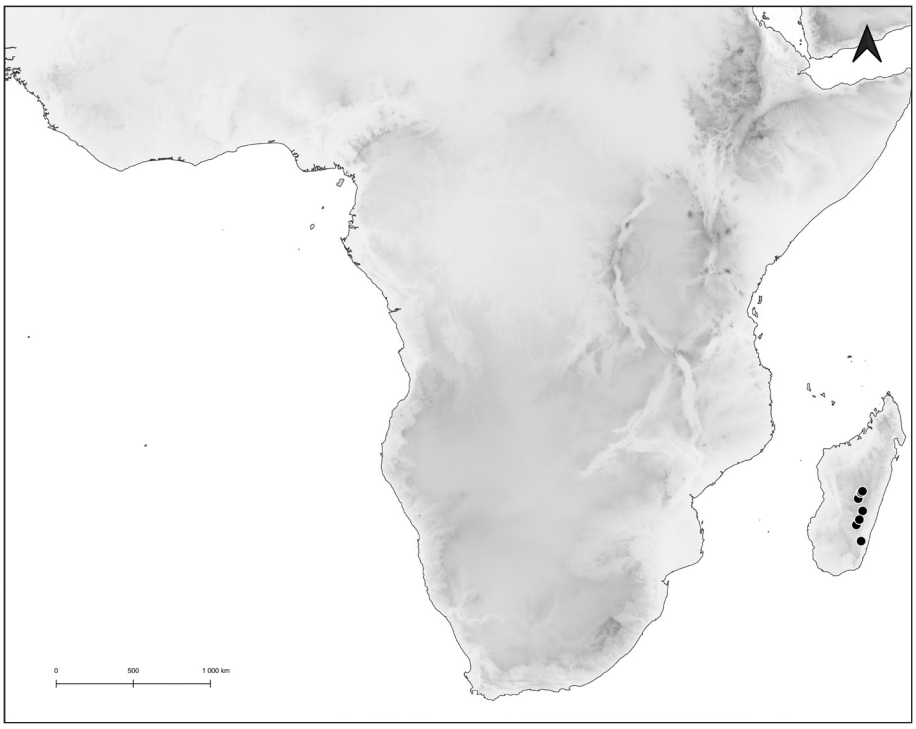

Fig. 90. Distribution map of *Gyaladenia disoides* (Ridl.) Szlach.

for both species, as the lip form is quite variable and can overlap in both taxa.

6.1.3.8. *Gyaladenia rhomboglossa* (Kraenzl.) Szlach. (Figs. 91-94)

Richardiana 4(2): 82. 2006. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 96. 2010. ≡ *Brachycorythis rhomboglossa* Kraenzl., Orchid. Gen. Sp. 1: 544. 1898; Type (Szlachetko *et al.* 2010: 96): THE DEMOCRATIC REPUBLIC OF THE CONGO (ZAIRE), *Laurent s.n.* (Lectotype: BR!, Isolectotype: K!, UGDA-DLSz! – copy).

Stem 20-40 cm tall, erect, delicate, glabrous, leafy throughout its length. Leaves 10-18, up to 3.5 cm long and 1 cm wide, lanceolate to oblanceolate, acute, glabrous, spreading, decreasing in size up the stem. Inflorescence 7-12 cm long, 10-20-flowered, rather lax or subdense. Flowers rather small. Floral bracts up to 30 mm long, ovate-lanceolate, acute to acuminate, glabrous, leaf-like. Pedicel and ovary 8-10 mm long, glabrous. Dorsal sepal 5-7 mm long, 2.3-2.9 mm wide, oblong-ligulate to oblong-ovate, convex, obtuse, 3-veined. Petals 5-7 mm long, 3 mm wide, oblong-elliptic, sigmoid, obtuse, 3-veined. Lateral sepals 6.5-7 mm long, 3-3.5 mm wide, obliquely oblong-elliptic, obtuse, 3- or 5-veined. Lip unlobed, 5.5-7 mm long, 3.5-5 mm wide, ovate to rhombic-ovate with ligulate, obtuse apex, thick and fleshy in the basal part, minutely papillate, with two high, decurrent keels terminating abruptly in front. Spur 6.5-8.5 mm long, cylindrical, slightly swollen and curved down at the apex, obtuse. Gynostemium 4.5-4.6 mm long, erect.

Ecology: On mountain slope, between camp and ridge, savanna-woodland, with many *Protea* trees, in

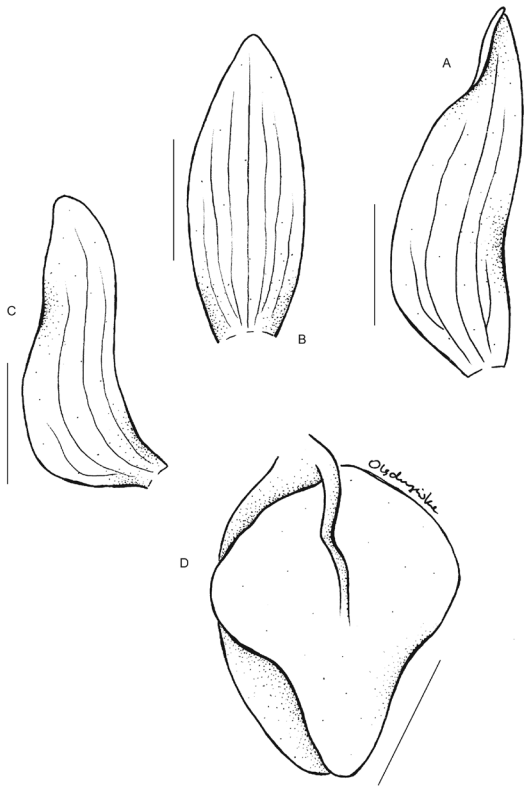

Fig. 91. *Gyaladenia rhomboglossa* (Kraenzl.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Krook 110,* W). Scale bar = 3 cm

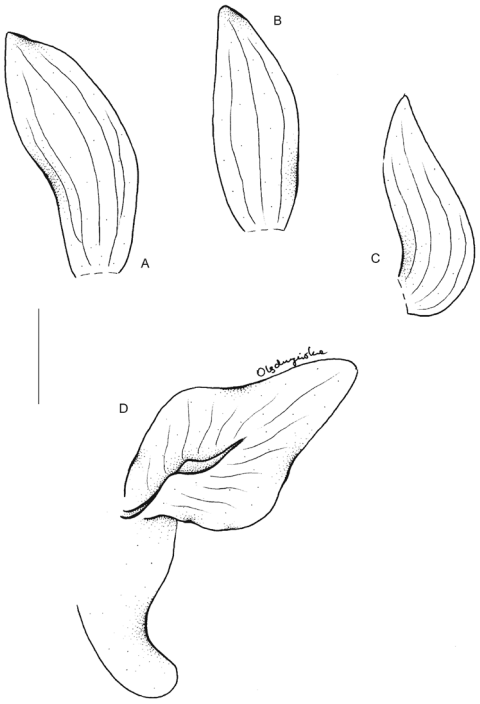

Fig. 92. *Gyaladenia rhomboglossa* (Kraenzl.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Krook 72,* P). Scale bar = 3 cm

Fig. 93. *Gyaladenia rhomboglossa* (Kraenzl.) Szlach.
Explanations: habit (drawn from *Cuthbert 26,* K). Scale bar = 3 cm

grassland, savanna, savanna-woodland, in sandy soils. Flowering time: January, March, August, December. General distribution: Guinea, Ivory Coast, The Democratic Republic of the Congo (Zaire), Tanzania, Angola, South Africa. Alt. no data.

Representative specimens: Guinea: Nzérékoré, Nimba Mts., mountain slope, between camp and ridge, savanna-woodland, with many Protea trees, *Jongkind 7838* (P!). Ivory Coast: In grassland on Nimba Mts. 10 Aug.1954, *Boughey X75* (BR!).

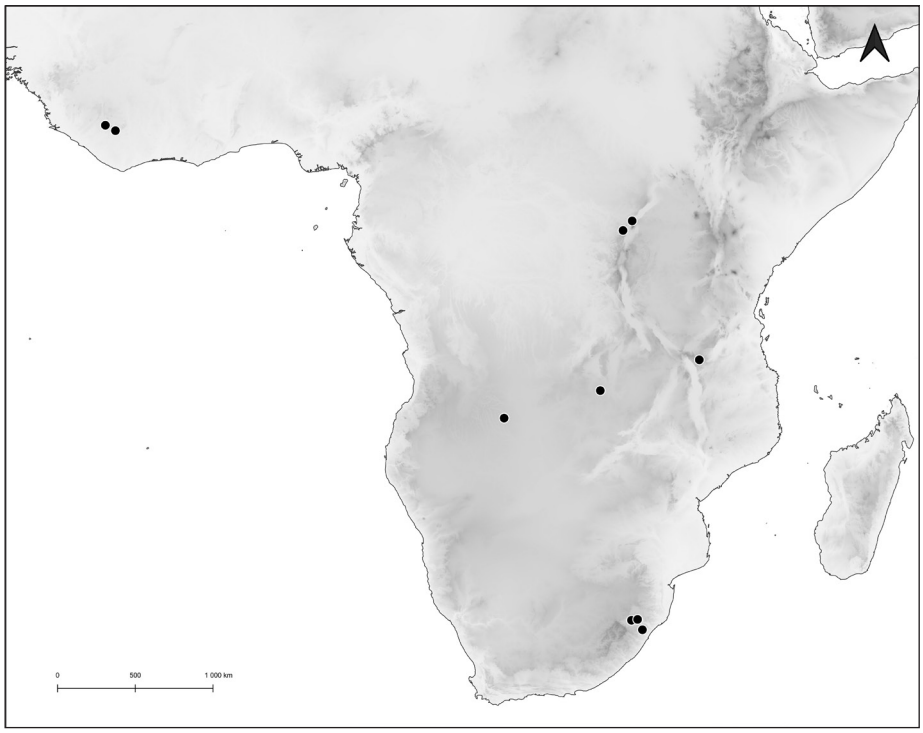

Fig. 94. Distribution map of *Gyaladenia rhomboglossa* (Kraenzl.) Szlach.

Democratic Republic of the Congo (Zaire): Kitimbo, Jan. 1908, *Kassner 2356* (K!); Upper Katanga, Kasenga terr., near Bwanga-Mukama village. 22 Jan. 1971, *Lisowski 66137* (UGDA-DLSz!); Elisabethville, near Lubumbashi, Jan. 1925, *von Hilschberg 174* (BR!). Tanzania: Ntombe, Uwemba Estate, damb tall grassland, Mar.1891, *Spurrier 107* (K!, UGDA-DLSz! – copy, drawing); *Sine loc.,* 9 Dec. 1895, *Laurent s.n.* (BR!, K!, UGDA-DLSz! – copy); *Sine loc.,* in sandy soil in Donga below hauses, *Cuthbert 26* (K!, L!). Angola: Moxico, by River Chibamba. 16 Jan. 1938, *Milne-Redhead 4162* (BR!, K!). South Africa: Natal, between Moritzburg and Bishopslan. 20 Jan. 1869, *Gueinzius 1046* (W!); Natal, Ladysmith, 1895, *Schlechter s.n.* (K!, UGDA-DLSz! – copy, drawing); KwaZulu Natal, Klipriver Distr., 2 Mar. 1895, *Krook 72* (P!, UGDA-DLSz! – copy, drawing); *Sine loc., Krook 110* (W!, UGDA-DLSz – copy, drawing).
Notes: This species by all modern authors is united with *Brachycorythis* (=*Gyaladenia*) *tenuior*, despite their clear difference in the lip shape. Differences between *G. rhomboglossa* and its close relative, *G. disoides*, from Madagascar are discussed above.

6.1.3.9. *Gyaladenia tenuior* (Rchb.f.) Szlach.
(Fig. 95, Plate III)

Richardiana 4(2): 82. 2006. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 22. 2007. – Szlachetko, Orchid. Ivory Coast: 35. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 96. 2010. ≡ *Brachycorythis tenuior* Rchb.f., Flora 48: 183. 1865; Type (Szlachetko 2007): SOUTH AFRICA, *Gueinzius s.n.* (Lectotype: W-R!, UGDA-DLSz! – copy) – Summerhayes, Kew Bull. 10: 247. 1955. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Summerhayes, FTEA, Orchid. 1: 19. 1968. – Williamson, Orchid. S. Centr. Afr.: 31. 1977. – Stewart *et al.*, Wild Orchid. S. Afr.: 73. 1982. – Geerinck, Fl. Afr. Centr., Orchid. 1: 41. 1984. – la Croix *et al.*, Orchid. Malawi: 33. 1991. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 17-18. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 76. 1998. – Linder & Kurzweil, Orch. South. Afr.: 83. 1999. – Perez-Vera, Orchid. Côte d'Ivoire: 116. 2003. – Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid. 36(1): 22. 2004. ≡ *Habenaria tenuior* (Rchb.f.) N.E.Br., Gard. Chron. 2(24): 307. 1885. ≡ *Platanthera tenuior* (Rchb.f.) Schltr., Bot. Jahrb. Syst. 20, Beibl. 50: 12. 1895. ≡ *Diplacorchis tenuior* (Rchb.f.) Schltr., Beih. Bot. Centralbl. 38(2): 128. 1921.
= *Brachycorythis crassicornis* Kraenzl., Vierteljahrsschr. Naturf. Ges. Zurich 74: 103. 1929; Type (Szlachetko *et al.* 2010): UGANDA, *Dummer 5533* (Lectotype: Z, Isolectotype: K!).

Tubers 1-3.5 cm long, ellipsoid to ovoid. Stem 20-64 cm tall, erect, delicate, glabrous, leafy throughout its length. Leaves 12-28, up to 5.5 cm long and 1.5 cm wide, ovate-lanceolate to lanceolate, acute, glabrous, erect to suberect, decreasing its size up the stem. Inflorescence 4.5-16 cm long, (8)12-30-flowered, dense. Flowers rather small, purple or violet, often with darker spots or whitish portions. Floral bracts up to 30 mm long, ovate-lanceolate, acute to acuminate, glabrous, leaf-like. Pedicel and ovary 6-13 mm long, glabrous. Dorsal sepal 5-10 mm long, 2-5 mm wide, elliptic to elliptic-ovate, convex, obtuse, cucullate at the apex, 3-veined. Petals (4.5)5.5-9.5 mm long, 1.9-3.7 mm wide, oblong, sigmoid, obtuse, somewhat cochleate, 3-veined. Lateral sepals 6-12 mm long, 2-4.5 mm wide, obliquely oblong-ovate, subobtuse, 3-veined. Lip rather obscurely and very unequally 3-lobed above the base, 6.5-9.5 mm long and (2.8)3.8-7.5 mm wide in total, thick, fleshy, minutely papillate; middle lobe 2.5-4.5 mm long, ca 1.9-3 mm wide, oblong to ligulate, obtuse, with two decurrent keels terminating abruptly in front; lateral lobes 1-1.5 mm long, 3 mm wide, triangular to triangular-ovate, rounded at the apex. Spur 5-12 mm long, cylindrical, curved down above the middle, slightly swollen towards obtuse apex. Gynostemium (3)4-6 mm long, erect.
Ecology: Open grassy areas, dambo margins, tall grass woodlands, in grassy swamp, in damp flushes in peaty soil. Flowering time: January-February, April, June-July, November.
General distribution: Guinea, Sierra Leone, Central African Republic, Gabon, The Democratic Republic of the Congo (Zaire), Angola. Alt. 300-1600 m.
Representative specimens: Guinea: Massif de Fon, Jul. 1945, *Schnell 3098bis* (P!, UGDA-DLSz! – copy, drawing). Sierra Leone: Lome Mts., alt. 1600 m, 29 Jul. 1964, *Jaeger 6935* (P!, UGDA-DLSz! – copy, drawing); Lome Mts., in damp flushes in peaty soil, 15 Jun. 1966, *Morton SL3558* (P!, UGDA-DLSz! – copy, drawing). Central African Republic: Ouaka Region, grassy swamp, 10 km W Moroubas, 6 Apr. 1923, *Tisserant 1194b* (BM!, P!); Bozoum, *Tisserant s.n.* (Cribb & Fay 1986). Gabon: Sibange Farm, Jan. 1882, *Soyaux 365* (K! – drawing); Libreville, Nov. 1894, *Thollon 1082* (P!, UGDA-DLSz! – copy, drawing). Democratic Republic of the Congo (Zaire): *Sine loc., Lacomte s.n.* (P!). Uganda: Bugabe malina Mengo Distr.. Sep. 1922, *Dummer 5533* (K). Kenya: Kakamega, Jul. 1943. *Carroll s.n.* (K). Angola: "Am Quiriri oberhalb Sibi", alt. 300 m, 20 Feb. 1900, *Sine col., 694A* (B†); Libreville, 1890-91, *Thollon 4071* (P!). Zimbabwe: Salisbury. Chakoma Vlei. 17 Jan. 1953, *Greatrex 41248* (K!); Inyanga Distr. Cheshire. 15 Jan. 1931. *Norlindh & Weimarck 4397* (K); Melsetter Distr., Chimanimani Mtns., 10 Feb. 1954, *Ball 218* (K!).
Notes: This species can be easily separated from closely related *Gyaladenia engleriana* by the form of

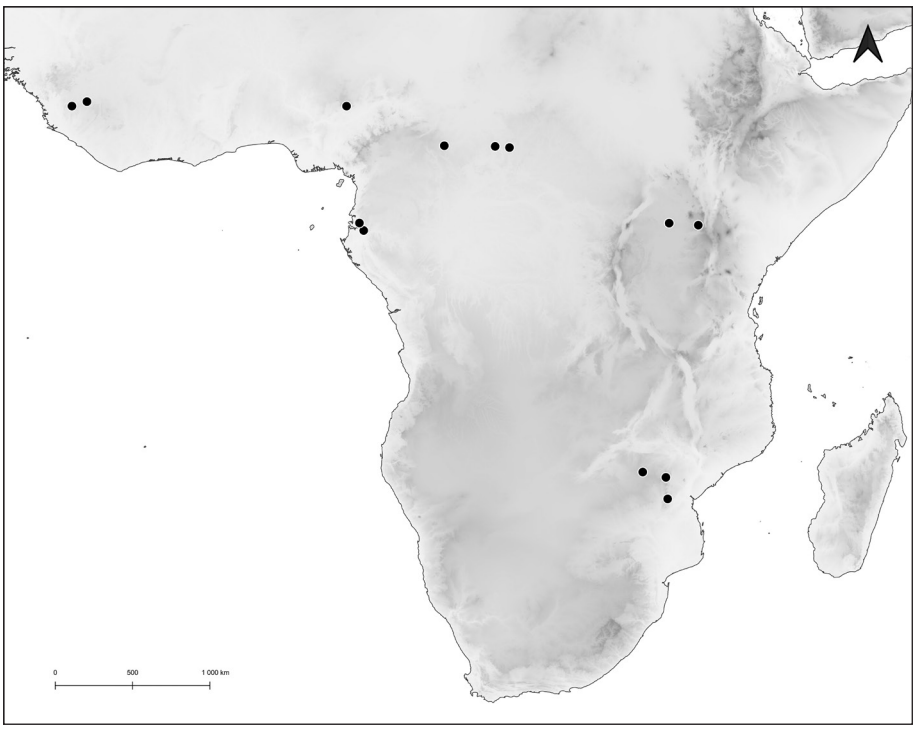

Fig. 95. Distribution map of *Gyaladenia tenuior* (Rchb.f.) Szlach.

lip lateral lobes, which are relatively small, triangular to triangular-ovate, rounded at the apex (vs obliquely triangular to rhombic, obtuse to subacute, margins more or less dentate or erose, somewhat undulate).

Given from the Republic of Congo by Sita & Moutsambote (1988), but we have seen no materials of this species from this country.

6.1.3.10. *Gyaladenia engleriana* (Kraenzl.) Szlach. (Figs. 96-97)

Richardiana 6(2): 81. 2006. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 97. 2010. ≡ *Gyaladenia engleriana* Kraenzl. Bot. Jahrb. Syst. 22: 20. 1896; Type (Szlachetko *et al.* 2010: 97): CAMEROON, *Zenker s.n.* (Lectotype: HBG!, UGDA-DLSz! – copy, drawing). ≡ *Brachycorythis engleriana* Kraenzl., Bot. Jahrb. Syst. 22(1): 20. 1895. ≡ *Platanthera engleriana* (Kraenzl.) Rolfe, Fl. Trop. Afr. 7: 204. 1898. ≡ *Diplacorchis engleriana* (Kraenzl.) Schltr., Beih. Bot. Centralbl. 38(2): 129. 1921.

Stem 30-60 cm tall, erect, delicate, glabrous, leafy throughout its length. Leaves numerous, up to 5 cm long and 1 cm wide, ovate-lanceolate to lanceolate, acute, glabrous, erect to suberect, decreasing its size up the stem. Inflorescence 5-11 cm long, 10-25-flowered, dense. Flowers rather small, purple or violet, often with darker spots or whitish portions. Floral bracts up to 20 mm long, ovate-lanceolate, acute to acuminate, glabrous. Pedicel and ovary 11-12 mm long, glabrous. Dorsal sepal 5-9 mm long, 2.3-4 mm wide, elliptic, convex, obtuse, cucullate at the apex, 3- or 5-veined. Petals 6-8 mm long, 2-4 mm wide, oblong, sigmoid, obliquely obtuse to truncate, basally subauriculate, somewhat cochleate, 3-veined. Lateral sepals 6-10 mm long, 3.2-5 mm wide, obliquely oblong-ovate to ovate, subobtuse to acute, 3- or 5-veined. Lip distinctly and unequally

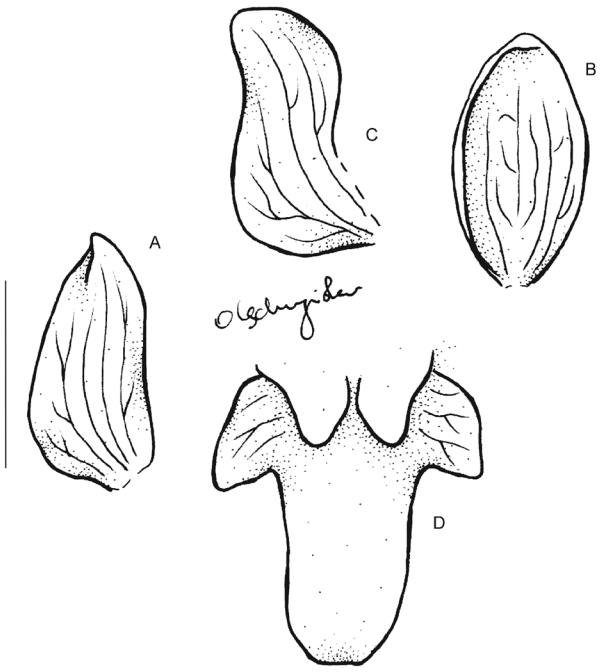

Fig. 96. *Gyaladenia engleriana* (Kraenzl.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

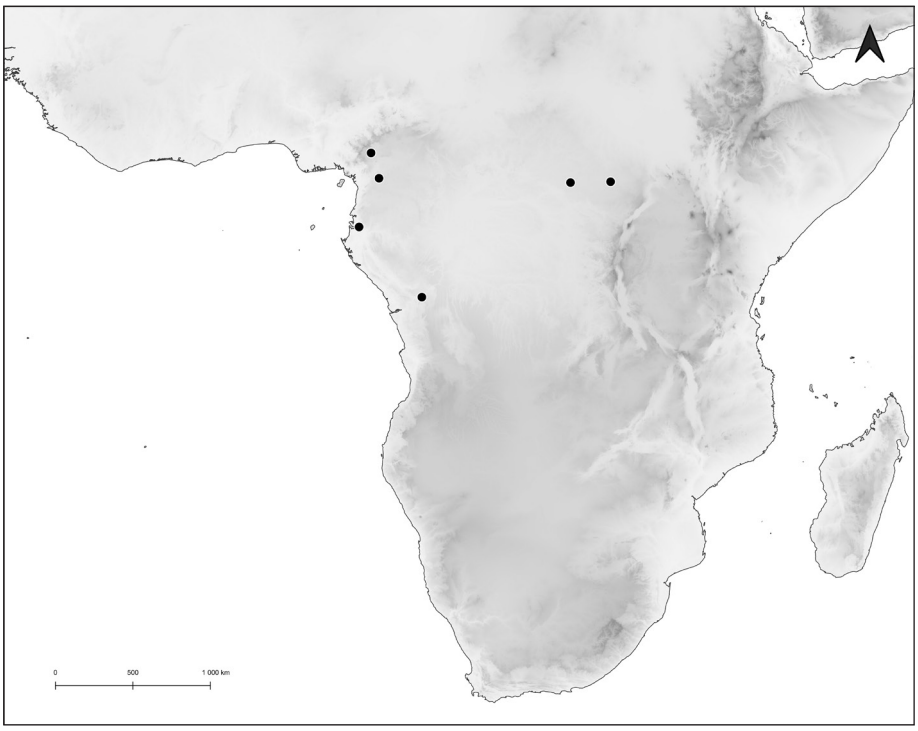

Fig. 97. Distribution map of *Gyaladenia engleriana* (Kraenzl.) Szlach.

3-lobed above base, 6.5-9 mm long and 3-7 mm wide in total, thick, fleshy, minutely papillate; middle lobe (2.5) 3-4 mm long, ca. 2-3 mm wide, oblong to ligulate, obtuse, with two decurrent keels terminating abruptly in front; lateral lobes 2-4.5 mm long, 1.8-4 mm wide, obliquely triangular to rhombic, obtuse to subacute, margins more or less dentate or erose, somewhat undulate. Spur 5-10 mm long, cylindrical, curved down at the obtuse apex. Gynostemium 4-6 mm long, erect.

Ecology: Open grassy areas, in grassy swamp, dambo, woodlands, margin of river. Flowering time: February, July-August, November-December.

General distribution: Cameroon, Gabon, The Republic of Congo, The Democratic Republic of the Congo (Zaire). Alt. 800-1250 m.

Representative specimens: Cameroon: Near Djikaine, 4 km from Foumban, 5°43'N, 10°55'E, alt. 1200 m, 7 Jul. 1972, *Leeuwenberg 10172* (WAG!, UGDA-DLSz! – copy, drawing); Yaounde, *Zenker s.n.* (HBG!). Gabon: Libreville, Nov. 1894, *Thollon 164* (P!, UGDA-DLSz! – copy, drawing). The Republic of Congo: *Sine loc.* 11 Dec. 1895, *Lecomte s.n.* (P!). Democratic Republic of the Congo (Zaire): Uele, just W of the Uganda border, *Chandler 72* (K!); Dungu, Parc Natl. de la Garamba, env. crete Congo-Nil, piste centrale vers km 113, alt. 800-900 m, 15 Aug. 1952, *Troupin 1926* (BR, P!). Angola: "Am Longa oberhalb Nimesera", alt. 1250 m. 2 Feb. 1900, *Baum 694* (BM!, K!, W!, UGDA-DLSz! – copy, drawing); Huilla, Vila de Ponte, Ganguellas, margins of River Cubango, Dec. 1905, *Gossweiler 1979* (K!).

Notes: This species differs easily from both *Gyaladenia rhomboglossa* and *G. tenuior* by distinctly 3-lobed lip above the base. Lateral lip lobes of *G. engleriana* are obliquely triangular to rhombic, obtuse to subacute, margins are more or less dentate or erose, somewhat undulate.

6.1.4. *AFRORCHIS* Szlach.

Richardiana 4(2): 82. 2006; Generitype: *Afrorchis angolensis* (Schltr.) Szlach. [≡ *Brachycorythis angolensis* (Schltr.) Schltr.]. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 23. 2007. – Szlachetko, Orchid. Ivory Coast: 28. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 103. 2010.

Roots thick, fleshy, clustered. Stem rather stout, leafy through its length, glabrous or velvety hairy. Leaves either several, in the lower part of the stem, distinctly decreasing in size upwards, or numerous, subsimilar in size, arranged along stem, sessile, glabrous or velvety hairy. Inflorescence multi-flowered, often very dense. Flowers broadly opened. Floral bracts leaf-like. Sepals and petals dissimilar in form. Lip 3-lobed at the apex, lobes equal or not in length, the middle one thickened along midvein. Spur short, ovoid to ovoid-saccate with very wide orifice, sides of the spur urgently disappearing on the lamina. Anther erect, connective narrow, blunt, locules close to each other, parallel. Pollinia massulate, caudicles shorter than pollen mass. Stigma entire, oval to elliptic, slightly concave in the centre. Rostellum

tongue-like, the middle lobe pleated, both lateral lobes in close contact to each other. Viscidia naked. Auricles prominent.

Afrorchis includes 5 African species. All of them have lip rather obscurely 3-lobed at the apex, all lobes are subsimilar, and the spur is relatively short with very wide orifice, more or less ovoid to ovoid-saccate.

Key to the species:

1. Stem leafy throughout its length, the largest ones near the middle of the stem 2
1. The largest leaves gathered in the lower part of the stem 4
2. Plants velvety hairy ..... *A. pilosa*
2. Plants glabrous 2
3. Sepals 4.8-8 × 1-3.6 mm, lip middle lobe transversely elliptic, truncate or retuse, lateral lobes distinctly shorter than the middle one ..... *A. congoensis*
3. Sepals 7.3-14.3 × 2-5.4 mm, lip lobes equal in length, lateral lobes longer than the middle one ..... *A. sceptrum*
4. Plant with two different types of stem, i.e. sterile and flowering ones, lip wider than long ..... *A. angolensis*
4. Plant with single type of stem, lip longer than wide ..... *A. paucifolia*

6.1.4.1. *Afrorchis congoensis* (Kraenzl.) Olędrz. & Szlach., comb. nov. (Figs. 98-99)

Basionym: *Brachycorythis congoensis* Kraenzl., Orchid. Gen. Sp. 1: 544. 1898; Type (Szlachetko *et al.* 2010): THE DEMOCRATIC REPUBLIC OF THE CONGO (ZAIRE), *Debeerst 81* (Lectotype: BR!, K! – drawing; UGDA-DLSz! – copy, drawing). – Summerhayes, FTEA, Orchid. 1: 19. 1968. – Geerinck, Fl. Afr. Centr., Orchid. 1: 39. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 18. 1995. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 113. 2010.

= *Brachycorythis hirschbergii* Braid, Bull. Misc. Inform. Kew 1925: 358. 1925; Type: THE DEMOCRATIC REPUBLIC OF THE CONGO (ZAIRE), *von Hirschberg 134* (Holotype: K!, Isotypes: K!, PRE, BR!, UGDA-DLSz! – copy, drawing).

Roots thick, fleshy, cylindrical, woolly. Stem 40-100 cm tall, erect, rather stout, glabrous. Leaves usually numerous, often 5-25, 4-8 cm long, 0.8-3 cm wide, broadly lanceolate or oblong-ovate, acute, glabrous, erect, imbricating, decreasing in size up the stem. Inflorescence 6-30 cm long, densely 20-50-flowered. Flowers - sepals purplish outside, whitish inside, petals whitish, lip mauve to purple, white in the center with purple dots. Floral bracts up to 40 mm long, lanceolate, acuminate, glabrous, the lower ones longer than the flowers. Dorsal sepal 4.8-8 mm long, 1-3.6 mm wide, oblong to elliptic, concave, subobtuse, 3-veined. Petals 4.8-8 mm long, 1-3 mm wide, obliquely oblong or ligulate, truncate or retuse at the apex, 3-veined. Lateral sepals 5-8 mm long, 2-3.6 mm wide, obliquely oblong or elliptic, acute, 3-veined. Lip 5-9 mm long, 4-7.5 mm wide, broadly ovate-elliptic or ovate in general outline, 3-lobed in the apical part, with a keel running along the mid-vein and a pair of keels on its both sides disappearing just above the base; middle lobe 2-3.8 mm long, 2-3.5 mm wide, transversely elliptic, truncate or retuse, with or without a triangular apiculus in the center; lateral lobes distinctly shorter than the middle one, obliquely

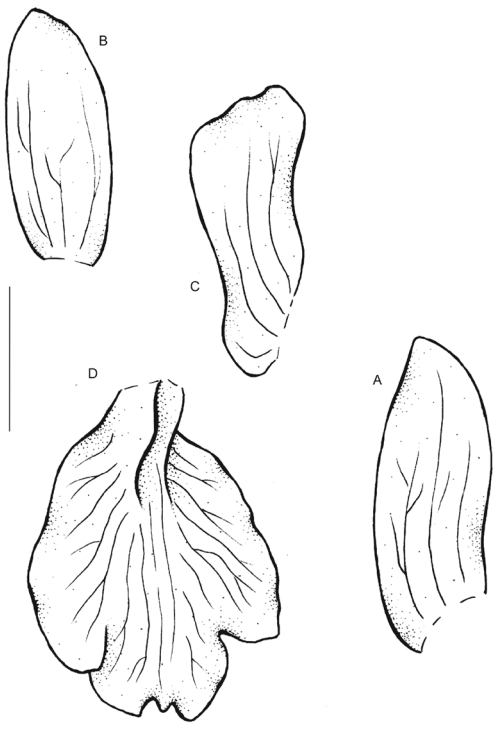

Fig. 98. *Afrorchis congoensis* (Kraenzl.) Olędrz. & Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

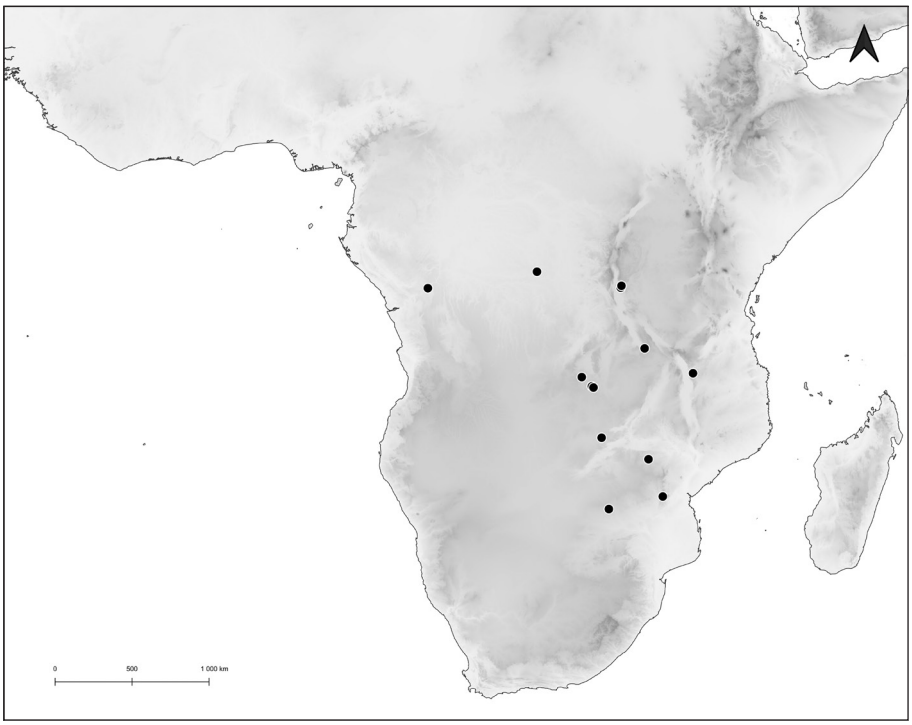

Fig. 99. Distribution map of *Afrorchis congoensis* (Kraenzl.) Olędrz. & Szlach.

oblong-ovate, rounded. Spur 2.5-4(5.5) mm long, (2.4)3-5 mm wide, conical-saccate, obtuse. Gynostemium 3.3-5.2 mm long.

Ecology: In dambo, in humid herb savanna, in forest, in grassland, in fairly dry peaty marsh in black soil near stream, in swamp grassland. Flowering time: January, September, November-December.

General distribution: The Democratic Republic of the Congo (Zaire), Burundi, Zambia, Zimbabwe. Alt. 975-1500 m.

Representative specimens: Democratic Republic of the Congo (Zaire): Tanganyika Distr., Haut Marungu, Jan. 1895, *Debeerst 81* (BR!, K!, UGDA-DLSz – copy, drawing); Sankuru Distr., Lubifu-Lusembo. Sep. 1910, *Kassner 3319* (BM!); Entre Likasi et Madingushia, dambo, 24 Nov. 1981, *Mesmaeker 2* (BR!); Kipopo, humid stepp savanna, 25 Dec. 1981, *Schaijes 1258* (BR!, UGDA-DLSz! – copy, drawing); Kafubu, in forest, Jan. 1923, *De Giorgi 359* (K!, UGDA-DLSz! – copy); Haut Katanga Distr., Lubumbashi Valley, 13 Dec. 1923, *von Hirschberg 134* (K!, UGDA-DLSz! – copy); Shaba Region, grassland, alt. 975 m, 2 Jan. 1983, *Shaijes 1746* (K!, UGDA-DLSz! – copy). Burundi: Nyanza-lac., plaine, marais, 22 Dec. 1969, *Lewalle 4231* (BR!, UGDA-DLSz! – copy, drawing); Dunga (Mosso), Prov. Bururi, savanna a Entada et Combretum, 4°12'S, 30°00'E, alt. 1350 m, 14 Dec. 1977, *Reekmans s.n.* (BR!). Zambia: Abercorn Distr., Kali dambo, in fairly dry peaty marsh 2.5-3 ft, 15 Jan. 1955, *Richards 4085* (BR!, UGDA-DLSz! – copy, drawing); 7 miles of Lusaka, 4000 ft , grassland especially black soil near stream, 2 Jan.1956, *King 251* (K!). Zimbabwe: Matobo Distr., swamp grassland, alt. 4800 ft, *Miller 4037A* (K!); Distr. Abercorn, 1945-1951, *Bullock 3653* (K!, UGDA-DLSz! – copy); Melsetter Distr., 10 miles W of Melsetter, alt. 1500 m, Dec. 1952, *Crook 426* (K!).

Notes: *Afrorchis congoensis* is very similar in habit to *A. pilosa* and both share numerous leaves, densely arranged along rather stout, and erect stem. The former, however, can be easily distinguishable by glabrous stem and leaves (vs both densely velvety hairy) and by its large transversely elliptic, truncate or retuse lip middle lobe (vs triangular, subacute).

6.1.4.2. *Afrorchis pilosa* (Summerh.) Szlach. (Figs. 100-102)

Richardiana 4(2): 82. 2006. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 103. 2010. ≡ *Brachycorythis pilosa* Summerh., Kew Bull. 10: 259. 1955; Type: TANZANIA, *Bullock 2031* (Holotype: K!, UGDA-DLSz! – copy) – Summerhayes, FTEA, Orchid. 1: 25. 1968. – Geerinck, Fl. Afr. Centr., Orchid. 1: 42 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 23. 1995.

Roots tuberous, fleshy, clustered. Stem 25-70 cm tall, erect, stout, densely velvety hairy. Cauline leaves numerous, up to 5 cm long and 1.5 cm wide, sessile, lanceolate or ovate-lanceolate, acute to acuminate, densely velvety hairy. Inflorescence 10-20 cm long, densely many-flowered. Flowers cream-coloured or yellowish-white, the lip rose-coloured. Floral bracts densely velvety, the lower ones distinctly longer than

Fig. 100. *Afrorchis pilosa* (Summerh.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip, E – habit (drawn from *Schaijes 1590,* BR). Scale bar = 3 cm

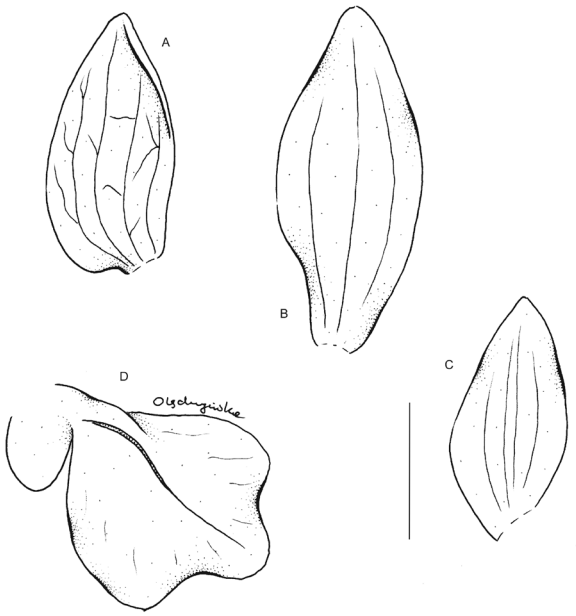

Fig. 101. *Afrorchis pilosa* (Summerh.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Holmes 0307,* K). Scale bar = 3 cm

flowers. Pedicel and ovary 10-12 mm long, densely velvety hairy. Dorsal sepal 5-7.5 mm long, up to 3 mm wide, oblong elliptic, obtuse, cucullate at the apex, sparsely pubescent outside, 3-veined. Petals 4-7 mm long, 1.9-3.1 mm wide, obliquely oblong-ovate, rounded, 3-veined. Lateral sepals 5-9 mm long, 2.5-4.5 mm wide, obliquely oblong-elliptic, subobtuse, sparsely pubescent outside, 3-veined. Lip 3.5-7.5 mm long and wide, ovate to suborbicular in outline, more or less 3-lobed at the apex; middle lobe ca 1 mm long, triangular, subacute; lateral lobes equal to the middle one, obliquely triangular, subacute. Spur up to 3 mm long, ovoid-saccate, rounded. Gynostemium 2.5-4.2 mm long. E c o l o g y : In grassland, in red soil, in savanna, in scrub woodland at the edge of watershed plain. Flowering time: September, December.

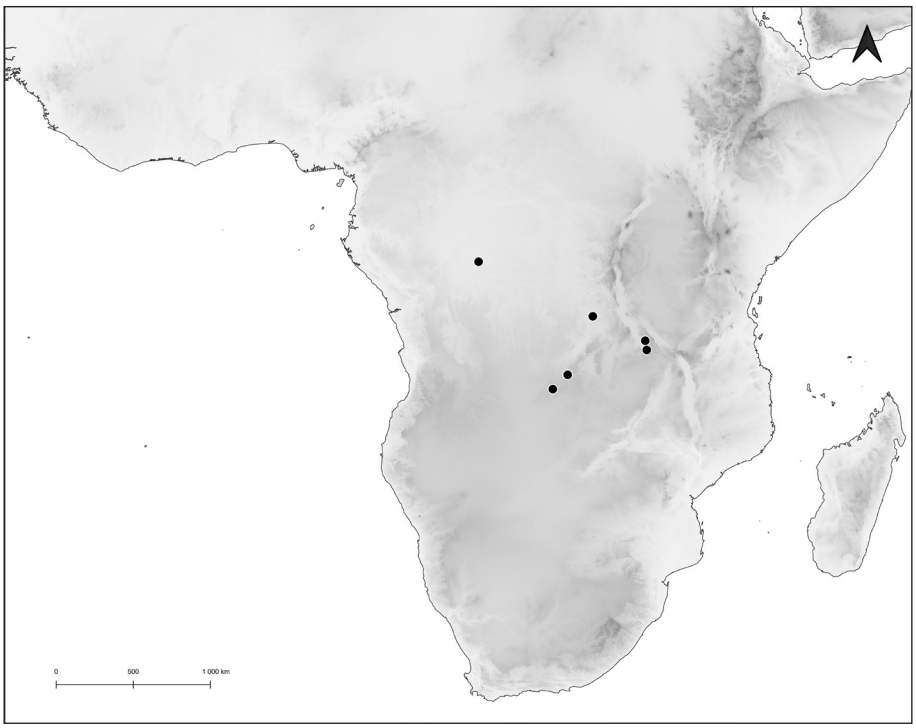

Fig. 102. Distribution map of *Afrorchis pilosa* (Summerh.) Szlach.

General Distribution: Democratic Republic of the Congo (Zaire), Tanzania, Zambia. Alt. 1680-1800 m. Representative specimens: Democratic Republic of the Congo (Zaire): Upper Katanga, Musinga river source, Kolwezi zone, *Schaijes 1590* (BR!, UGDA-DLSz! – copy, drawing); Lac Lèopold II Distr., between Katokokombe and Lodja, in savanna, Sept. 1932, *Lebrun 6191*(BR!). Tanzania: Ufipa Distr., Chapota, alt. 1800 m. 4 Dec. 1949, *Bullock 2031* (K!); [Tanganyika], Mosya Distr, top of Chimala Escarpment, in graslsland, in red soil, alt. 2100 m, *Richards 18561* (K!, UGDA-DLSz! – copy, drawing); Zambia: Mwinilunga Distr., Source of W Lungu River, scurb woodland at the edge of watershed plain, *Holmes 0307* (K!, UGDA-DLSz! – copy, drawing); Mbala (old Abercorn) Distr., Kawimbe, alt. 1680 m, 21 Dec. 1956, *Richards 7318* (BR!, UGDA-DLSz! – copy, drawing). Notes: This species is easy to recognize by its velvety hairy covers of the stem and leaves. It differs from similar *Afrorchis congoensis* by the lip form, especially the middle lobe, which is triangular and acute (vs transversely elliptic, truncate or retuse).

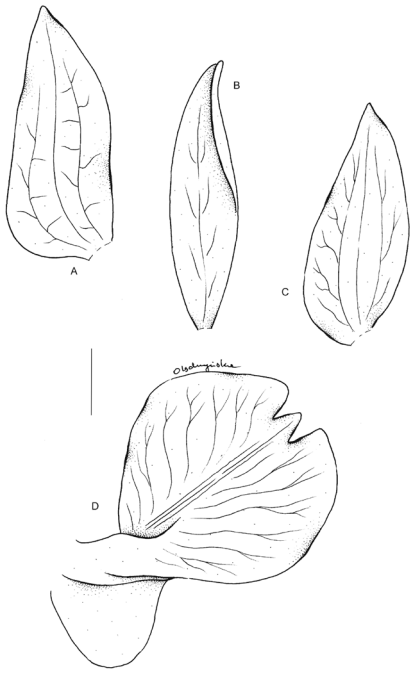

Fig. 104. *Afrorchis sceptrum* (Schltr.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Letouzey 11330,* BR). Scale bar = 3 cm

6.1.4.3. *Afrorchis sceptrum* (Schltr.) Szlach.
(Figs. 103-107)

Richardiana 4(2): 83. 2006. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 23. 2007. – Szlachetko, Orchid. Ivory Coast: 28. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 104. 2010. ≡ *Brachycorythis sceptrum* Schltr., Beih. Bot. Centralbl. 38(2): 114. 1921; Type: CAMEROON, *Walker s.n*. (Syntype: B†); CAMEROON, *Range 80* (Syntype: B†) – Summerhayes, FWTA, ed. 1, 2: 407. 1936. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 68. 1998.

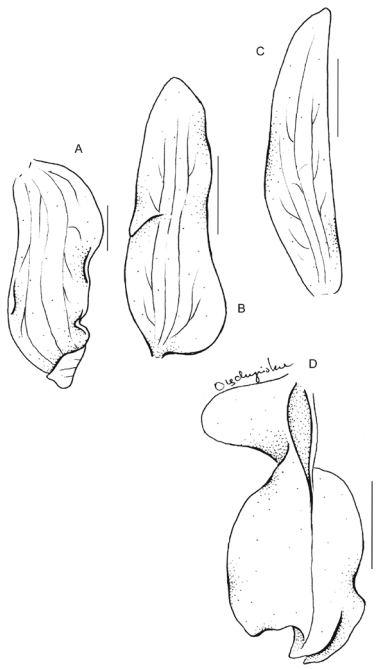

Fig. 103. *Afrorchis sceptrum* (Schltr.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Chipp 531*, K – lectotype). Scale bar = 3 cm

Fig. 105. *Afrorchis sceptrum* (Schltr.) Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Tisserant 2872,* P). Scale bar = 3 cm

Fig. 106. *Afrorchis sceptrum* (Schltr.) Szlach.

Explanations: habit (drawn from *Walker s.n.*, B). Scale bar = 3 cm

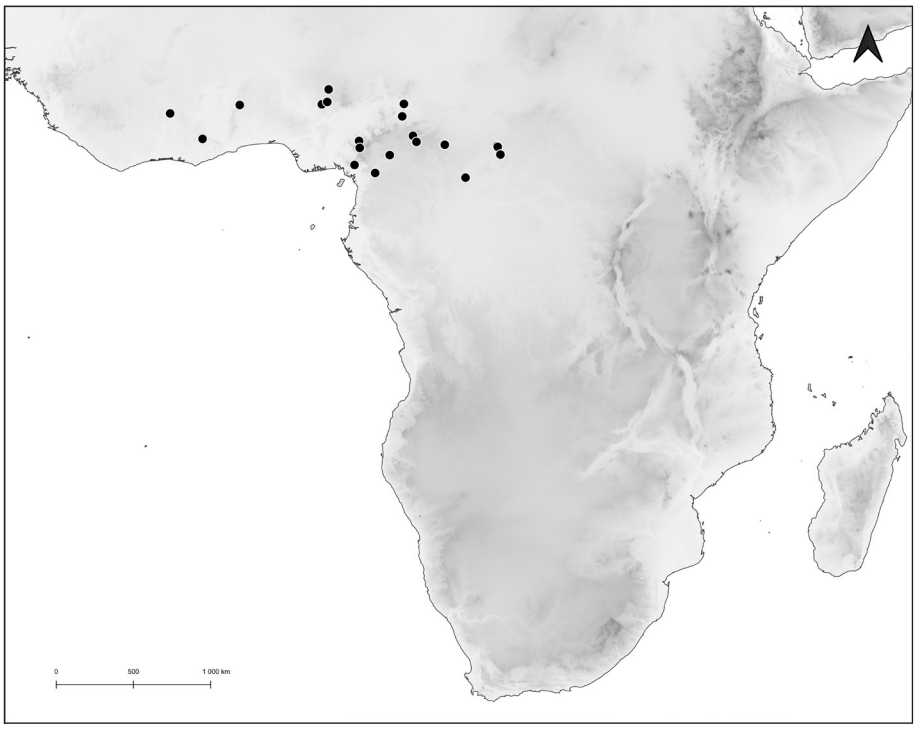

Fig. 107. Distribution map of *Afrorchis sceptrum* (Schltr.) Szlach.

= *Diplacorchis ashantensis* Summerh., Bull. Misc. Inform. Kew 1931: 378. 1931; Type (Szlachetko 2007: 23): GHANA, *Chipp 531* (Lectotype: K!, UGDA-DLSz! – copy, drawing).

Roots tuberous fleshy, cylindrical, clustered. Stem 50-100 cm tall, erect, stout, glabrous, densely-leafy, occasionally leaves distantly placed along stem. Cauline leaves up to 35 or so, 4-9 cm long, up to 3 cm wide, sessile, broadly lanceolate to ovate-lanceolate, acute to acuminate, glabrous, mid-nerves well-seen on the lower surface, covered by large swollen cells, suberect, decreasing in size up the stem. Inflorescence 13-25 cm long, up to 70-flowered, dense, cylindrical. Flowers medium-sized, sepals and petals greenish-white, lip pinkish-purple. Floral bracts 17-45 mm long, lanceolate, acuminate, glabrous, the lower ones distinctly longer than flowers. Pedicel and ovary 12-20 mm long, glabrous. Dorsal sepal 7.7-14.3 mm long, 2-6.2 mm wide, oblong ovate, subacute, cucullate at the apex, glabrous, 3-veined. Petals 7.3-12.6 mm long, 3-6 mm wide, obliquely ovate-lanceolate to elliptic-ovate, subauriculate at the base, subacute to rounded, cucullate, minutely papillate on both sides, 3-veined. Lateral sepals 7.3-13 mm long, 2.7-5.4 mm wide, obliquely oblong-ovate, subacute to subobtuse, semi-cucullate at the apex, revolute on margins, glabrous, 3-veined. Lip 10-12 mm long, 11-14 mm wide, transversely elliptic-reniform to rotundate-ovate, thickened along mid-vein, densely papillate, obscurely 3-lobed at the apex; middle lobe ca. 1 mm long, tongue-like, obtuse; lateral lobes longer than middle one, rounded to triangular at the apex, erose along margins. Spur 2-7 mm long, coical-saccate, obtuse. Gynostemium 4-6 mm long.

Ecology: In savanna, in shade, in tall grass among shrubs, in grassland. Flowering time: June-August.

General distribution: Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Central African Republic. Alt. 488-2134 m.

Representative specimens: Ivory Coast: S of Gansè, in savanna, in shade 3°55'W, 8°37'N, 11 Aug. 1967, *Geerling & Bokdam 694* (W!). Ghana: Ashanti, Northern Province, Amoma, amongst the grass savannah country, 06 July 1913, *Chipp 531* (K!). Togo: Alèdjo Forest Reserve, Reg. II, 18 Jul. 1984, *Akè Assi 16649* (P!, UGDA-DLSz! – copy, drawing). Nigeria: Nothern Region, Zaria Prov., Kurantan, Kagarko Distr., tall grass among shrubs, alt. ca. 488 m, 5 Jul. 1957, *Summerhayes 122* (K!, UGDA-DLSz! – copy, drawing); Zaria Prov., in grassland, alt. 2134 m, *King 145* (K!); Plateau Prov., Dogon Kurmi F. R., *Okafor FHI 47526* (K!). Cameroon: Mango, 7 km S Poli, 21 Jul. 1974, *Fotius 2147* (P!, UGDA-DLSz! – copy, drawing); Ngaoundere-Meiganga road, Jun. 1939, *Jacques-Felix 4086 & 4305* (K! – fragments, P!, UGDA-DLSz! – copy, drawing); Meiganga, Jul. 1939, *Jacques-Felix 4457* (K! – fragment, P!, UGDA-DLSz! – copy, drawing); Piste Loa-Gantan, près Yoko. 2 Jul. 1959, *Letouzey 2337* (P!, UGDA-DLSz! – copy, drawing); Versants rocheux du Mt. Zomo, près Ngona, 50 km ENE Yaounde, , alt. 1219 m, 21 Jun. 1972, *Letouzey 11330* (BR!, K!, P!, UGDA-DLSz! – copy, drawing); 30 km N Wum, pres Kunyang sur piste Essu-Munkep, sur rochers couverts

de mousse, alt. 1000 m, 7 Jul. 1975, *Letouzey 13972* (BR!, K!, P!, UGDA-DLSz! – copy, drawing); Res. For. Bafut Ngemba near Bamenda, *Lowe 71* (K!); Garoua, *Range 80 (*B†); Bakossi Mts., near Bangem, *Walker s.n*. (B†). Central African Republic: Moroubas. 1 Jul. 1922, *Le Testu 640* (BM!); Bozoum, 26 Jul.-2 Aug. 1931, *Le Testu 2872* (BM!); Oubangui Plateau, Bambari Region, near Morambas. 1 Jul. 1922, *Tisserant 640* (P!, UGDA-DLSz! – copy, drawing); Boukoko, Morouba. 1 Jul. 1922, *Tisserant 816* (P!); Hte Ouahm, Bozoum, 26 Jul. 1931, *Tisserant 2872* (P!, UGDA-DLSz! – copy, drawing); 10 km SE Maroubas, 20 Jun. 1922, *Tisserant 638* (P!, UGDA-DLSz! – copy, drawing).

Notes: *Afrorchis sceptrum* is similar in habit to both aforementioned species, *A. pilosa* and *A. congoensis*, with rather stout stem and numerous leaves, usually densely arranged along it. Unlike *A. pilosa*, but similarly to *A. congoensis*, leaves and stem of *A. sceptrum* are glabrous. The latter species can have ca twice larger flower segments than *A. pilosa* and *A. congoensis*, and its lip is different – it is transversely elliptic-reniform to rotundate-ovate, thickened along mid-vein, obscurely 3-lobed at the apex, the middle lobe is tongue-like, obtuse and lateral lobes are longer than middle one, erose along margins.

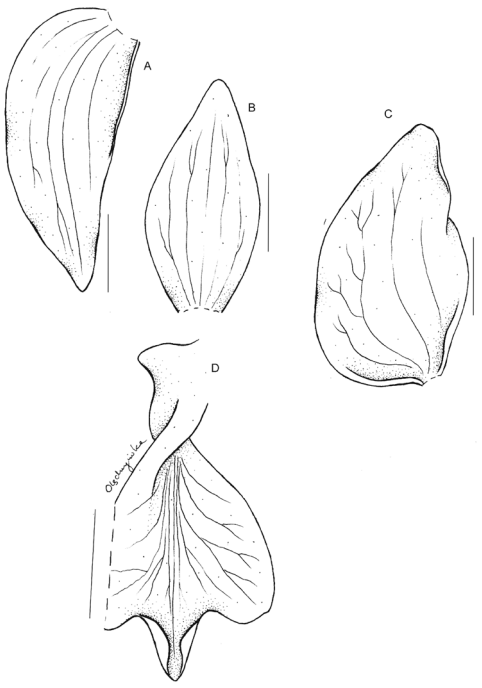

Fig. 108. *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Jaeger 1027,* P). Scale bar = 3 cm

6.1.4.4. *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach., comb. nov. (Figs. 108-113)

Basionym: *Brachycorythis paucifolia* Summerh. Kew Bull. 2: 123. 1948. 2003; Type: SIERRA LEONE, *Jaeger 1327* (Holotype: K!, Isotypes: P!, WAG!, UGDA-DLSz! – copy, drawing). – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Perez-Vera, Orchid. Côte d'Ivoire: 113. 2003. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 29. 2007. – Szlachetko, Orchid. Ivory Coast: 33. 2008.

Roots tuberous, thick and fleshy, cylindrical, clustered. Stem 20-45 cm tall, erect, slender. Cauline leaves 4-6, up to 15 cm long and 4 cm wide, lanceolate to elliptic-ovate, acute to obtuse, gathered in the lower part of the stem, spreading, the upper ones much smaller, bract-like, erect. Inflorescence 2-10 cm long, dense, cylindrical, many-flowered. Flowers white, with lip mauve purple spotted. Floral bracts up to 30 mm long, lanceolate, acute to acuminate, glabrous, the lower one equaling the flowers. Pedicel and ovary 11-20 mm long, glabrous. Dorsal sepal 9-16 mm long, 4-7 mm wide, ovate to ovate-elliptic, obtuse, somewhat cucullate, glabrous, (3)5-veined. Petals 10-15.2 mm long, 6-9.5 mm wide, obliquely suborbicular-ovate to ovate, subobtuse, glabrous, 5(3)-veined. Lateral sepals 10-18 mm long, 4.2-7.1 mm wide, obliquely ovate-elliptic to ligulate-ovate, obtuse, glabrous, (3)5-veined. Lip 9-14 mm long, 7-13 mm wide, triangular to triangular-reniform in general outline, 3-lobed at the apex or almost truncate, thickened along midvein; middle lobe 1-3.8 mm and wide, ligulate to oblong-triangular, obtuse, longer than lateral lobes; lateral lobes ovate-triangular, more

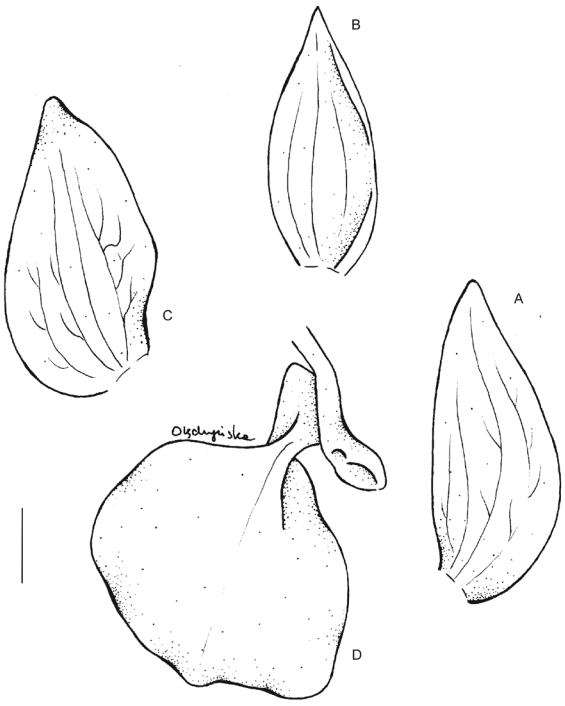

Fig. 109. *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Jongkind & Nimba Botanic Team 8238,* MO). Scale bar = 3 cm

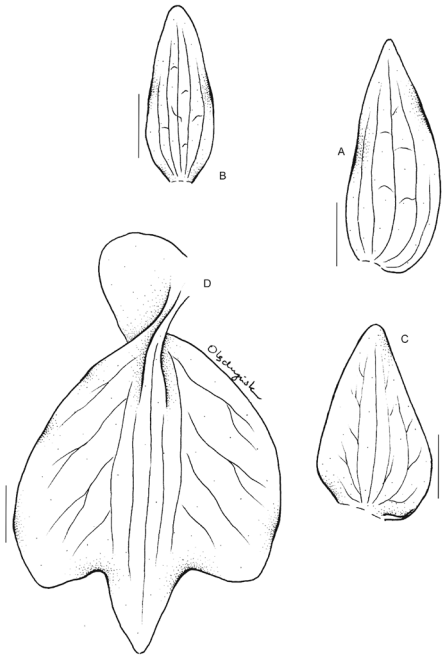

Fig. 110. *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Morton SL3573,* P). Scale bar = 3 cm

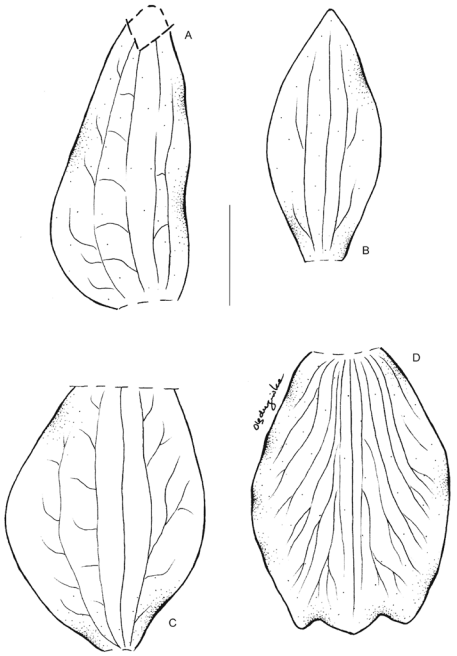

Fig. 111. *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Schnell 3405*, K). Scale bar = 3 cm

or less erose along margins. Spur 3.5-6 mm long and 4 mm in diameter at base, sac-like to saccate-conical, obtuse. Gynostemium (3)5-6 mm long.

Ecology: Rock on ridge, in peaty pockets of soil among rocks, on grassland on summit, savanna on slope, cracks in steep bare rock slope. Flowering time: June-October.

General distribution: Guinea, Sierra Leone, Liberia. Alt. 1320-1700 m.

Representative specimens: Guinea: Nimba Monts, Sept. 1947, *Schnell 3730* (P!, UGDA-DLSz! – copy, drawing); Nimba Mts., Aug.1947, *Schnell 3405* (K!, P!, UGDA-DLSz! – copy, drawing); Nimba Mts., grassland on summit, Sept. 1942 *Schnell 1853* (K!, P!,

Fig. 112. *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach.

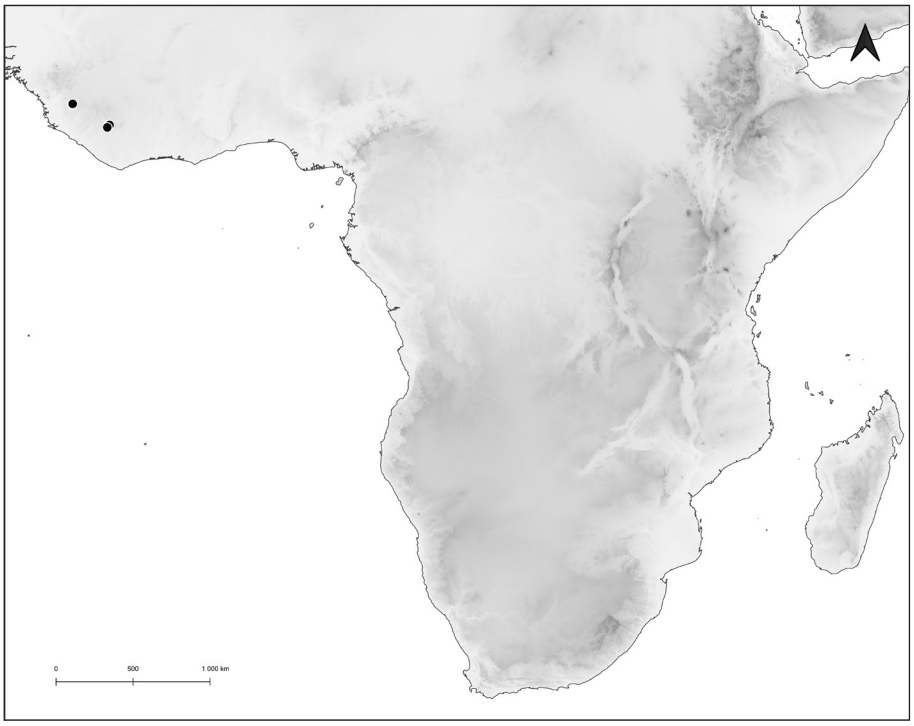

Fig. 113. Distribution map of *Afrorchis paucifolia* (Summerh.) Olędrz. & Szlach.

UGDA-DLSz! – copy, drawing); Nzèrèkorè, Nimba Mts., between Gouan and Ziè valleys, savanna on slope, 7°40.3'N, 8°22.4'W, alt. 1320 m, 27 Jun. 2007, *Jongkind & Holiè & Cherif 7863* (BR!, K!, P!, UGDA-DLSz! – copy, drawing); Nzèrèkorè, Nimba Mts., east side, cracks in steep bare rock slope, 7°39.56'N, 8°22.64'W, alt. 1599 m, *Jongkind & Nimba Botanic Team 8238* (K!, MO!); Guinea – Ivory Coast border, alt. 1700 m, *Mathew s.n.* (K!, UGDA-DLSz! – copy, drawing); *Sine loc.,* 1937, *Scaetta 3253* (P!, UGDA-DLSz! – copy, drawing). Sierra Leone: Loma Mts. Bintumane Massif, on NW slope, alt. 1570 m, Aug. 1945, *Jaeger 1327* (K!, P!, WAG!, UGDA-DLSz! – copy, drawing); Loma Mts., 16 Aug. 1947, *Jaeger 1027* (P!, UGDA-DLSz! – copy, drawing); Loma Mts., alt. 1600 m, 29 Jul. 1964, *Jaeger 6947* (P!, UGDA-DLSz! – copy, drawing); Loma Mts., 13 Aug. 1945, *Jaeger 975* (P!); Loma Mts., 8 Aug. 1964, *Jaeger 7099* (P!, UGDA-DLSz! – copy, drawing); Loma Mts., Face NNW of pic 'Britumane', 22 Aug. 1945, *Jaeger 1132* (K!, P!, UGDA-DLSz! – copy, drawing); Daoulè, Loma Mts., alt. 1400 m, *Adam 22503* (P!, UGDA-DLSz! – copy, drawing); Loma Mts., summit of Bintimani, in peaty pockets of soil among rocks, 16 Jun. 1966, *Morton SL3573* (K!, P!, UGDA-DLSz! – copy, drawing). Liberia: Nimba, rock on ridge, 16 Oct. 1969, *Adam 24344* (P!, UGDA-DLSz! – copy, drawing).

N o t e s : There are 3 African species of *Brachycorythis*-complex having similar habit, i.e., *Afrorchis paucifolia*, *A. angolensis* and *Brachycorythis basifoliata*. In all of them, leaves are gathered in the lower part of the stem, where they are the longest. The upper ones decrease in size upwards. Although all can be easily recognized one from another, *B. basifoliata* has no spur – basal part of its lip is only shallowly cochleate. *Afrorchis paucifolia* is characterized by having one type of the stem. The flower segments of this species are somewhat larger than in *A. angolensis* either. *A. angolensis* is the only species of *Brachycorythis*-complex having both sterile and flowering shoots.

6.1.4.5. *Afrorchis angolensis* (Schltr.) Szlach. (Figs. 114-119, Plate IV)

Richardiana 4(2): 82. 2006. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 105. 2010. ≡ *Platanthera angolensis* Schltr. *in* Warb., Kunene-Sambesi-Exped. Baum: 203. 1903; Type (Szlachetko *et al.* 2010): ANGOLA, *Baum 326* (Lectotype: B†; Isolectotypes: BM!, COI, HBG!, K!, W-R!, UGDA-DLSz! – copy, drawing). ≡ *Brachycorythis angolensis* (Schltr.) Schltr., Beih. Bot. Centralbl. 38(2): 113. 1921, *pro parte* – Summerhayes, Kew Bull. 10: 250. 1955. – Summerhayes, FTEA, Orchid. 1: 21. 1968. – Williamson, Orchid. S. Centr. Afr.: 31. 1977. – Geerinck, Fl. Afr. Centr., Orchid. 1: 38. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 18-20. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 69. 1998.

= *Brachycorythis oligophylla* Kraenzl. *in* Warb., Kunene-Sambesi-Exped.: 208. 1903; Type (Szlachetko

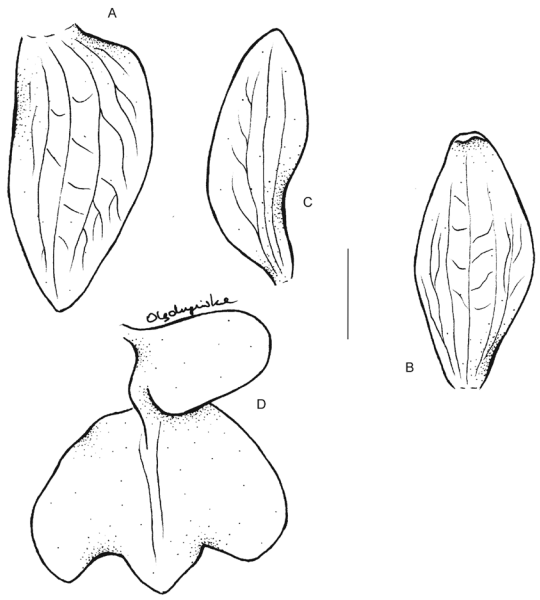

Fig. 114. *Afrorchis angolensis* (Schltr.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Lawton 1325*, K). Scale bar = 3 cm

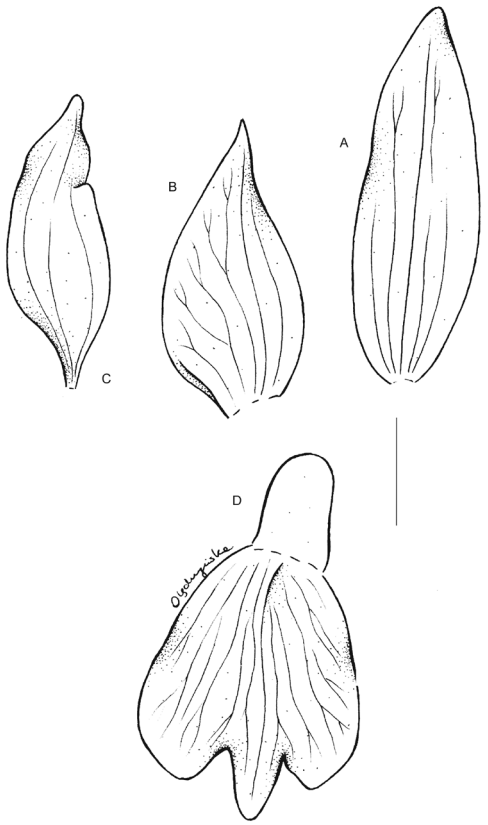

Fig. 115. *Afrorchis angolensis* (Schltr.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Robbinson 5837,* B). Scale bar = 3 cm

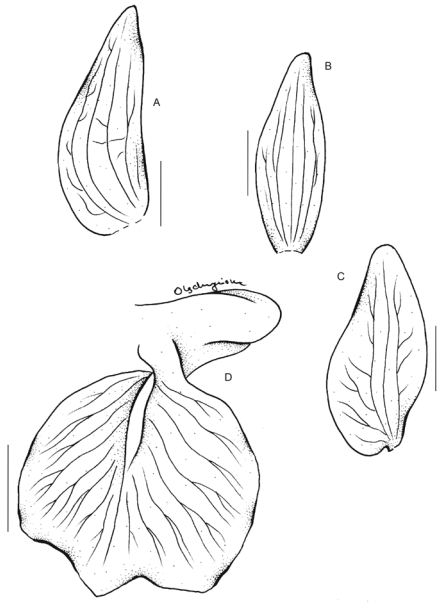

Fig. 116. *Afrorchis angolensis* (Schltr.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *King 251*, K). Scale bar = 3 cm

et al. 2010): ANGOLA, *Baum 614* (Lectotype: W!, Isolectotypes: BM!, HBG!).

Roots thick and fleshy, cylindrical. Sterile stem with 1-2 leaves, up to 28 cm long and 3.5 cm wide, oblanceolate, petiolate. Flowering stem 30-68 cm tall, erect, slender, glabrous. Cauline leaves 5-10, up to 10 cm long and 2.5 cm wide, lanceolate or lanceolate-ovate, acute, erect, well spaced along stem. Inflorescence 5.5-12.5 cm long, dense, cylindrical, many-flowered. Flowers white or mauve, with darker lip mauve or purple spotted. Floral bracts 20-36 mm long, lanceolate, acute, glabrous, the lower one equaling the flowers. Pedicel and ovary 11-17 mm long, glabrous. Dorsal sepal 6.2-12 mm long, 2.5-6.1 mm wide, oblong-elliptic, obtuse, cucullate, glabrous, 5-veined. Petals 5.2-12.5 mm long, 1.5-5 mm wide, obliquely oblong or elliptic-ovate, subobtuse, glabrous, 3-veined. Lateral sepals 6-13 mm long, 2.5-6.5 mm wide, obliquely ovate-elliptic, cochleate or cucullate at rounded apex, glabrous, 5-veined. Lip 5.5-11.5 mm long, 7-14 mm wide, elliptic-reniform to suborbicular in general outline, rather thick, densely papillate, shortly 3-lobed at the apex; middle lobe 1.5-2.5 mm long, 2.5-4 mm wide, semi-rotundate to semi-elliptic, truncate to rounded, longer than lateral lobes; lateral lobes 4-4.5 mm long, 2.5-3 mm wide, ovate-rhombic to ovate, indistinctly erose along margins. Spur 3.5-6 mm long, sac-like, obtuse. Gynostemium 2.5-7 mm long.

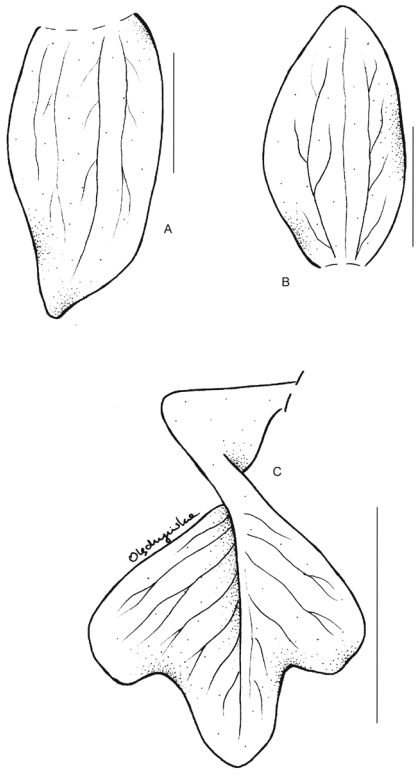

Fig. 117. *Afrorchis angolensis* (Schltr.) Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Schaijes 2765,* BR) Scale bar = 3 cm

Ecology: In wet herbal savanna, in boggy grassland, in damp herbaceous vegetation, in swampy dambo grassland, in wet places, in permanently wet dambo, in grassy swamp, in deep black soils, in boggy grassland, in boggy grassland more or less waterlogged, growing among tall grass in wet peaty swamp, perennially wet dambo, in wet ulei, in swampy grassland. Flowering time January, October-December

General distribution: Democratic Republic of the Congo (Zaire), Tanzania, Angola, Zambia. Alt. 1050-2400 m.

Representative specimens: Democratic Republic of the Congo (Zaire): Upper Katanga, Katentania, Nov. 1912, *Homble 824* (BR!, K!, UGDA-DLSz! – copy, drawing); Region of Shaba, at 62 km N of Kolwezi, on the route Kolwezi–Dilolo, wet steppe savanna, 12 Dec. 1985, *Schaijes 2765* (BR!, UGDA-DLSz! – copy, drawing). Tanzania: Tanganyika, Songea Distr., about 12 km E of Songea by Nonganonga Stream, in boggy grassland, alt. 1050 m, 27 Dec. 1955, *Milne-Redhead & Taylor 7928&7929* (K!). Angola: Bie, Kuebe River, Matungue, alt. 1150 m. 26 Oct. 1899, *Baum 326* (BM!, HBG!, K!, W-R!, UGDA-DLSz! – copy, drawing); "Am Longa bei Napalanka", alt. 1150 m. 1 Jan. 1900, *Baum 614* (BM!, HBG!, W!, UGDA-DLSz! – copy, drawing); Ganda, alt. 2400 m, 29 Nov. 1937, *Pittard 77* (BM!, K!); Chipia, between Nova Lisboa and Cuima. 15 Nov. 1959, *Stopp BO251* (K!, UGDA-DLSz! – copy, drawing); Mission de Huambo, S of mission, Nov. 1942, *Tisserant A260* (K! – fragment); Huambo Mission (E of Benguellas), 5 km to E. Nov. 1942, *Tisserant 326* (K!); Riviere Luveje, near Villa Luzo, 2 Nov. 1932, *Young 1264*

Fig. 118. *Afrorchis angolensis* (Schltr.) Szlach.

Explanations: habit (drawn from *Baum 326*, BM – isolectotype). Scale bar = 3 cm

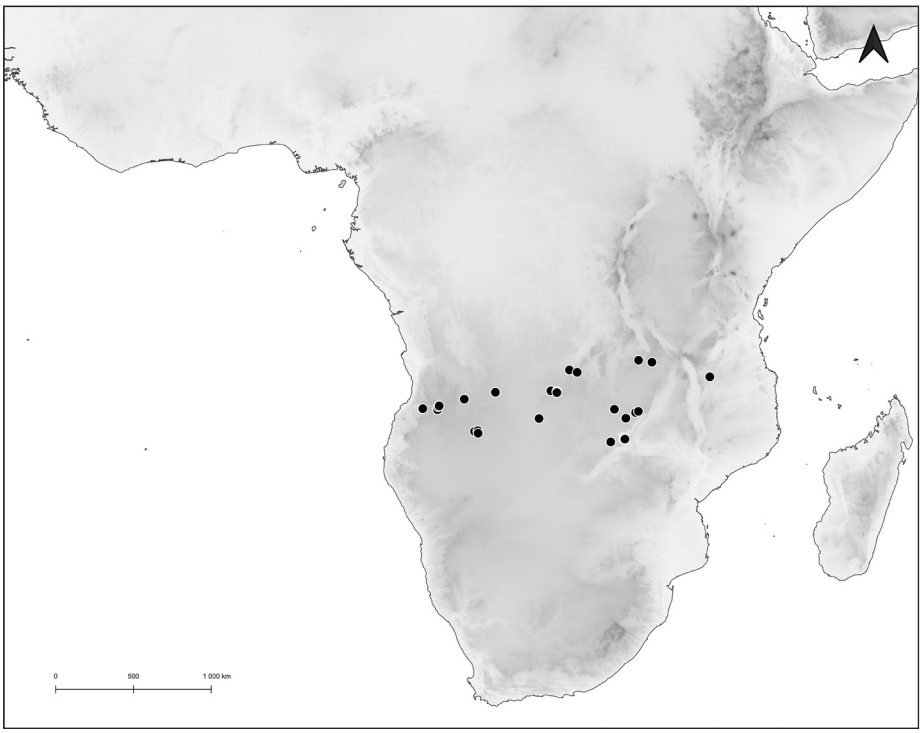

Fig. 119. Distribution map of *Afrorchis angolensis* (Schltr.) Szlach.

(BM!, UGDA-DLSz! – copy, drawing); Benguella, Monogue, Cassuango, Vale do Cuiriri, 17 Oct. 1906, *Gossweiler 3279* (K!); Same loc., *Gossweiler 3293* (K!); Cuiriri River, Cassuango, in damp herbaceous vegetation, Oct.1906, *Gossweiler 3292* (K!, COI). Zambia: Central Prov. Lusaka Distr., Great East Rd., between Undaunda and Rufunza, 135 km E from Lusaka, swampy dambo grassland, 15°13'S, 29°25E', alt. 1150 m 16 Dec. 1972, *Kornaś 2813* (K!); Central Prov., Lusaka Distr., Great E Road between Undaunda and Rufunsa, 128 km E of Lusaka, dambo swamp, 15°12'S, 29°21'E, alt. 1180 m, 2 Jan. 1972, *Kornaś 0784* (KRA!, UGDA-DLSz! – copy, drawing); Central Prov., Lusaka Distr., Great E Road between Undaunda and Rufunsa, 135 km E of Lusaka, dambo swamp, 15°12'S, 29°21'E, alt. 1150 m, 16 Dec. 1972, *Kornaś & Medwecka-Kornaś 2818* (KRA!, UGDA-DLSz! – copy, drawing); Central Prov., Lusaka Distr., 131 km from Lusaka along Great East Road, dambo locally known as the '80 mile dambo', in wet places, alt. 1120 m, 16 Dec. 1972, *Strid 2663* (K!); Chakwenga Headwaters, 100-129 km, East of Lusaka, Central Prov., permanently wet dambo, 16 Dec. 1963, *Robbinson 5837* (B!, K!, UGDA-DLSz! – copy, drawing); Serenje Distr., M'Kushi River, in grassy swamp, alt. 1350 m, 27 Nov. 1962, *Richards 17316* (K!); Central Prov., Serenje Distr., Great N Road, 6 km W from Serenje, Lusili Stream Headwaters, 13°16'S, 30°12'E, alt. 1440 m, 26 Nov. 1972, *Kornaś & Medwecka-Kornaś 2718* (K!, KRA!, UGDA-DLSz! – copy, drawing); Nothern, Mporokoso Distr., along Mporokoso-Kasama Road, 33.5 km ESE of intersection of Mporokoso, at bridge over Katutwa River, in dambo on both sides of the road, deep black soils, 09°26'00"S, 30°25'05"E, alt. 1470 m, *Harder, Merello & Nkhoma 2235* (MO!, UGDA-DLSz! – copy, drawing); Mwinilunga Distr., just S of Bobeka Bridge, in boggy grassland, 17 Nov. 1937, *Milne-Redhead 3201 and 3201A* (K!); Mwinilunga Distr., Sinkabolo Dambo, very abundant in boggy grassland more or less waterlogged, 9 Dec. 1937, *Milne-Redhead 3567* (BR!); Mwinilunga Distr., Sinkabolo Swamp, growing among tall grass in wet peaty swamp, alt. 1200 m, 20 Nov. 1962, *Richards 17421* (K!); NW Rov., Mwinilunga Distr., 20 October 1958, *Holmes 076*a (K!); 80 km S of Abercorn, perennially wet dambo, 12 Nov. 1960, *Robinson 4057 & 4059* (K!); Mwinilunga Distr., just NW of Dobeka Bridge, 7 Dec.1937, *Milne-Redhead 3531* (K!); Mwinilunga Distr., Dobeka R. bridge, ca 11 km E of Matonchi, dambo, 21 Dec.1969, *Williamson & Simon 1807* (K!); NW Distr., ca 5 miles of Zambesi Source, in wet ulei, 28 Nov.1966, *Leach & Williamson 13529* (K!); Kasama, *Robinson 4082* (K!); Mpika Distr., Mpika-Kapiri Mposhi Road, 79 mls from Kapiri Mposhi, in swampy grassland at the edge of M'Kushi R., alt. 1200 m, 2 Nov. 1962, *Richards 16866* (K!); Ndola, 7 Dec. 1963, *Morge 146* (K!); *Sine loc., Lawton 1325* (K!, UGDA-DLSz! – copy, drawing).

Notes: This species can be easily separated from other genus representatives by peculiar habit, i.e., two types of the stem, sterile and flowering ones.

6.1.5. *BRACHYCORYTHIS* Lindl.

Gen. Sp. Orchid. Pl.: 363. 1838; GENERITYPE: *Brachycorythis ovata* Lindl. – Rolfe, Fl. Trop. Afr. 7: 200. 1898. – Summerhayes, Kew Bull. 9: 221. 1955. – Summerhayes, FWTA, ed. 2, 3: 186. 1968. – Summerhayes, FTEA, Orchid. 1: 17. 1968. – Seidenfaden, Orchid. Gen. Thailand 5: 9. 1977. – Stewart *et al.*, Wild Orchid. S. Afr.: 72. 1982. – Geerinck, Fl. Afr. Centr., Orchid. 1: 29. 1984. – la Croix *et al.*, Malwi Orchid.: 29. 1991. – Seidenfaden, Orchid. Indochin.: 40. 1992. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 14-16. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 60. 1998. – Linder & Kurzweil, Orch. South. Afr.: 80. 1999. – Szlachetko & Rutkowski, Acta Bot. Fenn. 169: 116. 2000. – Pridgeon *et al.*, Gen. Orchid. 2(1): 265. 2001. – Perez-Vera, Orchid. Côte d'Ivoire: 109. 2003. – Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid. 36(1): 16. 2004. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 24. 2007. – Szlachetko, Orchid. Ivory Coast: 30. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 106. 2010.

Roots fleshy, clustered. Stem usually leafy through its length, occasionally gathered in the lower part of the stem, glabrous or pubescent. Leaves usually sessile, glabrous or pubescent. Inflorescence often multi-flowered. Flowers resupinate of various size, usually broadly opened. Floral bracts leaf-like. Sepals and petals very dissimilar. Lip constricted above the base, forming shallow, rounded hypochile and much larger, almost flat epichile. Epichile usually unequally 3-lobed at the apex only, the middle lobe often obscure. Spur lacking. Anther erect, connective narrow, blunt or apiculate, locules close to each other, parallel. Pollinia massulate, caudicles shorter than pollen mass. Stigma entire, oval to elliptic, slightly concave in the centre. Rostellum tongue-like, the middle lobe pleated, both lateral lobes in close contact to each other. Viscidia naked. Auricles prominent.

A genus includes about 9 species native to tropical and South Africa. It appears to be closely related to *Schwartzkopffia* from which it differs in the lip architecture and in the presence of green leaves. *Brachycorythis* can be easily separated from *Gyaladenia* and *Afrorchis* by lacking spur formed from an elongated lip base. In all species of the former, the basal part of the lip – hypochile – is more or less concave.

The genus has been divided into 3 sections based on the lip details.

Key to the species:

1. Lip lateral lobes falcate, acute, much larger than usually obscure middle lobe ..... sect. *Brachycorythis* (3)
1. Lip lobes almost equal in length 2
2. Lip hypochile and epichile lying on the same plane ..... sect. *Microcorythis* (6)
2. Lip epichile perpendicular to the hypochile ..... sect. *Dasycorythis* (7)
3. The largest leaves gathered at the base of the stem, gradually decreasing in size up the stem ... *B. basifoliata*
3. The largest leaves at the middle of the stem, the lower part of the stem with cauline sheaths ... 4
4. Lip orbicular or transversely elliptic, bi-lobed, the middle lobe absent, lip lobes crossing each other ..... *B. pleistophylla*
4. Lip unequally 3-lobed, the middle lobe triangular to ligulate, much smaller than laterals 5
5. Petals 10-15 mm long, 7.5-11.5 mm wide, lip 15-20 mm long, 13-24 mm wide ... *B. kalbreyeri*
5. Petals 6-10 mm long, 2.8-7 mm wide, lip 8.5-12(16) mm long, 6.5-10.5 mm wide ... *B. ovata*
6. Lip with prominent, conical callus in front of the hypochile ..... *B. buchananii*
6. Lip ecallose ..... *B. inhambanensis*
7. Lip bent down in the knee-like manner in the junction between hypochile and epichile ..... *B. pubescens*
7. Lip projecting horizontally 8
8. Lip middle lobe shorter than or equaling the sides lobes ..... *B. mixta*
8. Lip middle lobe longer than lateral lobes ..... *B. velutina*

Section *Brachycorythis*

The section includes 4 species with lip suborbicular or often lunate in general outline, with lateral lobes falcate, acute, much larger than usually obscure middle lobe. Most species have numerous leaves arranged along stem, but in *Brachycorythis basifoliata* they are gathered in the lower part of the stem.

6.1.5.1. *Brachycorythis basifoliata* Summerh.
(Fig. 120-121)

Bull. Misc. Inform. Kew 1937(9): 457. 1937; Type: PRÍNCIPE, *Exell 680* (Holotype: BM!, K! – drawing, UGDA-DLSz! – copy, drawing). – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 107. 2010.

Roots fleshy, clustered. Stem up to 40 cm tall, erect, slender, glabrous. Leaves up to 8, 3-4 gathered at the base of the stem forming a kind of rosette, 5.5-50 cm long, 1.5-3.5 cm wide, long-petiolate, blade oblong-lanceolate, lanceolate to narrowly lanceolate, acute to acuminate, spreading, glabrous, above 3-4 smaller cauline leaves, erect, enveloping stem. Inflorescence up to ca 13 cm long, up to 24-flowered, dense. Flowers lilac or pinkish with white or greenish centre. Floral bracts up to 35 mm long, lanceolate, acuminate. Pedicel and ovary ca 15-20 mm long, twisted, slender. Dorsal sepal 9-12 mm long, 3-6.5 mm wide, oblong-elliptic to ovate, more or less cochleate, subobtuse to obtuse, 3-veined. Petals 8.5-12 mm long, 3.5-8 mm wide, obliquely elliptic-ovate, basally auriculate, subacute to subobtuse, 1-, 3- or 5-veined. Lateral sepals 11-18 mm long, 5-9 mm wide, obliquely oblong-elliptic, to ovate-lanceolate, obtuse, 3- or 5-veined. Lip – hypochile 6 mm long, slightly concave, with thickened margins; epichile 10-16 mm long, 8-13 mm wide, suborbicular to subquadrate in general outline, thin, held horizontally, usually obscurely 3-lobed, sometimes unlobed, acute to subobtuse at the apex. Gynostemium 4-6 mm long.

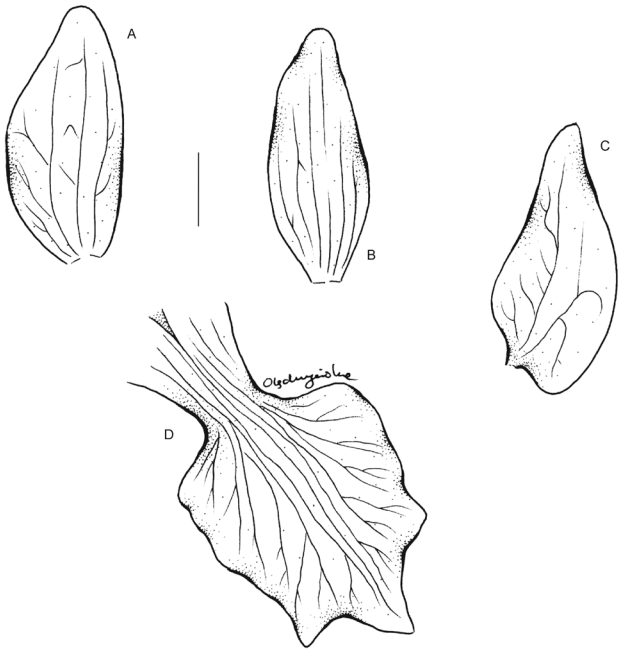

Fig. 120. *Brachycorythis basifoliata* Summerh.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

Ecology: In dense primary forest of medium altitude. Flowering time: November, December.
General Distribution: Endemic to São Tomé and Príncipe. Alt. 700-800 m.
Representative specimens: São Tomé and Príncipe: Príncipe: Pico Papagaio, ca. 30 m below summit, alt. 700 m, 27 Dec. 1932, *Exell 680* (BM!,

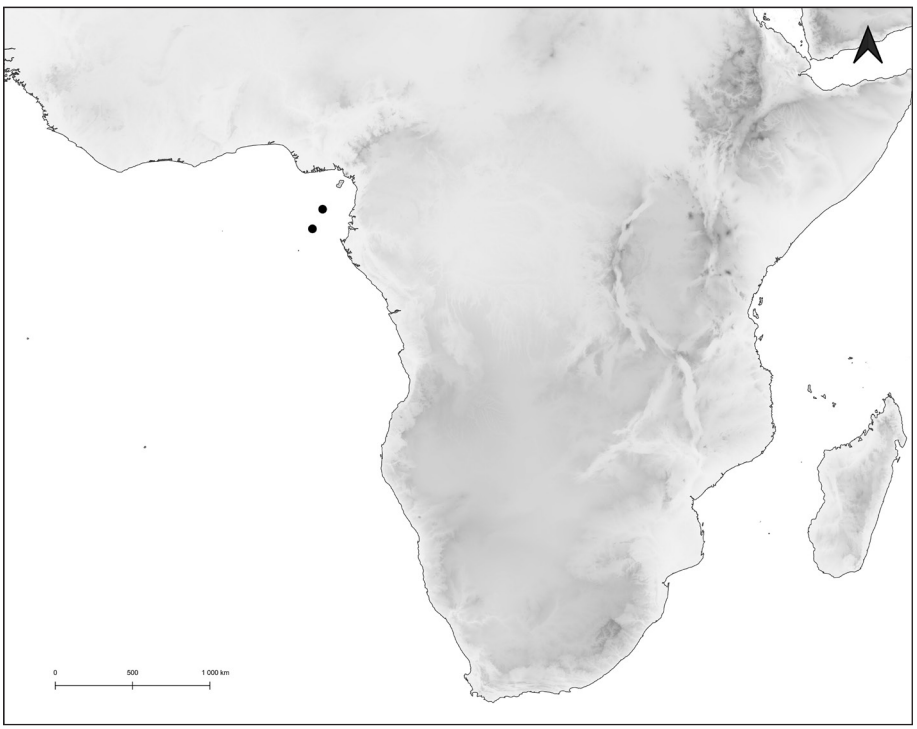

Fig. 121. Distribution map of *Brachycorythis basifoliata* Summerh.

K! – drawing, UGDA-DLSz! – copy, drawing); Pico Papagaio, alt. 700 m. 29 Dec. 1932, *Exell 725* (BM!, UGDA-DLSz! – copy, drawing); Pico to Principe path (summit), dense primary forest of medium altitude, 1°34'45''N, 7°23'00''S, alt. 800 m, 1 Nov. 1998, *Stèvart 436* (BR!); São Tomé: Pico Maria Fernandes (Stévart & de Oliveira 2000).

Notes: This species is easy to distinguish from all other genus representatives by its peculiar habit – long and narrow leaves are gathered at the base of the stem. In all other species of *Brachycorythis* leaves are arranged along stem. There are two other species, i.e., *Afrorchis paucifolia* and *A. angolensis*, similar in habit to *B. basifoliata*, what we discussed above.

6.1.5.2. *Brachycorythis kalbreyeri* Rchb.f. (Figs. 122-126, Plate V)

Flora 61: 77. 1878; Type (Szlachetko 2007): CAMEROON, *Kalbreyer 145* (Lectotype: W-R!, Isolectotypes: BM!, W!, W-R!, UGDA-DLSz! – copy, drawing). – Rolfe, Fl. Trop. Afr. 7: 201. 1898. – Summerhayes, FWTA, ed. 1, 2: 405. 1936. – Summerhayes, FTEA, ed. 2, 3: 187. 1968. – Summerhayes, FTEA, Orchid. 1: 24. 1968. – Williamson, Orchid. S. Centr. Afr.: 28. 1977. – Geerinck, Fl. Afr. Centr., Orchid. 1: 33. 1984. - la Croix & Cribb, Fl. Zambes., Orchid. 1: 23. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 65. 1998. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 26. 2007. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 110. 2010.

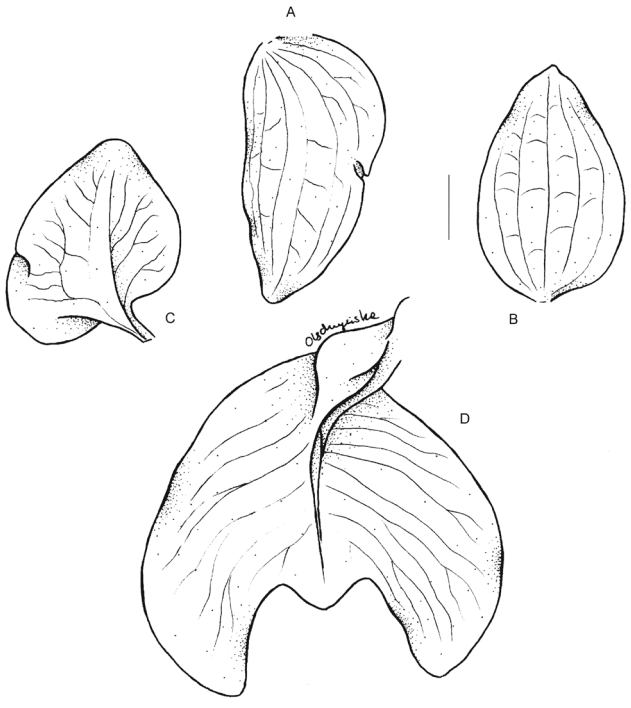

Fig. 122. *Brachycorythis kalbreyeri* Rchb.f.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Thomas 894,* K). Scale bar = 3 cm

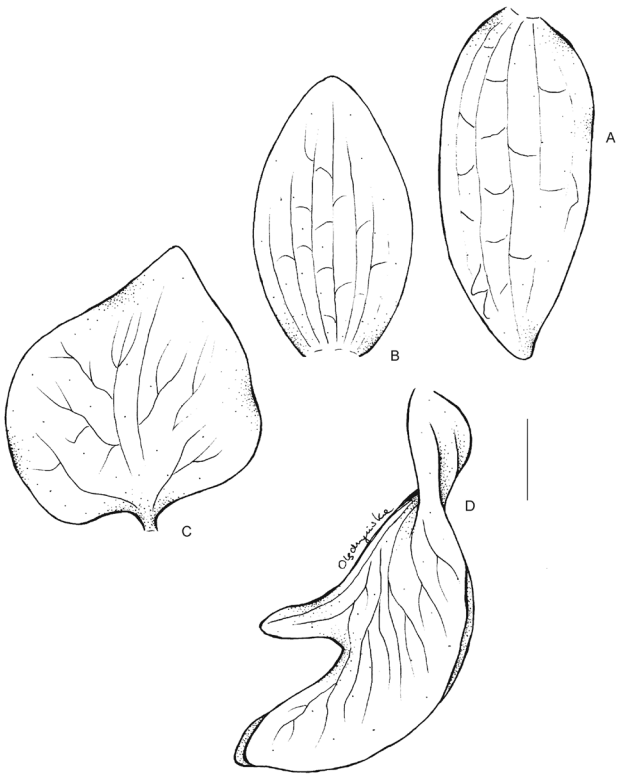

Fig. 123. *Brachycorythis kalbreyeri* Rchb.f.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Adames 290,* P). Scale bar = 3 cm

Tubers thick, fleshy, densely woolly. Stem 15-40 cm tall, erect, delicate, glabrous or minutely, densely pubescent, especially in the lower part. Cauline leaves 5-15, above the lower third of the stem; 4-11 cm long, 1-2.5 cm wide, sessile, lanceolate to broadly lanceolate, acute, glabrous with pubescent sheaths, spreading, similar in size up the stem. Inflorescence 7-17 cm long, laxly 5-22-flowered. Flowers whitish, variously tinged

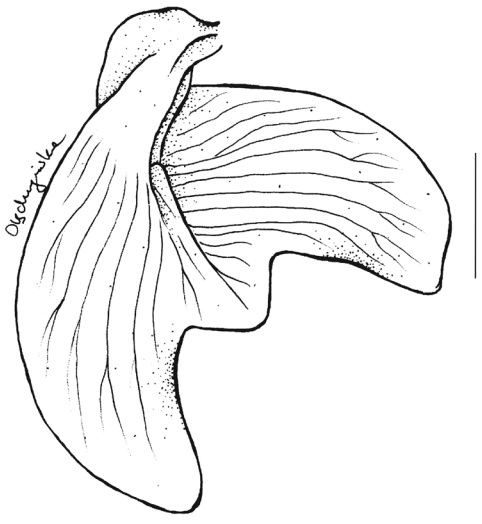

Fig. 124. *Brachycorythis kalbreyeri* Rchb.f.
Explanations: lip (drawn from *Warner 139*, K). Scale bar = 3 cm

Fig. 125. *Brachycorythis kalbreyeri* Rchb.f.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Dawe 489bis,* K). Scale bar = 3 cm

or coloured lilac or mauve, perfumed. Floral bract up to 55 mm long, ovate- to elliptic-lanceolate, acute, leaf-like, the lower ones longer than the flowers. Pedicel and ovary 15-28 mm long, densely pubescent. Tepals thin, rather delicate. Dorsal sepal 12.2-18 mm long, 6-10 mm wide, elliptic, broadly ovate to oblong-ovate, acute to obtuse, 5-veined. Petals 9.6-15 mm long, (4)7.5-12.5 mm wide, obliquely suborbicular to broadly ovate, subaucriculate basally, obtuse to rounded at the apex, sometimes undulate or dentate along margin(s), 3-4-veined. Lateral sepals 12.3-20 mm long, 5-10 mm wide, obliquely elliptic-ovate to ovate-lanceolate, subacute to obtuse, 3- or 5-veined. Lip – hypochile 6-10(16.5) mm long and (4)8-10 mm wide, shallowly concave, margins thickened; epichile (12)15-24 mm long, 12-26 mm wide, broadly lunate in general outline, with longitudinal keel along the mid-vein, distinctly 3-lobed in the upper part; middle lobe (2)3.5-4.5(6) mm long and wide, tongue-like to triangular, curved upwards, much smaller than lateral lobes; lateral lobes (4)7-12.5 mm long, incurved, more or less minutely dentate along margins. Gynostemium 4- 6.5 mm long.

Ecology: On tree among ferns, epiphyte on *Parkia biglobosa* Benth., in riverine forest. Flowering time: January, March, May-August, November.

General distribution: Sierra Leone, Liberia, Cameroon, Tanzania, Kenya, Mozambique. Alt. 122-2040 m.

Representative specimens: Guinea: near Bandakure, SW of Pita, on Perinari excelsa, in mossy crevice and on clump of Eulophiopsis lurida, 5 Jul. 1962, *Adames 290* (P!); Sierra Leone: Makump, alt. 122 m, 18 Jul. 1914, *Thomas 894* (K!, UGDA-DLSz! – copy, drawing); Waia, on tree among ferns, Jun. 1923, *Dawe 489bis* (K!, UGDA-DLSz! – copy, drawing); Heddles farm, 1915, *Lane Poole 376* (K!); Near dinning Hall, Fourah Bay College, epiphyte on *Parkia biglobosa*,

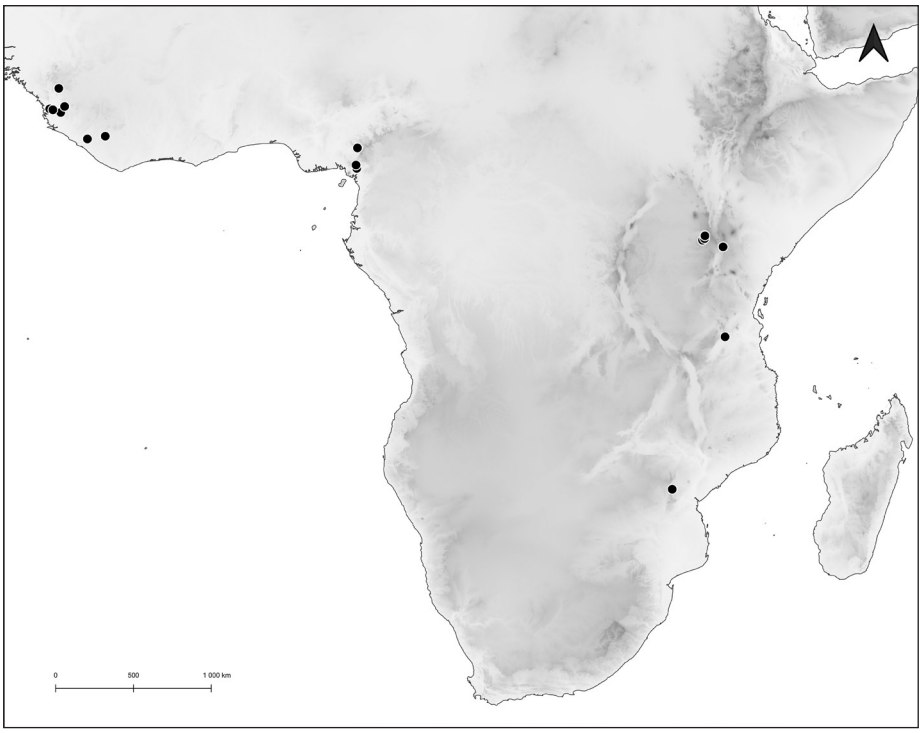

Fig. 126. Distribution map of *Brachycorythis kalbreyeri* Rchb.f.

8 Aug. 1967, *Morton SL4459* (K!). Liberia: Nimba, route mine, alt. 650 m, 19 Jun. 1965, *Adam 21547* (P!, UGDA-DLSz! – copy, drawing); Farmington (Riv.?), 1942-1943, *Warner 139* (K!, UGDA-DLSz! – copy, drawing). Cameroon: Mt. Cameroon, Mopanja. 25 Mar. 1877, *Kalbreyer 145* (BM!, W!, W-R!); Kondo, between Oshie and Bako, 40 km NW Bamenda, alt. 1150 m, 7 Aug. 1975, *Letouzey 14191* (P!); NW side of Mt. Koupe, *Letouzey 14706* (P!). Tanzania: Udzungwa, Urhega Forest Reserve (T7), Nov. 1966, *F. M. 74* (K!, UGDA-DLSz! – copy). Kenya: Kericho Distr., Itare, Jan. 1942, *Copley 53* (K!); Ndijajula, near Njala, epiphytic, in riverain forest, Jun. 1946, *Deighton 4315* (K!); Kericho Distr., Saosa River, 1950 m, in deep moss on tree branches, Mar. 1934, *Firth 20* (K!); Sotik Distr., Kipsonoi River, 2040 m, cult., Nairobi, May-Jun.1954, *Piers 129* (K!). Mozambique: Manica & Sofala, Manica, Sarra Mts., alt. 1225 m, *Poroira & Marguas 1017* (L!).
Notes: *Brachycorythis kalbreyeri* is rather easily separated from other genus representatives by peculiar habit, similar rather to *Phyllomphax* species. Stem is rather delicate with the largest leaves arranged in the upper part, leaves are lanceolate to broadly lancelate, acute, with pubescent sheaths, which gradually transform into the floral bracts.

General flowers appearance of *B. kalbreyeri* is similar to *B. ovata,* but they are distinctly larger. Its petals are 10-15 mm long and 7.5-11.5 mm wide, lip is 15-20 mm long and 13-24 mm wide. In *B. ovata* petals are 6-10 mm long and 2.8-7 mm wide, lip is 8.5-12(16) mm long and 6.5-10.5 mm wide.

6.1.5.3. *Brachycorythis pleistophylla* Rchb.f. (Figs. 127-132, Plate V)

Otia Bot. Hamburg.: 104. 1881; Type (Szlachetko *et al.* 2010): MOZAMBIQUE, *Kirk s.n.* (Lectotype: K!) - Rolfe, Fl. Trop. Afr. 7: 202. 1898. – Schlechter, Beih. Bot. Centralbl. 38(2): 117. 1921. – Summerhayes, Bot. Not. 1937: 182. 1937. – Perrier, Fl. Madag., Orchid. 1: 8. 1939. – Summerhayes, Kew Bull. 10: 253. 1955. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Summerhayes, FTEA, Orchid. 1: 22. 1968. – Williamson, Orchid. S. Centr. Afr.: 32. 1977. – Geerinck, Fl. Afr. Centr., Orchid. 1: 36. 1984. – la Croix *et al.*, Orchid. Malawi: 31. 1991. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 21. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 69. 1998. – Linder & Kurzweil, Orch. South. Afr.: 85. 1999. – Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid. 36(1): 19. 2004. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 107. 2010.
≡ *Platanthera pleistophylla* (Rchb.f.) Schltr., Westafr. Kautschuk-Exped.: 274. 1900.
= *Brachycorythis macclouniei* Braid, Bull. Misc. Inform. Kew 1925: 357. 1925; Type (Szlachetko *et al.* 2010): MALAWI, *McClounie s.n.* (Lectotype: K!, UGDA-DLSz! – copy).

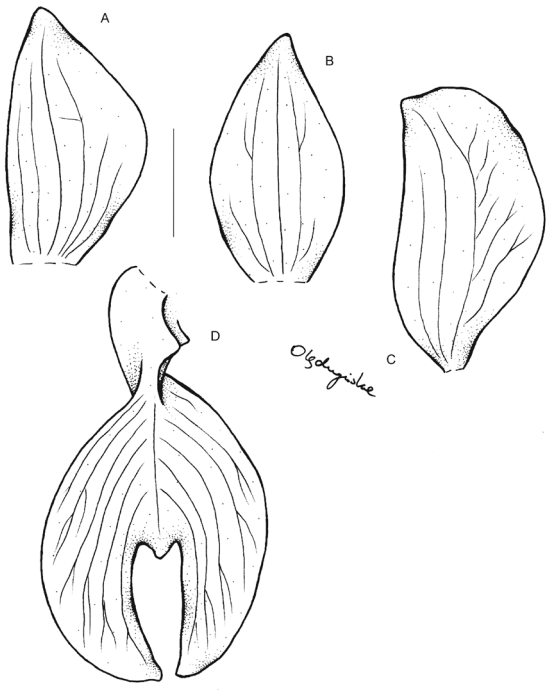

Fig. 127. *Brachycorythis pleistophylla* Rchb.f. var. *pleistophylla*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Schlieben 3240*, P). Scale bar = 3 cm

Roots thick, fleshy, cylindrical, woolly pubescent. Stem 25-100 cm tall, erect, rather delicate, glabrous, drying black. Cauline leaves up to 60, or even more, up to 10 cm long and 1.5 cm wide, lanceolate to narrowly lanceolate, acuminate to long acuminate, suberect, glabrous, decreasing in size and becoming erect up the stem. Inflorescence 15-35 cm long, rather densely up to 45-flowered. Flowers lilac or with various shades of purple often with white or yellow centre. Floral bracts up to 30 mm long, narrowly ovate-lanceolate to lanceolate, acuminate, the lower ones overtopping the flowers, leaf-like. Pedicel and ovary 10-18 mm long, glabrous. Tepals thin, delicate, glabrous. Dorsal sepal 5-9.8 mm long, 2-5.5 mm wide, elliptic to ovate, more or less cochleate, subacute to subobtuse, 5-veined. Petals (5.5)6-8.4 mm long, 3.2-8 mm wide, semi-orbicular to obliquely orbicular, acute to obtuse, 3-4-veined. Lateral sepals (5)6-10 mm long, 3.2-6 mm wide, obliquely orbicular to semi-orbicular, acute to shortly acuminate, 5-6-veined. Lip – hypochile (2)3-4 mm long and 4-8 mm wide, slightly concave; epichile 6.5-15 mm long, 6-14 mm wide, transversely elliptic to orbicular, thin, thickened along the mid-vein only, deeply ntched apically; lateral lobes rounded or acute, entire, crossing each other when flattened. Gynostemium 1.5-3 mm long.
Notes: *Brachycorythis pleistophylla* is similar in habit to *B. ovata*. It can be easily misidentified with

Fig. 128. *Brachycorythis pleistophylla* Rchb.f. var. *pleistophylla*
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Humbert 18575*, B). Scale bar = 3 cm

Fig. 129. *Brachycorythis pleistophylla* Rchb.f. var. *pleistophylla*
Explanations: habit (drawn from *Lisowski 66425*, UGDA-DLSz). Scale bar = 3 cm

B. kalbreyeri and especially *B. ovata*, but unlike the latters it has orbicular or transversely elliptic, bi-lobed lip, with the middle lobe missing, lip lobes are crossing each other (vs lip unequally 3-lobed, the middle lobe triangular to ligulate, much smaller than laterals).

This species can be divided into two varieties:

var. *pleistophylla*

Lip longer than broad, or as long as broad; flowers drying dark blackish-brown.

Ecology: in claire forest, in grassy steppe, growing in shade in wooded savanna, grassland, stepp savanna, partly degradated, in woodland under trees in longish grass, wooded grassland, swampy ground, *Brachystegia-Uapaca* woodland, in humus soil, occasional *Brachystegia* woodland, in meadows. Flowering time: January, July, October-December.

General distribution: Democratic Republic of the Congo (Zaire), Tanzania, Kenya, Angola, Malawi, Zimbabwe, Mozambique, Madagascar. Alt. 880-2134 m.

Representative specimens: Democratic Republic of the Congo (Zaire): Haut-Katanga, env. De Lubumbashi, Kipopo, foret Claire, 7 Dec. 1970, *Lisowski 65755* (UGDA-DLSz!); Haut Katanga, domaine de Muhila, env. 2 km du Porte Musofwa, bord de la riviere Musofwa, alt. 1350 m. 6 Nov. 1970, *Lisowski 65766* (UGDA-DLSz!); Haut Katanga, Muhila terr., près Poste Musofwa, steppe arboree, alt. 1320 m, 6 Nov. 1970, *Lisowski 66422* (UGDA-DLSz!); Haut Katanga, Muhila terr., 5 km a l'W de Kausimba, steppe arboree seche, alt. 1400 m. 6 Nov. 1970, *Lisowski 66424* (UGDA-DLSz!); Haut-Katanga, steppe herbeuse au-dessus du village Kalobele, alt. 1690 m. 8 Nov. 1970, *Lisowski 66425 & 66426* (UGDA-DLSz!); Katanga, Kundelungu Plateau, near eastern source of Lutshipuka river, alt. 1600 m, 6 Jan. 1969, *Lisowski, Malaisse & Symoens 549* (UGDA-DLSz!); Katanga, Munama, ?, growing in shade in wooded savanna, Apr. 1946, *Quarrè 7859* (K!); Katanga, Kundelungu Plateau, alt. 1550 m, 27 Oct. 1969, *Lisowski, Malaisse & Symoens 7436* (UGDA-DLSz!); Munanga, 90.5 km nearly N of Kolwesi, on road Busanga-Funda, 880 m, grassland, 7 Dec.1983, *Schaijes 2105* (K!, UGDA-DLSz! – copy, drawing); vallèe de la Zibwe, a 20 km au sud de Kolwezi stepp savanna, partly degradated, 15 Nov. 1981, *Schaijes 1114* (BR!, UGDA-DLSz! – copy, drawing); Mussima, Haut-Lualaba, Sept. 1899, *Briart s.n.* (BR!). Tanzania: Nyassa Hochland, Station Kyimbala, alt. 1100 m, 1910, *Stolz 463* (B!, W!, UGDA-DLSz! – copy, drawing); Ufipa Distr., Mso Village, in woodland under trees in longish grass, alt. 1800 m, 14 Dec. 1958, *Richards 10319* (K!, UGDA-DLSz! – copy, drawing); Blantyre Distr., wooded grassland, 13 Dec. 1968, *Monaily 40* (K!, UGDA-DLSz! – copy, drawing); Bezirk Morogoro, Uluguru-Gebirge, NS side, alt. 1250 m, 14 Jan. 1933, *Schlieben 3240* (P!, UGDA-DLSz! – copy, drawing). Kenya: Uasin Gishu Distr., near Zugari, grassland, alt. ca 1700 m, 16 Jul. 1962, *Piers P62A* (K!, UGDA-DLSz! – copy, drawing).

Fig. 130. *Brachycorythis pleistophylla* Rchb.f. var. *leopoldi* (Kraenzl.) Geerinck

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Stolz 1063*, B). Scale bar = 3 cm

Angola: 40 km SW Camabatela, alt. 950 m. 5 Oct. 1959, *Stanton 119* (BM!, UGDA-DLSz! – copy, drawing); Mission de Huambo (SE of Nova Lisboa, E of Benguella), Nov. 1942, *Tisserant A272* (K! – fragment); Saurimo, swampy ground, 22 Oct. 1932, *Young 1129* (BM!, UGDA-DLSz! – copy, drawing); Njombe, Tandala, Dec. 1913, *Stolz 2364* (EA – photo seen). Malawi: N Prov., Mzimba Distr., Mzulu, Marymount, toward Toch Sch., Brachystegia-Uapaca woodland, in humus soil, ca 1400 m, *Pawek 1593* (K!, UGDA-DLSz! – copy, drawing); N Prov., Rumphi Distr., Nyika Plateau, 9 miles of Ml., alt. 1700 m, occasional *Brachystegia* woodland, 23 Dec.1977, *Pawek 13317A* (K!, MO!, UGDA-DLSz! – copy, drawing); Mt. Milanji, alt. ca 2134 m, Oct. 1895, *McClounie s.n.* (K!). Zimbabwe: Umtali, Vumba, E foothills, alt. ca 1060 m, 8 Dec. 1961, *Wild & Chase 5567* (MO!); Mozambique: Morambala Mts., near Shire River, *Kirk s.n.* (K!). Madagascar: Centre, bois secs, cimes a Philippia, vers 1400 m d'alt. mont Tsaratanana, 1912, *Perrier de la Bathie 11361* (P!, UGDA-DLSz! – copy, drawing); Center, Mangaka Plateau, between Ankaizina and Sambirano , meadows, alt. 1500 m, *Perrier de la Bathie 15171* (P!); Bassin superieur du Sambirano, *Humbert 18575* (B!, P!, UGDA-DLSz! – copy, drawing).

Notes: Given from the Republic of Congo by Sita & Moutsambote (1988), but we have seen no materials of this taxon from the country.

var. *leopoldi* (Kraenzl.) Geerinck

Bull. Jard. Bot. Belg. 52: 141. 1982. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 22. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 70. 1998.– Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid. 36(1): 20. 2004. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 109. 2010. ≡ *Brachycorythis leopoldi* Kraenzl., Orchid. Gen. Sp. 1: 542. 1898; Type (Szlachetko *et al.* 2010): DEMOCRATIC REPUBLIC OF THE CONGO (ZAIRE), *Laurent s.n.* (Lectotype: BR!, K! – drawing; UGDA-DLSz! – copy). ≡ *Brachycorythis pleistophylla* Rchb.f. ssp. *leopoldi* (Kraenzl.) Summerh., Kew Bull. 10: 302. 1963. – Summerhayes, FTEA, Orchid. 1: 19. 1968.

= *Brachycorythis pulchra* Schltr., Bot. Jahrb. Syst. 53: 485. 1915; Type (Szlachetko *et al.* 2010): TANZANIA, *Stolz 1063* (Lectotype: B!, Isolectotypes: K!, L!, W!, UGDA-DLSz! – copy, drawing).

Lip broader than long; flowers drying pale brown or mid-brown.

Ecology: In savanna, on caravan routes, on open hills, in forest, in dambo. Flowering time: January-February, May, June, September-December.

General distribution: Cameroon, Gabon, Republic of the Congo, Democratic Republic of the Congo (Zaire), Burundi, Angola Tanzania. Alt. 290-1800 m.

Representative specimens: Cameroon: Plateaux Prefecture, between Impe and main road, Lefini Res., 2°50'S, 15°20'E, alt. 650 m. 18 Oct. 1991, *Harris, Moutsambote & Thomas 3049* (K!); Riv. Loma, near Garoua-Boulai, alt. ca. 800 m, 1 May 1914, *Mildbraed 9198* (K!). Gabon: Km 55 Moanda-Franceville road, 4 Oct. 1970, *Breteler 6767* (K!, WAG!); about 15 km SSE of Pana, about 1°51'S, 12°41'E, 19 Oct. 1970, *Breteler 6986* (K!, WAG!); Moumbain, swamp NW from Tayday, 1 Dec. 1907, *Le Testu 1256* (BM!, BR!, P!); Mayombe Bayaka forest, Massanga, 9 Nov. 1910, *Le Testu 1665* (BM!, P!, UGDA-DLSz! – copy, drawing); Upper Ogooue, savanna on border of Ogooue Bassegha, 22 Nov. 1929, *Le Testu 7670* (BM!, K! – fragment, P!, UGDA-DLSz! – copy, drawing); Ogooue-Ivindo, Lope-Okanda Res., 2.6 km E along road from Kazamabika to Offoue River, 0°07'12"S, 11°42'57"E, alt. 290 m, 31 Oct. 2000, *Walters, Stone, Nziengui & Moussavou 461* (K!, MO!). Republic of Congo: Stanley Pool, on caravan routes, Oct. 1895, *Laurent s.n.* (BR!, K!, UGDA-DLSz – copy); 18 km NW de Dimonika, Mayombe, 28 Nov. 1968, *Attims 1* (P!, UGDA-DLSz! – copy, drawing); Brazzaville region, Kikoumbe near Ndono Kimbotu, 10 Nov. 1930, *Babet s.n.* (P!, UGDA-DLSz! – copy, drawing); Pays de Batekes, 8 Jun. 1914, *Bel s.n.* (P!); Foret apres le carrefour de Makaba ancienne route de Voula, *G. Cusset 801* (P!); In Mayombe on open hills near French Congo

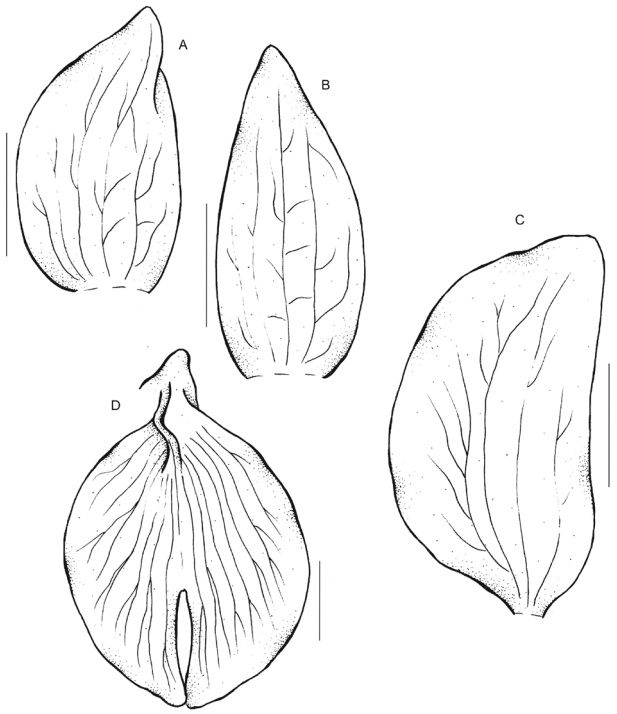

Fig. 131. *Brachycorythis pleistophylla* Rchb.f. var. *leopoldi* (Kraenzl.) Geerinck

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (drawn from *Sita 2744*, P). Scale bar = 3 cm

border at Panga. Oct.-Nov. 1921, *Dawe 239* (K!); Lefini, region de Kindamba, road between Loukakou and Meya, on the route to Hamon, 7 Nov. 1963, *Descoings 11410* (P!); Kilobi, pres d'un village a cote d'Asperyes, Sept. 1893, *Lecomte A76* (P!, UGDA-DLSz! – copy, drawing); Batikes Plateau, Ngakouba, 47 km N from Brazzaville, 700 m, 6 Feb. 1969, *Makany 1013* (P!); Bateke Plateau, km 46 of Maloukou-Trechot road, Mandiele forest, near Mandiele village, 22 Oct. 1968, *Sita 2744* (P!, UGDA-DLSz! – copy, drawing); Banza Region – Poudi, between Loumo and Mankoussou – Boko, 10 Nov. 1959, *Sitha 29* (P!); Fort Rousset – Edou route, 17 Oct. 1951, *Trochain 8466* (P!). Democratic Republic of the Congo (Zaire): Upper Shaba, Luapula valley, near Kiniama, dambo, 15 Dec. 1968, *Lisowski 65567* (UGDA-DLSz!); Upper Shaba, vicinity of Kipopo, dambo, Kibunduku, 8 Dec. 1970, *Lisowski 65569* (UGDA-DLSz!); Grelco, Biano Plateau, Oct. 1961, *Quarrè 1961* (BR!). Burundi: Dunga, Mosso, Prov. Bururi, savanna a Entada et Combretum, 4°12'S, 30°00'E, alt. 1350 m, 14 Dec. 1977, *Reekmans s.n.* (BR!, UGDA-DLSz! – copy, drawing). Angola: Vicinity of Portugalia, Lunda, Dec. 1962, *Cavaco 1218* (P!); Cazengo District, Londa, alt. 300-700 m, *Gossweiler 795* (P!, UGDA-DLSz! – copy); Cuanza, Bamba de Saupa, Zenza, *Gossweiler 8427* (BM!); Cabinda, 1976, *Schelpe s.n.* (K!); Saurimo, 28 Oct. 1932, *Young 1206* (BM!, UGDA-DLSz! – copy, drawing). Tanzania: Tanganyika, Bezirk Mahenge, 1931, *Schlieben* 1596 (B!); Nyassa Hochland, Station Kyimbila, 9 Jan. 1912, *Stolz s.n.* (WAG!); SW, Tanganyika, Matengo-Hochland WSW of Songea, 1500 m, 25 Dec.1935, *Zenry 215* (W!, UGDA-DLSz! – copy, drawing); Tanganyika, Songea Distr., Matengo Hills, 9 Jan. 1956, *Milne-Redhead & Taylor 8167* (B!).

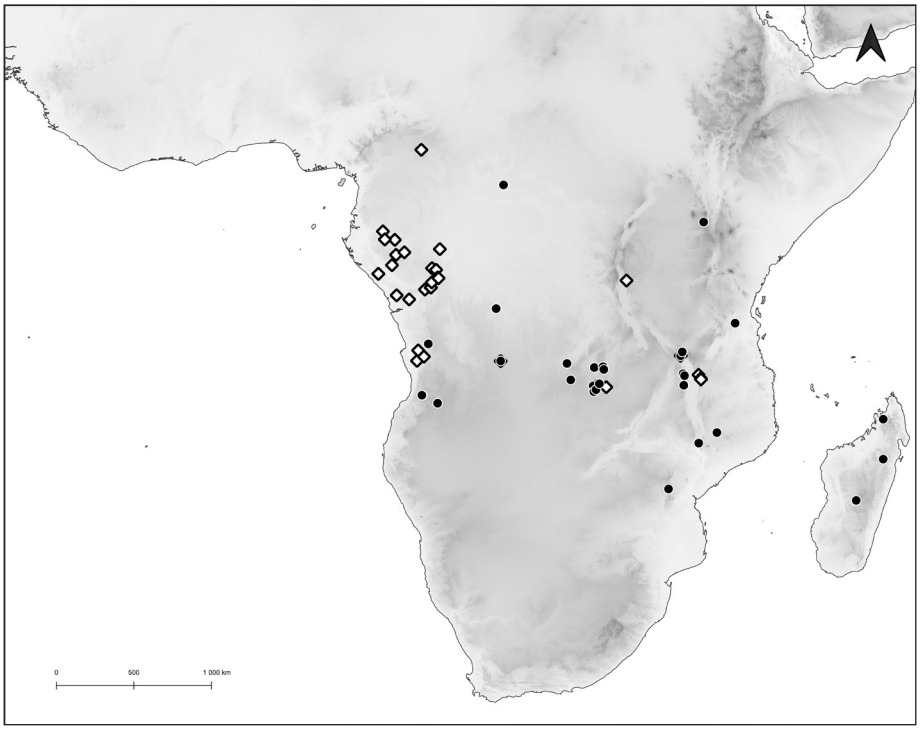

Fig. 132. Distribution map of *Brachycorythis pleistophylla* Rchb.f.: circle – var. *pleistophylla*, square – var. *leopoldi* (Kraenzl.) Geerinck.

6.1.5.4. *Brachycorythis ovata* Lindl. (Fig. 133-134)

Gen. Sp. Orchid. Pl.: 363. 1838; Type (Szlachetko 2007): SOUTH AFRICA, *Drege 4569* (Lectotype: K!, UGDA-DLSz! – copy). – Bolus, Icon. Orchid. Austro-Afr. 1: tab. 62. 1896. – Rolfe *in* Dyer, Fl. Cap. 5(3): 85. 1912. – Schlechter, Beih. Bot. Centralbl. 38(2): 115. 1921. – Summerhayes, Kew Bull. 10: 256. 1955. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Summerhayes, FTEA, Orchid. 1: 23. 1968. – Williamson, Orchid. S. Centr. Afr.: 32. 1977 – Stewart *et al.*, Wild Orchid. S. Afr.: 73. 1982. – Geerinck, Fl. Afr. Centr., Orchid. 1: 35. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 22-23. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 70. 1998. – Linder & Kurzweil, Orch. South. Afr.: 84. 1999. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 27. 2007. – Szlachetko, Orchid. Ivory Coast: 30. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 111. 2010. ≡ *Platanthera ovata* (Lindl.) Schltr., Bot. Jahrb. Syst. 20(1): 12. 1895.

Roots thick, fleshy, cylindrical, woolly. Stem 20-100 cm tall, erect, slender, glabrous in the lower part, minutely glandular below and along inflorescence axis. Leaves numerous, up to 35, up to 8 cm long and 2.5 cm wide, narrowly to lanceolate or oblong-ovate, acute, glabrous, erect, decreasing in size up the stem. Inflorescence 13-35 cm long, many-flowered, rather dense to relatively lax. Flowers variously shaded with purple or mauve, often with an admixture of white. Floral bracts up to 40 mm long, oblong lanceolate, acute, glabrous, the lower ones usually as long as or even longer than the flowers. Pedicel and ovary 10-20(24) mm long, glabrous. Dorsal sepal 4.5-9.3 mm long, 3-5 mm wide, elliptic to rotundate-ovate, cochleate, obtuse to rounded and cucullate at the apex, 3-veined. Petals 5-10 mm long, 2.5-7 mm wide, obliquely oblong-ovate, basally auriculate, subacute to truncate, margins more or less undulate, sometimes reose or crenate, 3-veined. Lateral sepals 6 -11(12.5) mm long, 2-5.9 mm wide, obliquely elliptic-ovate, cochleate, subacute, semi-cucullate, 3-veined. Lip – hypochile 4-7 mm long, 4-8 mm wide, slightly concave; epichile (5)6-12(16) mm long, 4.9-10.5 mm wide, broadly ovate-lunate in general outline, 3-lobed in the apical part, with a keel running along the mid-vein into the triangular, upcurved middle lobe; middle lobe 1-1.6 mm long, 1-2 mm wide; lateral lobes 1.5-2 mm long, 2.5-3.5 mm wide, falcate, subacute to obtuse, longer or shorter than the middle lobe, papillate. Gynostemium 3-6 mm long.

Notes: The species most similar to *Brachycorythis ovata* is *B. kalbreyeri*. Both of them have a little different habit, what we discussed above. *B. kalbreyeri* is a smaller plant, up to 40 cm tall (vs 20-100 cm), with acute (vs acuminate to long-acuminate), 5-15 leaves (vs up to 35), shorter (7-17 cm vs 13-35 cm) and few-flowered (laxly 5-22 vs numerous) inflorescence, and smaller flower segments (9.6-20 mm vs 4.5-12.5 mm). Petals of *B. kalbreyeri* are 9.6-15 × (4)7.5-12.5 mm, obliquely suborbicular to broadly ovate, subaucriculate basally, obtuse to rounded at the apex, sometimes margins are undulate or dentate (vs 5-10 × 2.5-7 mm, obliquely oblong-ovate, basally auriculate, subacute to truncate, margins more or less undulate, sometimes erose or crenate).

Three varieties can be distinguished in *B. ovata*. Typical variety is known from South Africa, whereas var. *schweinfurthii* was found in West Africa, the Democratic Republic of the Congo (Zaire), Sudan, Uganda, Kenya, and Tanzania.

var. *ovata*

Plants rather short in growth, with dense inflorescence and small flowers. Lip lobed at the apex only, middle lobe equaling or longer than both lateral lobes.
Ecology: No data. Flowering time: January-February, September, November-December.
General distribution: Burundi, Tanzania, Zimbabwe, Eswatini (Suazi), South Africa. Alt. 300-2400 m.
Representative specimens: Burundi: *Sine loc., Reekmans 4142* (BJA – photo seen). Tanzania: Nyassa Hochland, Station Kyimbala, alt. 1400 m, 13 Jan. 1909, *Stolz 190* (W!, UGDA-DLSz! – copy, drawing). Zimbabwe: *Sine loc.,* Dec. 1908, *Swynnerton 6632* (BM!). Eswatini (Suazi): Hlalikula Distr., 13 Sept. 1911, *Stewart & Reed s.n.* (K!). South Africa: Natal, District Alexandra, Station Dumissa, 15 Dec. 1908, *Rudatis 552* (K!, W!, UGDA-DLSz! – copy, drawing); Natal, District Alexandra, Station Dumissa, 28 Nov. 1911, *Rudatis 1526* (W!, UGDA-DLSz! – copy, drawing); Tongaat Prov., alt. 1000 m, 7 Nov. 1901, *Medley Wood 8401* (P!, UGDA-DLSz! – copy, drawing); Environs de Durban, 300-400 m, Nov. 1911, *Medley Wood s.n.* (P!, UGDA-DLSz! – copy, drawing); Drakensberge, Sani-Pass, 2000-2400 m, 17 Dec. 1958, *Werdermann & Oberdieck 1446* (B!, UGDA-DLSz! – copy, drawing); Between Umtata and Umgaziana, alt. ca 450-600 m, *Drege 4569* (P!, K!); Transvaal: Saddloback Mts., Barberton, *Thorncroft s.n.* (K!, UGDA-DLSz! – copy, drawing); Griqualand East, ?, 1 Feb. 1895, *Krook 115* (W!).

var. *schweinfurthii* (Rchb.f.) Szlach. & Olszewski
Fl. Cam., Orchid. 34(1): 72. 1998. – Perez-Vera, Orchid. Côte d'Ivoire: 112. 2003. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 28. 2007. – Szlachetko, Orchid. Ivory Coast: 32. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 111. 2010.
= *Brachycorythis schweinfurthii* Rchb.f., Otia Bot. Hamburg.: 59. 1878; Type (Szlachetko 2007): SUDAN,

Schweinfurth 3577 (Lectotype: W-R!, UGDA-DLSz! – copy, drawing). – Rolfe, Fl. Trop. Afr. 7: 201. 1898.
= *Brachycorythis ugandensis* Schltr., Notizbl. Bot. Gart. Berlin-Dahlem 8: 223. 1922; Type (Szlachetko 2007): KENYA, *Lindblom s.n.* (Lectotype: S).
= *Brachycorythis grandis* Kraenzl. var. *ugandensis* Braid, Bull. Misc. Inform. Kew 1925: 358. 1925; Type (Szlachetko 2007): UGANDA, *Snowden 877* (Lectotype: K!).

Plants usually exceeding 40 cm. Inflorescence rather lax. Flowers relatively large. Lip 12-16 mm long, lobed in the upper part, with lateral lobes distinctly longer than upcurved middle lobe.

Ecology: In open savanna woodland, in grass. Flowering time: April-August.

General distribution: Nigeria, Sudan, Cameroon Central African Republic, Democratic Republic of the Congo (Zaire), Kenya, Uganda. Alt. 595-2300 m.

Representative specimens: Nigeria: North, Zaria Prov., Regachikun, Kaduna-Zaira road, Aug. 1961, *Westwood 249* (P!, UGDA-DLSz! – copy, drawing); Zaria Prov., B. Gwari Distr., Mando, Terminalia macroptera, open savanna woodland, 21 Jul. 1950, *Kesy FHI 25982* (P!). Sudan: "Im Lande der Niamniam", N Moubutlu, 21 Apr. 1870, *Schweinfurth 3577* (W-R!). Cameroon: Mbibol, ?, 12 Jun. 1977, *Fotius 2622* (P!, UGDA-DLSz –copy, drawing); Bambili, Mezam Div., alt. 1300 m. 18 May 1970, *Bauer 72* (K!); Bamenda, *Brown 177 & 197* (K!); Plaine de Mbaw, Sabongari, 40 km WSW Mayo Darle, alt. 900 m, 9 May 1962, *Brunt 405* (K!); Batchingou Mts., 20 km W Bangangte, alt. 2000 m, 4 May 1964, *De Wilde 2431* (K!, WAG!); Ngaoundere-Meiganga route, Jul. 1939, *Jacques-Felix 4016* (P!); Sagdsche, 35 km SE Poli, Korowal Plateau, *Ledermann 3870* (K!); Km 8 Mbakaou-Tibati Road, 6°22'N, 12°46'E, alt. 860 m, 30 Jun. 1972, *Leeuwenberg 10062* (WAG!, UGDA-DLSz! – copy, drawing); Near Gandwa and between Gaui and Gandwa, 25 km NNW Banyo, 5 Jun. 1967, *Letouzey 8519* (K!, P!, UGDA-DLSz! – copy, drawing); Near Gandwa, 25 km NNE Banyo, 14 Jun. 1967, *Letouzey 8646* (P!, UGDA-DLSz! – copy, drawing); Lakom, near Bamenda, alt. 2000 m, Apr. 1931, *Maitland 1787* (B!, K!); Djuttitsa near Dschang, 20 May 1966, *Meurillon 358 bis* (P!); Dschang, Jun. 1955, *Saxer 62* (K!); Res. For. Bali-Ngemba near Bamenda, 9 May 1957, *Ujor FHI 30324 A* (K!).; Djuttitsa, 1900 m, 20 May 1966, *Letouzey 358bis* (P!). Central African Republic: Manovo-Gounda-St. Floris Natl. Park, 1 km E of camp Koumbala, 8°29'N, 21°13'E, alt. 600 m, 24 Jul. 1983, *Fay 5474* (K!, UGDA-DLSz! – copy, drawing); Manovo-Gounda-St. Floris Natl. Park, 2 km E of the Goumba River crossing on the Piste de Crete, 8°31'N, 21°18'E, 595 m, 11 Jun. 1983, *Fay 7136* (K!); Ht. Oubangui, Yalinga, 55 km Sangassa, 31 May 1921, *Le Testu 2005* (BM!, P!, UGDA-DLSz! – copy, drawing); *The same loc*., 9 Jun. 1922, *Le Testu 3938 (*BM!, P!, UGDA-DLSz! – copy, drawing); Buar, 6°N, 15°35'E, alt. 1000 m. May 1914, *Mildbraed 9419* (K!). Democratic Republic of the Congo (Zaire): Uele, 700-800 m, 26 May 1950, *Noirealise 376* (BR!, UGDA-DLSz! – copy, drawing). Kenya: Kakamega, in grass, alt 1524 m, May 1943, *Carroll 608* (K!). Uganda: Règion de la Haute Volta, Pays Kong, *Bouet 2560* (P!, UGDA-DLSz! – copy, drawing); Erusi, West Nile, in grass, Apr. 1940, *Eggeling 3925* (K!); Mt. Elgon, alt. ca 2300 m., grassland, 28 May 1920, *Lindbloom ? s.n.* (K!); Same loc., in grass, alt. ca. 2100 m, May 1933, *Dale 3088* (K!).

Notes: Given from the Republic of Congo by Sita & Moutsambote (1988), but we have seen no materials of this species from this country. This variety is closely related to var. *welwitschii* and differs from it by the lip shape and length of the middle lip lobe versus laterals.

Fig. 133. *Brachycorythis ovata* Lindl. var. *schweinfurthii* (Rchb.f.) Szlach. & Olszewski
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

var. *welwitschii* (Rchb.f.) Szlach. & Olszewski
Fl. Cam., Orchid. 34(1): 73. 1998. ≡ *Brachycorythis welwitschii* Rchb.f., Flora 50: 99. 1867; Type (Szlachetko *et al.* 2010): ANGOLA, *Welwitsch 707* (Lectotype: W-R!, Isolectotypes: BM!, K!, P!, UGDA-DLSz! – copy, drawing). – Rolfe, Fl. Trop. Afr. 7: 202. 1898.

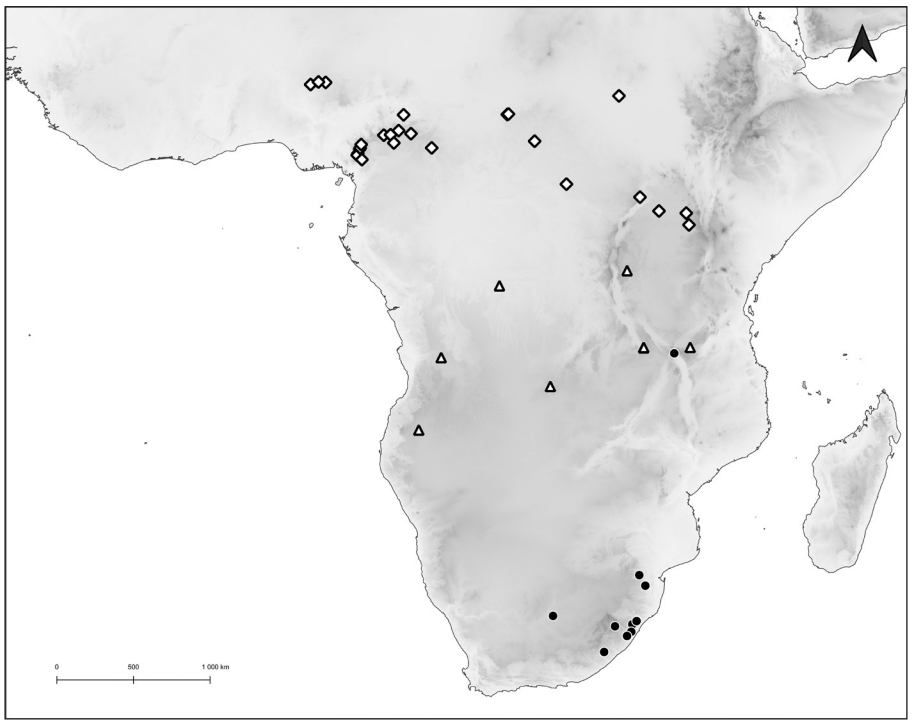

Fig. 134. Distribution map of *Brachycorythis ovata* Lindl.
Explanations: circle – var. *ovata, square* – var. *schweinfurthii* (Rchb.f.) Szlach. & Olszewski, triangle – var. *welwitschii* (Rchb.f.) Szlach. & Olszewski

Stem 20-60 cm tall, erect. Inflorescence up to 17 cm long, rather dense, up to 25-flowered. Flowers rather small. Lip – hypochile 5 mm long, 4-5 mm wide, slightly concave; epichile 8.5-10.5 mm long, 6.5-10.5 mm wide, elliptic in general outline, 3-lobed in the apical part, with a keel running along the mid-vein, into the ligulate, slightly upcurved middle lobe, lateral lobes oblong-elliptic, usually rounded, shorter than the middle lobe.
Ecology: Humid grasslands, swampy grassland, in rough grass, under trees. November-December.
General distribution: Burundi, Tanzania, Angola, Zambia.
Representative specimens: Burundi: Dweru, pont II de la piste allemande, près de la rivière Karuzi, 27 Nov. 1957, *van der Ben 1735* (BR!, UGDA-DLSz! – copy, drawing). Tanzania: Kipengere, Ubena, in swampy grassland, alt. ca 2100 m , 20 Jan. 1978, *Leedal 4834* (K!). Angola: Huilla, "in pratis humidiusculis Sobati de Humpata", ca 1200 – 1700 m, Dec. 1859, *Welwitsch 707* (BM!, K!, P!, WR!, UGDA-DLSz – copy, drawing); Statio Malange. Nov. 1879, *Mechow 311* (W-R!); Belgian Congo: Kaisai Distr. Sankuru River, Oct. 1910, *Kassner 3333* (K!). Zambia: Abercorn Distr., shore of Lake Chila, in rough grass, ca 1650 m, *Richards 261* (K!); Abercorn Distr., about 12 miles above Sansia Hills, Kalambo River, alt. 1740 m, 25 Dec. 1958, in rough grass, *Richards 10367* (K!); Abercorn Distr., under trees bordering the Mbuga of Lake Chila, 12 Dec. 1949, *Bullock 2084* (K!), Mwinilunga Distr., Oct. 1937-Feb. 1938, *Milne-Redhead 3616* (K!).

Section *Microcorythis* Schltr.

Beih. Bot. Centralbl. 38(2): 105 & 112. 1921; Type species (Szlachetko *et al.* 2010: 114): *Brachycorythis inhambanensis* Schltr.

This section includes only 2 species, which common character is lip with lobes almost equal in length, hypochile and epichile are lying on the same plane.

6.1.5.5. *Brachycorythis buchananii* (Schltr.) Rolfe (Figs. 135-136)

Fl. Trop. Afr. 7: 570. 1898. – Summerhayes, Kew Bull. 9: 252. 1955. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Summerhayes, FTEA, Orchid. 1: 21. 1968. – Geerinck, Fl. Afr. Centr., Orchid. 1: 33. 1984. – la Croix *et al.*, Orchid. Malawi: 29. 1991. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 20. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 73. 1998. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 25. 2007. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 114. 2010. ≡ *Platanthera buchananii* Schltr., Bot. Jahrb. Syst. 24: 420. 1897; Type: MALAWI, *Buchanan s.n.* (Holotype: B†).
= *Brachycorythis parviflora* Rolfe, Fl. Trop. Afr. 7: 202. 1898; Type (Szlachetko 2007): ZAMBIA, *Nutt s.n.* (Lectotype: K!).

Tuberous roots narrowly ellipsoid or fusiform. Stem 20-55 cm tall, erect, delicate, glabrous, turning black-brown in drying. Leaves up to 25, subdensely to rather distantly arranged along the stem, up to 4.5 cm long

and 1 cm wide, lanceolate, acute, glabrous, erect to suberect, decreasing in size up the stem. Inflorescence 4-14 cm long, densely 14-25-flowered. Flowers white, pink, mauve or purple, sometimes with lighter petals, lip callus yellowish. Floral bracts up to 10 mm long, lanceolate, acute, glabrous. Pedicel and ovary 5-10 mm long, glabrous. Dorsal sepal 4-6 mm long, 1.5-2.5 mm wide, oblong-ovate to lanceolate-elliptic, obtuse, slightly cochleate, 3-veined. Petals 4-6 mm long, 2.5-3.9 mm wide, rectangular, semi-orbicular to obliquely orbicular-obovate or rounded at the apex, obtuse, slightly cucullate, 3-veined. Lateral sepals 4-6 mm long, 1.5-2.9 mm wide, obliquely ovate, subacute to subobtuse, semi-cucullate, 3-veined. Lip – hypochile 1.7-3 mm long and 1.3-4.5 mm wide, cochleate, with more or less prominent, irregular, globular callosity in the bottom and with conical callus projecting in front of the cavity; epichile 2.4-4 mm long, 3-6 mm wide, transversely elliptic to reniform, distinctly 3-lobed; middle lobe ca. 0.3-1 mm long, ligulate, subobtuse, shorter than lateral lobes; lateral lobes more or less 1-1.5 mm long, up to 2 mm wide ovate-rhombic, subacute. Gynostemium 2 mm long.

Ecology: In mossy crevice and on clump of *Graphorkis lurida*, in marshy ground, humid steppe, in wet swamp, in upland grassland, in marshy ground with tall grass, in permanently wet dambo. Flowering time: January-February, July, October-December.

General distribution: Guinea, Nigeria, Central African Republic, Ethiopia, Democratic Republic of the Congo (Zaire), Tanzania, Kenya, Angola, Zambia, Malawi, Zimbabwe. Alt. 150-1900 m.

Representative specimens: Guinea: Saisi Valley, 22 Jan. 1970, alt. ca 150 m, *Sanana 1024* (K!, UGDA-DLSz! – copy, drawing); Mwinilunga Distr., by R. Kaoomba, in marshy ground, 22 Dec., 1937, *Milne-Redhead 3780* (K!). Nigeria: Adamawa Prov., Mambila Plateau, 7°N, 11°10'E, alt. ca 1670 m, 17 Jul. 1958, *Chapman 4* (K!, P!, UGDA-DLSz! – copy, drawing). Central African Republic: Manovo-Gounda-St. Floris Natl. Park, 3 km S of Pende-Koumbala confluence on W side of Pende Creek, 8°24'N, 21°15'E, alt. 605 m, 7 Jul. 1985, *Fay 7257* (K!, MO); Manovo-Gounda-St. Floris Natl. Park, 10 km S of Pende-Koumbala confluence on W side of Pende Creek, 8°21'N, 21°13'E, 30 Jul. 1985, *Fay 7341* (K!, MO!, P!, UGDA-DLSz! – copy, drawing). Ethiopia: Kaffa Prov., ca 3 km along Bonga-Timma road, 1250 m, 4 Jul. 1969, *De Wilde 5347* (K!). Democratic Republic of the Congo (Zaire): Katuka, Droogmans Farm, Dec. 1927, Quarrè 935 (K!, BR!, WAG!); Upper Shaba, a W of Lubumbashi, dembo Natwebe river bank, 25 Oct. 1970, *Lisowski 65713* (UGDA-DLSz!); Upper Shaba, Kundelungu Plateau, 2 km E from Lutshipuka sources, humid steppe, 1600 m, 8 Jan. 1971, *Lisowski 65782* (UGDA-DLSz!); Katanga, Kundelungu Plateau, near Lutshipuka sorces, alt. 1600 m, 6 Jan. 1969, *Lisowski, Malaisse & Symoens 574 & 575* (UGDA-DLSz!); Katanga, Plateau Kundelungu, 2 km E from Lutshipuka sorces, 1600 m. 8 Jan. 1971, *Lisowski, Malaisse & Symoens 13069* (UGDA-DLSz!). Tanzania: Nyassa Hochland, Station Kyimbila, 18 Jan. 1908, *Stolz 139* (B!, W!, UGDA-DLSz! – copy, drawing); Nyassa Hochland, Station Kyimbila, 25 Jan. 1911, *Stolz 568* (K!, W!, UGDA-DLSz! – copy, drawing); Tanganyika Ter., near N. Rhodesia border, Ufipa Distr., about 12 miles from Kawimbe, alt. 1680 m, 29 Jan. 1957, in wet swamp, *Richards 8039* (K!); Tanganyika, Iringa Distr., Dabaga Highlands, 8 miles S of Dabaga, on the Kibengu road, streamaide marah in upland grassland, alt. ca 1900 m, 22 Feb. 1962, *Polhill & Paulo 1570* (B!, K!, P!, UGDA-DLSz! – copy, drawing). Kenya: Kakamega, in marshy ground with tall grass, alt. 1500 m, Jul. 1943, *Carroll in Tweedie 614* (K!). Angola: Moxico, 0.5 mile E of Lusavo Falls, 13 Jan. 1938, *Milne-Redhead 4104* (BR!, K!); River Lumege near Vila Luzo, 2 Nov. 1932, *Young 1265* (BM!). Zambia: Central Prov., Lusaka Distr., Great E Road between Undaunda and Rufunsa, 128 km E of Lusaka, 15°12'S, 29°21'E, alt. 1180 m, 2 Jan. 1972, *Kornaś 0785* (KRA!, UGDA-DLSz! – copy, drawing); Central Prov., Serenje Distr., Lusili River 5 km W of Serenje, 13°16'S, 30°12'E, 1450 m, 3 Feb. 1973, *Kornaś &*

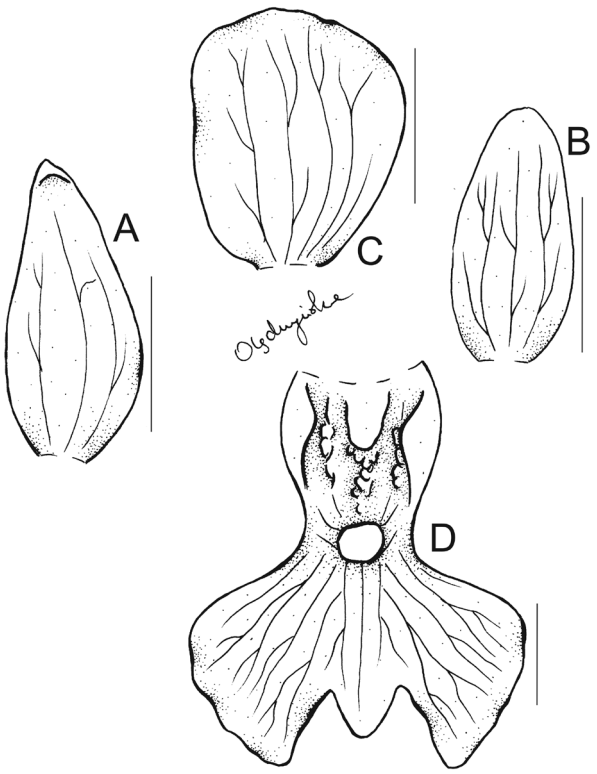

Fig. 135. *Brachycorythis buchananii* (Schltr.) Rolfe
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

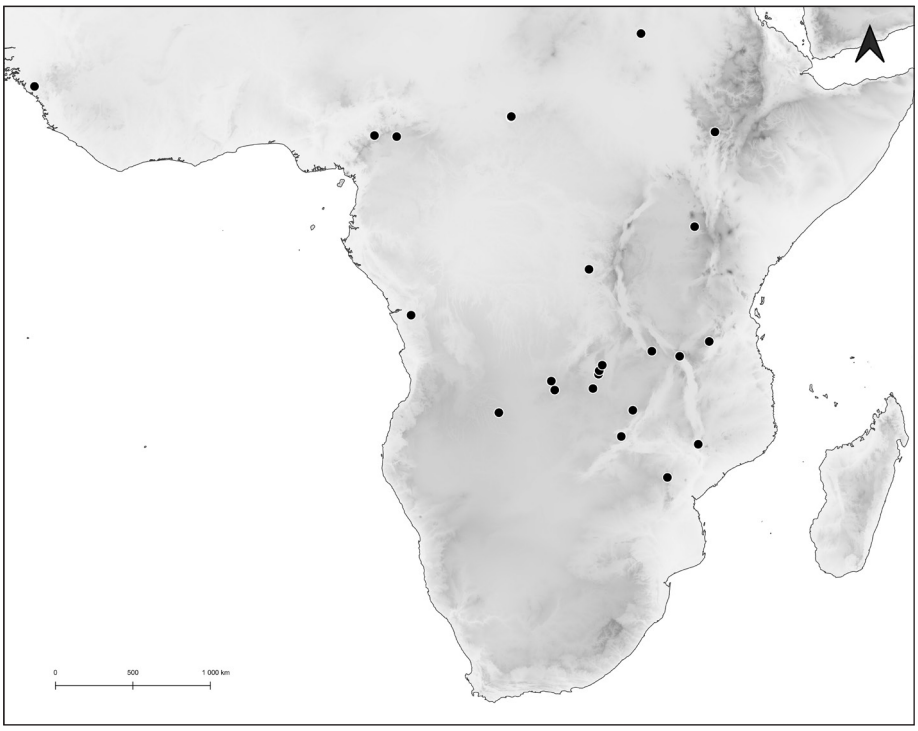

Fig. 136. Distribution map of *Brachycorythis buchananii* (Schltr.) Rolfe.

Medwecka-Kornaś 3145 (KRA!, UGDA-DLSz! – copy, drawing); Iwambo, S of Lake Tanzania, alt. 1700 m, 1896, *Nutt s.n.* (K!); 6 km N of Kalene Hill, Mwinilunga Distr., permanently wet dambo, 12 Dec. 1963, *Robinson 5911* (B!, UGDA-DLSz! – copy, drawing). Malawi: Nyambadwe, Blantyre, Dambu near Mission Dam, 26 Feb. 1945, *Benson 1067* (P!, UGDA-DLSz! – copy, drawing); Nyassaland, 1 Jul. 1895, *Buchanan 190* (E – photo seen); Nyasaland, Nyambadwa, Blantgre, Dambo near Mission, 4 Jan. 1945, *Benson 1076* (K!, UGDA-DLSz! – copy, drawing). Zimbabwe: Rhodesia austr. Inyanga, alt. 1700 m, 20 Jan. 1931, *Norlindh & Weimarck 4452* (K!).

Notes: Both species constituting this section have very similar habit, but *Brachycorythis buchananii* has a very characteristic callus on the bottom of hypochile and at the junction between epichile and hypochile. Additionally, petals of the former species are rectangular, semi-orbicular to obliquely orbicular-obovate or rounded at the apex, obtuse, slightly cucullate (vs obliquely elliptic-obovate, obtuse, outer margin more or less crenate). Lip lobation in *B. buchananii* is more prominent than in *B. inhambanensis*.

6.1.5.6. *Brachycorythis inhambanensis* (Schltr.) Schltr. (Figs. 137-138)

Beih. Bot. Centralbl. 38(2): 112. 1921; Type: MOZAMBIQUE, *Schlechter 12091* (Holotype: B†). ≡ *Platanthera inhambanensis* Schltr., Bot. Jahrb. Syst. 26: 330. 1899. – Geerinck, Fl. Afr. Centr., Orchid. 1: 34. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 20. 1995. – Linder & Kurzweil, Orch. South. Afr. 83. 1999. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 115. 2010.

Stem 20-35 cm tall, erect, slender, glabrous. Leaves 8, rather distantly placed along stem, up to 8 cm long and 3 cm wide, lanceolate to elliptic-lanceolate, acute, glabrous, erect, decreasing in size up the stem. Inflorescence 6-9.5 cm long, laxly or densely many-flowered. Flowers whitish- or yellowish-green, the inside of sepals and petals, and lip spotted with purple-brown. Floral bracts up to 25 mm long, lanceolate, acute, glabrous, longer than the lower flowers. Pedicel and ovary 7-10 mm long, glabrous. Dorsal sepal 4.1-6 mm long, 2-2.6 mm wide, elliptic to elliptic-ovate, obtuse, slightly cochleate, 3-veined. Petals 4.4-6 mm long, 1.5-3.2 mm wide, obliquely elliptic-obovate, obtuse, outer margin more or less crenate, 3-veined. Lateral sepals 4.5-6.3 mm long, 2.4-3.2 mm wide, obliquely elliptic-ovate, rounded at the apex, 3-4-veined. Lip - hypochile 1-2 mm long and wide, shallowly saccate; epichile 4.5-6 mm long, 3-5.5 mm wide, triangular or triangular-ovate in general outline, distinctly 3-lobed at the apex; middle lobe ca. 0.3-1 mm long, 1-2.5 wide triangular-ligulate, subobtuse, usually shorter than lateral lobes; lateral lobes 0.5-1.6 mm long, 1-2.5 mm wide, more or less ovate-rhombic, rounded. Gynostemium 2-3 mm long.

Ecology: In (permanently and perennially wet) dambo, in damp peaty soil with tall coarse grass, in wet

marshy grassland, grassy plain, in marsh. Flowering time: January-February, December.

General distribution: Democratic Republic of the Congo (Zaire), Zambia, Zimbabwe, Mozambique. Alt. 1680-1980 m.

Representative specimens: Democratic Republic of the Congo (Zaire): Katanga, 52 km SW of Mutshatsha, near N Rhod. Border, permanently wet dambo, 14 Dec. 1963, *Robinson 6011* (K!); Katanga, Manika Plateau, vicinity of 3 km W from Katema village, alt. 1490 m, 20 Jan. 1969, *Lisowski, Malaisse & Symoens 382* (BR!, UGDA-DLSz!); Katanga, Manika Plateau, Katema, alt. 1490 m. 12 Jan. 1971, *Lisowski, Malaisse & Symoens 13259* (BR!, UGDA-DLSz!); N'Konda, on the Nasondoye-Kasofu road, about 22.5 km by road NW from the Lufufa River, dambo, 4 Jan. 1983, *Schaijes 1772* (BR!). Zambia: Mwinilunga Distr., SW of Dobeka Bridge, 14 Dec. 1937, *Milne-Redhead 3655* (BR!, K!, UGDA-DLSz! – copy, drawing); Mwinilunga Distr., Dobeka Dambo, 45 km W of Mwinilunga, alt. 1350 m, wet dambo, 22 Jan. 1975, *Brummitt, Chisumpa & Polhill 13996* (K!, UGDA-DLSz! – copy, drawing); Mbala Distr., Chambeshi surce dambo, Kasama-Mbala 128.4 km, 9°12,5'E, 31°20.4'E, alt. 1560 m, 22 Jan.2001, *Bingham & Zukas 12358* (K!); Kasama Distr., perennially wet dambo, 16 Dec. 1960, *Robinson 4191* (K!); Abercorn Distr., small dambo above Nkali dambo, in damp peaty soil with tall coarse grass, alt. 1740 m, 28 Jan. 1959, *Richards 10782* (K!); Abercorn Distr., Ndulu, little dambo, in wet marshy grassland, alt. 1640 m, 15 Jan. 1962, *Richards 15904 (K!);* Abercorn Distr., Ndundu Dambo, in dambo, in wet peaty soil, alt. 1680 m, 8 Feb. 1957, *Richards 8111* (K!). Mbala, Ndumdu dambo, Dec. 1967, *Williamson 342* (K!). Zimbabwe: Melsetter Distr., Cimanimani Mts., grassy plain, alt. ca 1820 m, 26 Jan. 1954, *Ball 190* (BR!, SRGH! 46246); Same loc., 26 Jan. 1955, *Ball 488* (K!).

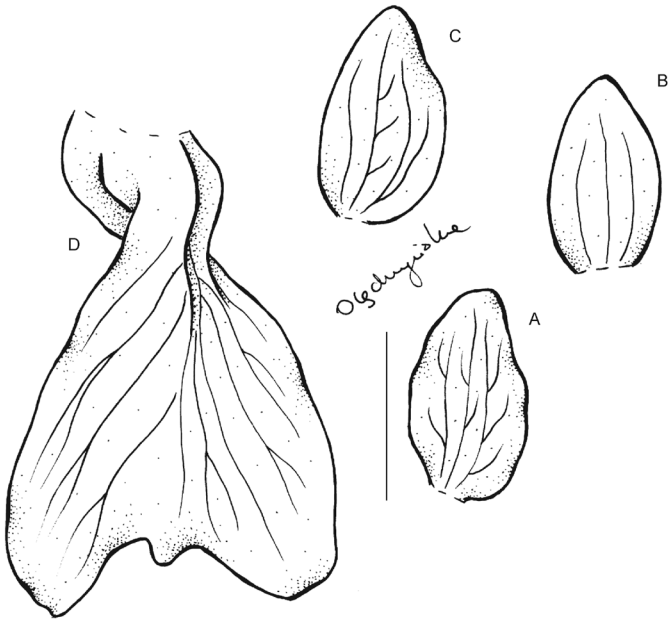

Fig. 137. *Brachycorythis inhambanensis* (Schltr.) Schltr.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

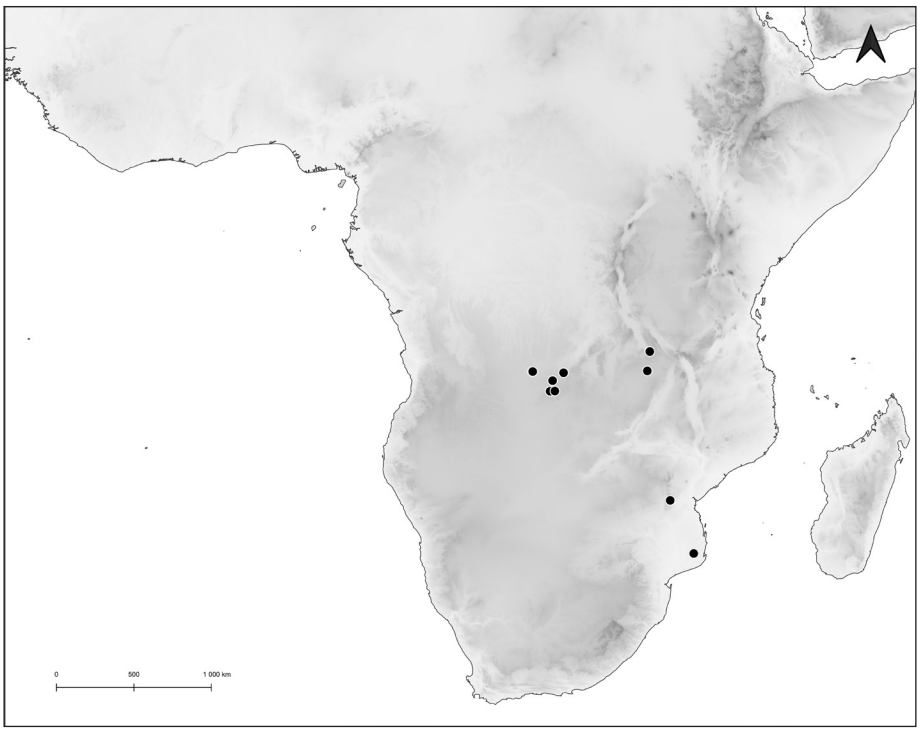

Fig. 138. Distribution map of *Brachycorythis inhambanensis* (Schltr.) Schltr.

Mozambique: Near Inhambane, in marsh, Feb. 1898, *Schlechter 12091* (B†).
Notes: It differs from *Brachycorythis buchananii* in having ecallose lip.

Section *Dasycorythis* Schltr.

Beih. Bot. Centralbl. 38(2): 105 & 107. 1921; Type species (Szlachetko *et al.* 2010): *Brachycorythis pubescens* Harv.

We included 3 species in this section, all with lip lobes almost equal in length, with epichile usually perpendicular to the hypochile. All of them are rather similar in habit.

6.1.5.7. *Brachycorythis mixta* Summerh. (Fig. 139)

Kew Bull. 10(2): 263. 1955; Type: ANGOLA, *Tisserant A177* (Holotype: K!, Isotype: K!, UGDA-DLSz! – copy).– Williamson, Orch. S. Centr. Africa 35. 1977. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 25. 1995. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 116. 2010.

Roots tuberous, fleshy, ellipsoid to cylindrical, clustered. Stem 30-50 cm tall, erect, rather stout, densely, minutely pubescent. Cauline leaves numerous, up to 5 cm long and 1 cm wide, lanceolate to linear-lanceolate, acute to acuminate, densely pubescent on both sides, suberect to erect, decreasing in size up the stem. Inflorescence 10-15 cm long, densely many-flowered. Sepals and petals yellow-green, purplish on the outside, lip bright yellow. Floral bracts up to 20 mm long, lanceolate, acute, densely pubescent on both sides. Pedicel and ovary 9.5-15 mm long, densely pubescent. Dorsal sepal 4.3-6.5 mm long, 2.1-4.5 mm wide, elliptic, obtuse to rounded at the apex, 5-veined, pubescent outside. Petals 5.5 mm long, 2.5 mm wide, obliquely oblong to ligulate, obtuse, 3-veined. Lateral sepals 5-7 mm long, (2.5)3-4.5 mm wide, obliquely ovate to elliptic, obtuse, 3- or 5-veined, ubescent outside. Lip – hypochile 2-3 mm long and wide, concave; epichile 5-7.3 mm long, 4.5-7.5 mm wide, obovate to broadly triangular in general outline, narrow at the base, widest at the apex, 3-lobed in the apical part, held horizontally, densely pubescent on both sides; middle lobe 1.3 mm long, 1.5 mm wide, shorter than lateral lobes, ligulate to elliptic, rounded; lateral lobes 2 mm long, 1.3 mm wide, obliquely rhombic-ovate, reflexed. Gynostemium 2.5-3 mm long.
Ecology: No data. Flowering time: September, November.
General distribution: Democratic Republic of the Congo (Zaire), Angola, Zambia. Alt. no data.
Representative specimens: Democratic Republic of the Congo (Zaire): 20 km S of Kolwezi, 15 Nov. 1981, *Schaijes 1113* (BR!, UGDA-DLSz! – copy, drawing). Angola: Huambo Mission, E of Benguela. Sept. 1942, *Tisserant A177* (K!, UGDA-DLSz! – copy). Zambia: Mwinilunga Distr., 20 Nov. 1958, *Holmes 059* (K!, UGDA-DLSz! – copy, drawing).
Notes. In habit this species is similar to *Afrorchis con-*

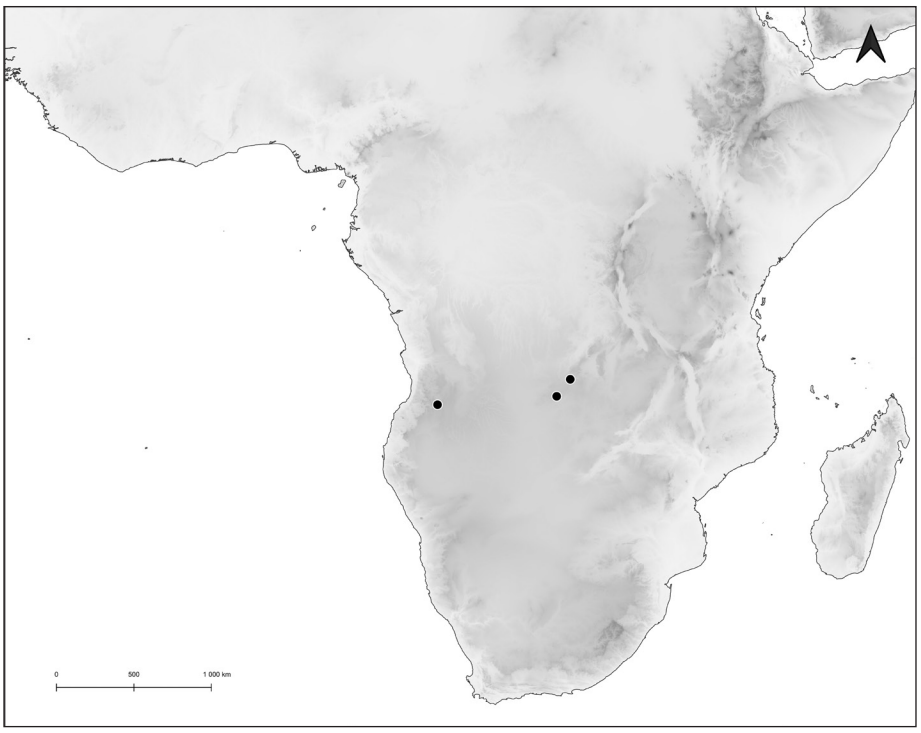

Fig. 139. Distribution map of *Brachycorythis mixta* Summerh.

goensis and *A. pilosa*, but they differ in having saccate spur.

According to Geerinck (1984) *Brachycorythis mixta* is a synonym of *B. pubescens*. We prefer to keep them separately because different position of the lip: horizontal in *B. mixta* vs bent down in the knee-like manner in *B. pubescens.*

6.1.5.8. *Brachycorythis pubescens* Harv. (Figs. 140-141)

Thes. Cap. 1: 35, tab. 54. 1859; Type (Szlachetko 2007): REPUBLIC OF SOUTH AFRICA, *Sanderson 482* (Lectotype: K!) – Rolfe, Fl. Trop. Afr. 7: 201. 1898. – Bolus, Ic. Orchid. Austr.-Afr. 3: tab. 73. 1913. – Summerhayes, FWTA, ed. 2, 3: 187. 1968. – Summerhayes, FTEA, Orchid. 1: 25. 1968. – Williamson, Orchid. S. Centr. Afr.: 34. 1977. – Stewart *et al.*, Wild. Orchid. S. Afr.: 75. 1982. – Geerinck, Fl. Afr. Centr., Orchid. 1: 44. 1984. – la Croix *et al.*, Orchid. Malawi: 32. 1991. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 23-24. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 65. 1998. – Linder & Kurzweil, Orch. South. Afr.: 84. 1999. – Perez-Vera, Orchid. Côte d'Ivoire: 114. 2003. – Szlachetko, Sawicka & Kras-Łapińska, Fl. Gabon, Orchid. 36(1): 20. 2004. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 30. 2007. – Szlachetko, Orchid. Ivory Coast: 33. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 116. 2010.
= *Peristylus hispidulus* Rendle, J. Linn. Soc., Bot. 30: 398. 1895; Type (Szlachetko 2007): KENYA, *Gregory s.n.* (Lectotype: BM!). ≡ *Platanthera hispidula* (Rendle) Gilg, Pflanzenw. Ost-Afr. C: 151. 1895. ≡ *Brachycorythis hispidula* (Rendle) Schltr., Beih. Bot. Centralbl. 38(2): 108. 1921.
= *Brachycorythis goetzeana* Kraenzl., Bot. Jahrb. Syst. 28: 176. 1900; Type (Szlachetko 2007): TANZANIA, *Goetze 634* (B†, Lectotype: K!, UGDA-DLSz! – copy).
= *Brachycorythis kassneriana* Kraenzl., Bot. Jahrb. Syst. 51: 378. 1914; Type (Szlachetko 2007): ZAMBIA, *Kassner 2117* (B†, Lectotype: BM!, Isolectotypes: BR!, K!, UGDA-DLSz! – copy, drawing).
= *Brachycorythis stolzii* Schltr., Beih. Bot. Centralbl. 38(2): 110. 1921; Type (Szlachetko 2007): TANZANIA, *Stolz 506* (B†, Lectotype: BM!, Isolectotypes: K!, WAG!, UGDA-DLSz! – copy, drawing).
= *Brachycorythis baumii* Schltr., Beih. Bot. Centralbl. 38(11): 109. 1921; Type (Szlachetko 2007): ANGOLA, *Baum 542* (B†, Lectotype: W!, Isolectotypes: K!).

Roots tuberous, fleshy, ellipsoid to cylindrical, up to ca 1 cm in diameter, densely woolly, clustered. Stem 15-80 cm tall, erect, rather delicate, densely, minutely pubescent. Cauline leaves up to 40 or so, 2-6 cm long, 1-2.5 cm wide, ovate to narrowly lanceolate, acute to acuminate, densely velvety hairy on both surfaces, spread to suberect, decreasing in size up the stem. In-

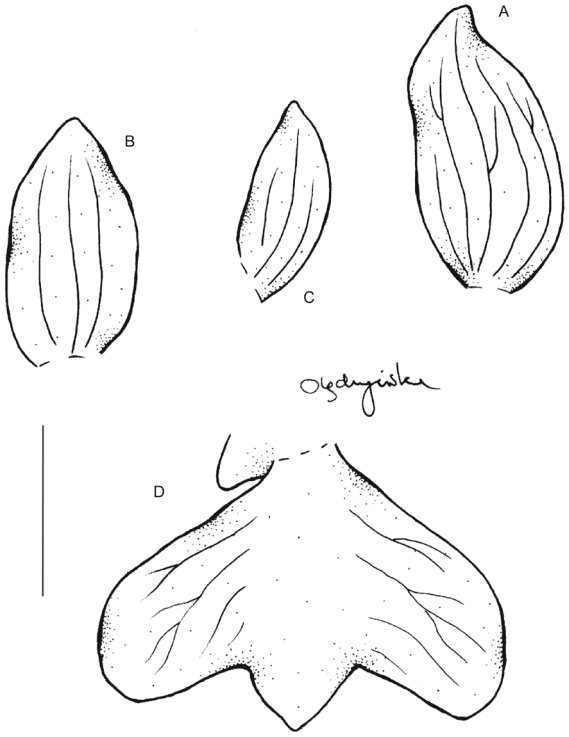

Fig. 140. *Brachycorythis pubescens* Harv.
Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

florescence 4-35 cm long, up to 40-50-flowered, dense. Flowers pink to purple often with the orange or yellow centre, the tepals often darker at the tips. Floral bracts up to 25 mm long, lanceolate, acute to acuminate, densely pubescent on both sides. Pedicel and ovary 10-25 mm long, densely pubescent. Sepals densely, minutely pubescent outside. Dorsal sepal 4-8 mm long, 2-4.5 mm wide, elliptic to broadly obovate, obtuse to rounded at the apex, 3-veined. Petals 4-7 mm long, 1.5-4 mm wide, obliquely ovate to elliptic, basally subauriculate, obtuse to subacute, sparsely pubescent outside, 2-3-veined. Lateral sepals 4.5-8.5 mm long, 2.5-5 mm wide, obliquely ovate or elliptic, rounded at the apex, cochleate, 3- or 5-veined. Lip – hypochile 1-4(6) mm long and wide, concave; epichile (4.3)5-10.5 mm long, 5-14 mm wide, bent downwards in the knee-like manner, densely pubescent on both sides, broadly wedge-shaped or fan-shaped in general outline, very narrow at the base, widest at the apex, 3-lobed in the apical part; middle lobe ca. 1-2.5(3) mm long and wide, obscure, ligulate, triangular or rounded; lateral lobes 1-4 mm long, (1.5)2.5-4 mm wide, obliquely broadly rounded to rhombic, shorter than or subequal to the middle one. Gynostemium 2-4 mm long.
Ecology: In savanna woodland, on sandy soil, on grassland slope, dambo, above waterlogging level , in rough grass, in grassland by the dam, secondary woodland, black soil, in grassland by the dam, in montane

grassland, on grassy hillsides, wet meadow (dambo). Flowering time: All year round.

General distribution: Guinea, Ivory Coast, Nigeria, Sudan, Cameroon, Central African Republic, Gabon, Republic of the Congo, Democratic Republic of the Congo (Zaire), Burundi, Tanzania, Angola, Zambia, Malawi, South Africa. Alt. 550-2300 m.

Representative specimens: Guinea: Near Kindia, Aug. 1905, *Pobéguin 1375* (K!). Ivory Coast: Lamte Reserve, 50 km S of Toumodi, in savanna woodland, on sandy soil, 12 Jun. 1968, *Bokdam 2745* (MO!, UGDA-DLSz! – copy, drawing). Nigeria: Adamawa Prov., Mambila Plateau, Nguroje, grassland slope, alt. ca 1670 m, 15 Jun. 1958, *Chapman* 8 (P!, UGDA-DLSz! – copy, drawing); Zaria Prov, 13 Jun. 1957, *Summerhayes 100* (P!, UGDA-DLSz! – copy, drawing). Cameroon: Bambili, Bamenda, alt. 1500 m, 5 May 1971, *Bauer 188* (K!); Between Galim and Bagam, alt. 1200 m, 8 May 1964, *De Wilde 2512* (K!, MO!, P!, WAG!, UGDA-DLSz! – copy, drawing); 6 km NE Bangangte, alt. 1350 m, 11 May 1964, *De Wilde 2512B* (B!, K!, MO!, P!, WAG!, UGDA-DLSz! – copy, drawing); Jakiri near Kumbo (=Banso), alt. 2000-2300 m, 8 Jun. 1947, *Gregory 144* (K!); Dschang, May 1940, *Jacques-Felix 5223* (K!, P!); Mts. Bambouto, alt. 1900 m, May 1940, *Jacques-Felix 5495* (K! – fragment, P!); Jua near Bamenda, alt. 1000-1200 m, Apr. 1931, *Maitland CNAD 1625* (B!, K!, UGDA-DLSz! – copy, drawing); Lakom, near Bamenda, 2000 m, Apr. 1931, *Maitland 1780* (K!); Doula and Mts. Bambouto, Djuttitsa near Dschang, alt. 1900 m, 20 May 1966, *Meurillon 358* (P!, UGDA-DLSz! – copy, drawing); Dirdu, Tshopeo and Dalami, near Garoua, *Range 64, 83A, 91* (K!). Central African Republic: Manovo-Gounda-St. Floris Natl. Park, Koumbala Bridge on the N'dele-Tirongoulou road, 8°31'N, 21°11'E, alt. 550 m, 4 Aug. 1983, *Fay 5536* (K!); Manovo-Gounda-St. Floris Natl. Park, 2 km S of Pende-Koumbala confluence on the W side of Pende Creek, 8°24'N, 21°16'E, alt. 600 m, 29 Jul. 1985, *Fay 7338* (K!, MO). Sudan: Folo*, Sine coll s.n. (*P!). Gabon: Ca 1 km N of Doussala, 2°18'S, 10°35'E, 4 Dec. 1986, *De Wilde, Arends & de Bruijn 9159* (BR!, K!, WAG!, LBV); Mayombe forest, Bayaka Tchibanga, 17 Nov. 1910, *Le Testu 1667* (P!); *Sine loc.,* "Gabon. Congo", *Thollon s.n.* (K!, P!). The Republic of Congo: Lefini, Kindamba region, on S of Bangou forest, between Meya and M'Poka, 5 Feb. 1963*, Descoings II.353* (P!); Nounzi, Dec. 1893, *Lecomte B19* (P!, UGDA-DLSz! – copy, drawing); Bateke Plateau, Maloukou route, between Mandiele and mare Mgatsou, *Sita 1176* (P!). Democratic Republic of the Congo (Zaire): Upper Shaba, vicinity of Kipopo, Kibunduka, dambo, 8 Dec. 1970, *Lisowski 66306 & 66397* (UGDA-DLSz!); Katanga, Marungu Plateau, Zeifa Mt, alt. 1900 m, 21 Feb. 1970, *Lisowski, Malaisse & Symoens 10558* (UGDA-DLSz!); Beni, 6 Apr. 1916, *Bequaert 9410* (BR!). Burundi: Mucura (Dunga), Prov. Bururi, 14 Dec. 1977, *Reekmans 6763* (BR!). Tanzania: Nyassa Hochland, Station Kyimbala, *Stolz 506* (BM!, W!, WAG!, UGDA-DLSz! – copy, drawing).

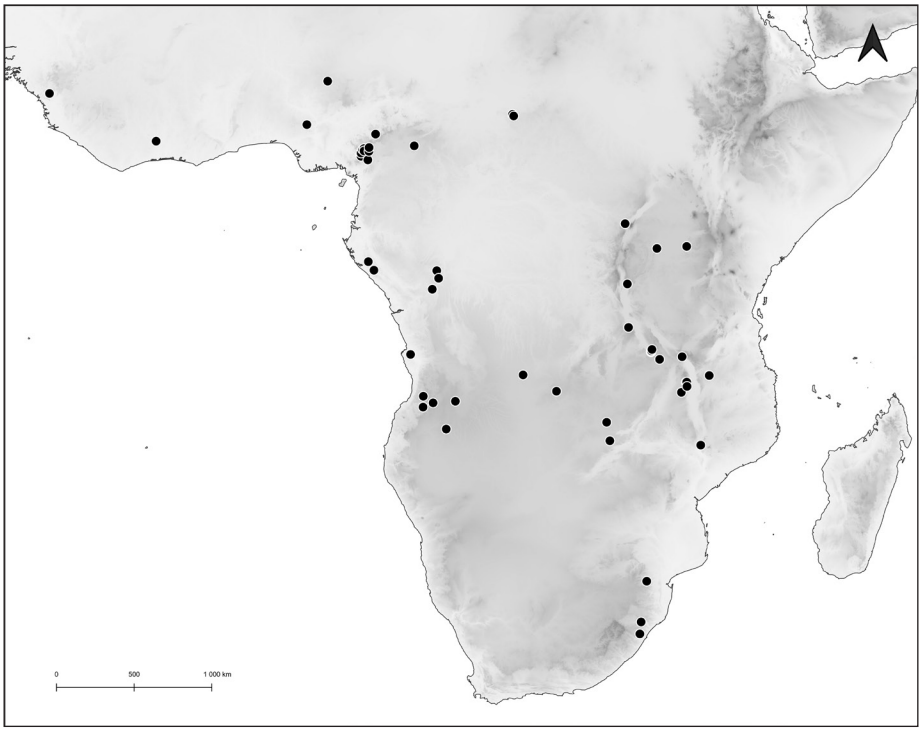

Fig. 141. Distribution map of *Brachycorythis pubescens* Harv.

Tanganyika, Bukoba Distr, Kisbanda 4500 ft, 24 Dec. 1931, *Haver 2369* (P!); Tanganyika, Songea Distr., 19 Jan. 1956, *Milne-Redhead & Taylor 8363* (B!); Tanganyika, Songea Distr., Matengo Hills, 27 Jan. 1956, *Milne-Redhead & Taylor 8559* (B!). Angola: "Am Kuito unterhalb des Longa", 1150 m. 14 Dec. 1899, *Baum 542* (K!, W!); Candido, 14 Jan. 1903, *Gossweiler 561* (BM!, UGDA-DLSz! – copy, drawing); Kubango, 19 Nov. 1905, *Gossweiler 2222* (BM!); NE da Lunda, proximum flumen Cassai, alt. 750 m, 19 Nov. 1946, *Gossweiler 13864* (B!, BM!, K!); Ganda, alt. 1400 m, 29 Nov. 1937, *Sine loc. Pittard 75* (BM!); Caujaugua, near Caala, 2100 m, 4 Dec. 1959, *Sine loc., Stopp BO 132* (K!); Pungo Andongo, Catete, Jan. 1854, *Welwitsch 693* (K!). Njombe, Mtila Downs., grassy slopes, 2100 m, Jan., *Spurrier 151* (K!). Zambia: Central Prov., Kabwe Ruval Distr., Mpunde Mission 52 km NW from Kabwe, Kelongwe River, 14°06'S, 28°06'E, alt. 1130 m, 20 Jan. 1973, *Kornaś & Medwecka-Kornaś 3034* (KRA!, UGDA-DLSz! – copy, drawing); Kabba Prov., near Kabba, *Westwood s.n.* (K!); Abercorn Distr., Nkali Dambo, in rough grass, 5 Jan. 1952, alt. ca 1500 m, *Richards 307* (BR!, K!, UGDA-DLSz! – copy, drawing); Mbala Distr., Zombe Plain, alt. 1500 m, 20 Jan. 1968, *Richards 22946* (B!, K!, UGDA-DLSz! – copy, drawing); Abercorn Distr., Edge of Lake Chila, mbuga, above waterlogging level, 9 Jan. 1950 *Bullock 2208* (K!, UGDA-DLSz! – copy, drawing); Nabalo, path to Chipulupa Forest, secondary woodland, black soil, alt. ca 1670 m, 17 Dec. 1968, *Sanane 380* (K!, UGDA-DLSz! – copy, drawing); Abercorn Distr., Chenda Farm, in grassland by the dam, alt. 1740 m, 13 Jan. 1965, *Richards 19557* (K!, UGDA-DLSz! – copy, drawing); Kasama Distr., Chilwilewi, Kauambi to Chosi Flats road, , in grassland, alt. 1200 m, 14 Dec. 1964, *Richards 19381* (K!, UGDA-DLSz! – copy, drawing); *Sine loc.,* Dec. 1907, *Kassner 2117* (BR!); Hill Forest Reserve, In Dambo, 1961, *Morge 37* (B!); Mwinilunga Distr, 1 Jan. 1938, *Milne-Redhead 3915* (K!). Malawi: Maowe, Dec. 1971, *Westwood 576A* (K!); Nyassaland, *Buchanan 103* (P!), Mzimba Distr., dambo 5 miles SW of Mzulu, Vipya, alt. c.1370 m, 6 Jan. 1971, *Pawek 4296* (K!, UGDA-DLSz! – copy, drawing); Vipya near Chikangawa-Mzulu road, montane grassland, 6 Jan. 1981, *La Croix 80* (K!, UGDA-DLSz! – copy, drawing); Mzimba Distr., grassland, alt. ca 1310 m, *Phillips 3178* (MO!, UGDA-DLSz! – copy, drawing); N Regiom, Vipluja Plateau, near bridge of Mzimba Riv., alt. 1500 m, in wet grasslands, 24 Feb. 1984, *La Croix 562* (K!, UGDA-DLSz! – copy, drawing); N Prov., Mzimba Distr., 3 miles W of Mzulu, Katoto, wet meadow (dambo), alt. ca. 1370 m, 26 Jan. 1974 *Pawek 6353* (P!); Nyassaland, 1895, *Buchanan 193* (P!); *Sine loc.,* 1891, *Buchanan 512* (BM!). South Africa: Natal: Mpenahle Distr, grassy hillside, 24 Feb. 1978, *Hilliard & Burtt 11817* (K!, UGDA-DLSz! – copy, drawing); near Durban, 1860, *Sanderson 482* (K!); Transvaal, Saddleback Mts, Barberton, 2 Dec. 1924, *Thorncroft s.n.* (K!, UGDA-DLSz! – copy, drawing)

Notes: See comments under *Brachycorythis mixta*.

6.1.5.9. *Brachycorythis velutina* Schltr. (Fig. 142)

Bot. Jahrb. Syst. 53: 483. 1915; Type (Szlachetko *et al.* 2010): TANZANIA, *Stolz 1053* (Lectotype: B!, Isolectotypes: BM!, BR!, K!, P!, PRE – photo seen; UGDA-DLSz! – copy, drawing). – Schlechter, Beih. Bot. Centralbl. 38(2): 107. 1921. – Summerhayes, FTEA, Orchid. 1: 27. 1968. – Geerinck, Fl. Afr. Centr., Orchid. 1: 45. 1984. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 25. 1995. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 118. 2010.

Roots fleshy, ellipsoid to cylindrical, clustered. Stem 20-70 cm tall, erect, rather stout, densely, minutely pubescent. Cauline leaves numerous, ca 20-40, rather densely arranged along the stem, up to 5 cm long and 1.5 cm wide, lanceolate to ovate-lanceolate, acute to acuminate, densely pubescent on both surfaces, suberect to erect, decreasing in size up the stem. Inflorescence 8-15 cm long, densely many-flowered. Sepals and petals greenish-brown to cream-coloured, lip yellow. Floral bracts up to 25 mm long, leafy, lanceolate, acute, densely pubescent on both sides. Pedicel and ovary 10-20 mm long, densely pubescent. Dorsal sepal 4-7(8.3) mm long, 2-3.4 mm wide, elliptic, ovate to broadly obovate, obtuse to rounded at the apex, pubescent outside, 3-veined. Petals 3.4-5(7) mm long, 1.5-2.5(3.4) mm wide, obliquely oblong to oblong-ovate, obtuse to rounded at the apex, 3-veined. Lateral sepals 4.5-7 mm long, 2.5-3.9 mm wide, obliquely ovate to elliptic-ovate, obtuse, 3-4-veined. Lip – hypochile 1.6-2.5(5) mm long and 1.8-2.5 mm wide, concave; epichile 2.5-6.1(9) mm long, 3-5.8(7) mm wide, held horizontally, densely pubescent on both sides, broadly ovate in general outline, narrow at the base, widest towards the apex, 3-lobed in the apical part, thickened along mid-vein; middle lobe 1.5-2 mm long, 1.3-1.5 mm wide, larger than lateral lobes, truncate or rounded at the apex, lateral lobes 1-2.5 mm long, 1-1.5(2.3) mm wide, falcate or obliquely triangular in general outline, acute to obtuse. Gynostemium 2.5-3 mm long.

Ecology: Terrestrial in mountain meadows, in open woodland and grassland. Flowering time: November-December.

General distribution: Democratic Republic of the Congo (Zaire), Tanzania, Malawi, Zimbabwe. Alt. 1470-1850 m.

Representative specimens: Democratic Republic of the Congo (Zaire): Katanga, Marungu Plateau, near Kibabwa village, alt. 1850 m, 9 Nov. 1970,

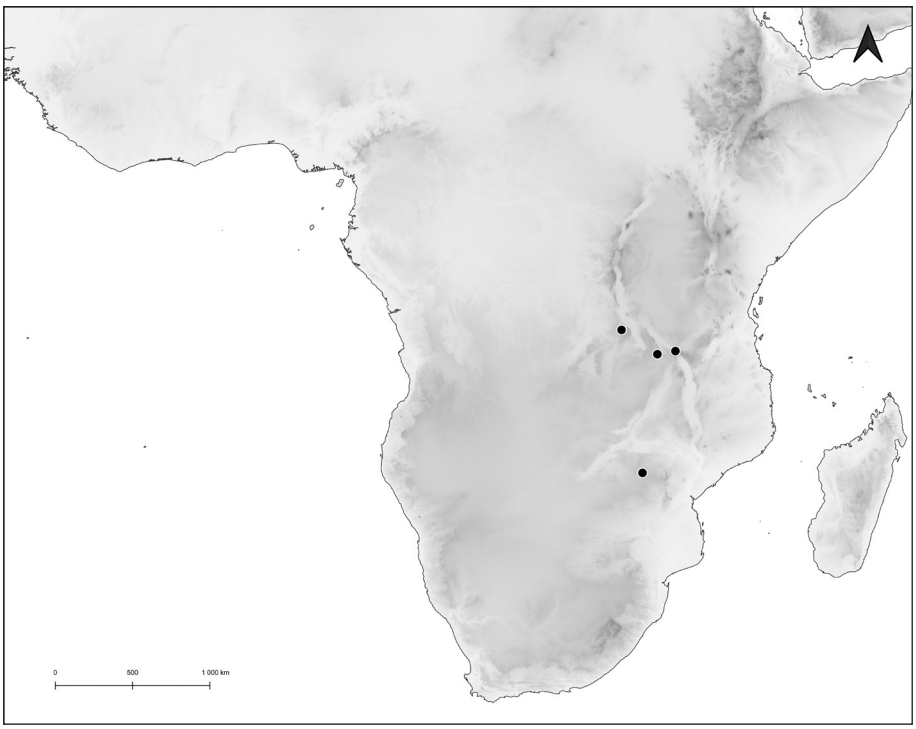

Fig. 142. Distribution map of *Brachycorythis velutina* Schltr.

Lisowski, Malaisse & Symoens 11878 & 11905 (BR!, UGDA-DLSz!). Tanzania: Tunduma-Mbala Road, *Brummitt 13707A* (K!); Kyimbila Distr., Bomalakitana, 1000 m, in mountain meadows, Dec. 1911, *Stolz 1053* (B+, BM!, BR!, K!, P!, PRE – photo seen; UGDA-DLSz! – copy, drawing). Malawi: *Sine loc.*, *Pawek 13406* (K!, UGDA-DLSz! – copy, drawing). Zimbabwe: Salisbury, Dec. 1897, *Rand 266* (BM!, K!); Salisbury Distr., Highlands, in open woodland and grassland, alt. 1470 m, Nov. 1948, *Greatrex 104* (K!).

Notes: This species is easy to recognize in the genus *Brachycorythis* by the lip form, which is deeply 3-lobed, held horizontally, with the middle lobe being the longest, somewhat thickened, truncate or rounded at the apex, and lateral lobes are falcate or obliquely triangular in general outline, acute to obtuse. The leaves are densely pubescent, like in *B. mixta*, and unlike *B. pubescent* (velvety hairy).

6.1.6. *SCHWARTZKOPFFIA* Kraenzl.

Bot. Jahrb. Syst. 28: 177. 1900; Generitype: *Schwartzkopffia buettneriana* Kraenzl. – Summerhayes, FWTA, ed. 2, 3: 186. 1968. – Summerhayes, FTEA, Orchid. 1: 15. 1968. – la Croix *et al.*, Orchid. Malawi: 34. 1991. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 26. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 78. 1998. – Szlachetko & Rutkowski, Acta Bot. Fenn. 169: 123. 2000. – Perez-Vera, Orchid. Côte d'Ivoire: 524. 2003. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 31. 2007. – Szlachetko, Orchid. Ivory Coast: 38. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 119. 2010.

Plants terrestrial. Roots thick, fleshy, clustered. Stem very short or somewhat elongate, erect, leafless, achlorophyllous, covered densely by imbricating sheaths. Inflorescence subcapitate, 1-2 or rarely 3-flowered. Flowers resupinate, pedicellate, relatively large. Sepals dissimilar, free from one another. Petals united in the basal part with the gynostemium. Lip horizontal, 3-lobed, shallowly concave at the base, neither spurred, nor divided into the hypochile and epichile. Gynostemium slightly inflexed, dorsiventrally flattened, massive, joined with petals, up to the base of auriculae. Anther placed above the stigma and the rostellum, nearly erect, broadly ellipsoid, both loculae divergent in the middle, convergent apically and basally, widely and firmly fused with the gynostemium; the chambers oblong-obovoid, attenuate and free at the base only. Connective very wide, separating widely both chambers, massive, truncate. Pollinia 2, sectile, oblong-obovoid, slightly falcate. Caudiculae 2, interlocular, filiform, shorter than pollen mass. No staminodes. Auriculae prominent, cells swollen, including raphides. Stigma ventral, probably bi-lobed, very large, oblong-elliptic, confluent along the mid-line. Rostellum 3-lobed, very short and wide; the median lobe ligulate, situated between loculae, slightly pleated, thick, mas-

sive, erect; both lateral lobes short, canaliculate, spread apart. Viscidia 2, widely spread, obliquely obovate, cellular, detachable, rather thin, lamellar.

A monotypic genus known from tropical Africa, easy to recognize. The plant is very small, achlorophyllous, with 1-3-flowered inflorescence and relatively large spurless flowers. It is often combined with *Brachycorythis*, but unlike the latter the lip is not divided into the hypochile and epichile and the gynostemum is massive, dorsiventrally flattened with very wide connective, separating widely both chambers.

6.1.6.1. *Schwartzkopffia pumilio* (Lindl.) Schltr. (Figs. 143-144)

Orchideen: 63. 1914. – Summerhayes, FWTA, ed. 3: 186. 1968. – Perez-Vera, Orchid. Côte d'Ivoire: 524. 2003. – Szlachetko & Kowalkowska, Contrib. Orchid. Guinea: 32. 2007. – Szlachetko, Orchid. Ivory Coast: 39. 2008. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 119. 2010. ≡ *Penthea pumilio* Lindl., J. Proc. Linn. Soc., Bot. 6: 138. 1862. Type (Szlachetko 2001:32): River Negroo. Apr. 1861, *Mann 904* (Lectotype: K!, UGDA-DLSz! – copy, drawing). ≡ *Brachycorythis pumilio* (Lindl). Rchb.f., Flora: 531. 1882. – Rolfe, Fl. Trop. Afr. 7: 203. 1898.

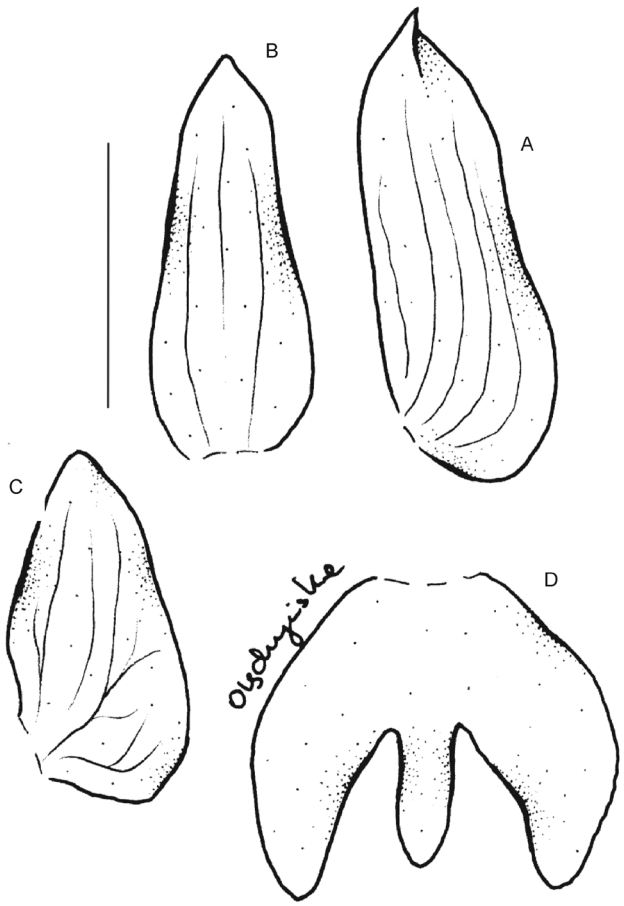

Fig. 143. *Schwartzkopffia pumilio* (Lindl.) Schltr. var. *buettneriana* (Kraenzl.) Olędrz. & Szlach.

Explanations: A – lateral sepal, B – dorsal sepal, C – petal, D – lip (redrawn from Szlachetko & al. 2010). Scale bar = 3 cm

Roots up to 2.5 cm long, 0.6 cm in diameter, thick, fleshy, clustered, spreading. Stem 3-12 cm tall, erect, glabrous. Cauline bracts few, up to 5 cm long, imbricating, acute, the apices of the upper ones recurved, whitish, very rarely sheaths with oblong lanceolate, acute blades. Inflorescence 1-2-, rarely 3-flowered, lax. Flowers relatively large, with a strong lemon scent, tepals white or pink, lip white or magenta with a yellow spot inside. Floral bracts up to 30 mm long, similar to the cauline bracts. Pedicel and ovary 27-40 mm long, very slender, erect, twisted in the lower part. Dorsal sepal 8.5-17 mm long, 3-6 mm wide, elliptic-oblong to lanceolate, acute to subobtuse, usually 3-veined. Petals 7-16 mm long, 3-7 mm wide, strongly oblique, oblong, ovate-oblong or ovate, obtuse, 3-veined. Lateral sepals 12-23 mm long, 3.4-8.5 mm wide, obliquely oblong-lanceolate to oblong-ovate, acute, 5-veined. Lip 11-22 mm long, 12.5-16 mm wide, cuneate, triangular, ovate to semi-lunate in general outline, relatively thick, horizontal, shallow saccate at the base, 3-lobed in the apical third; middle lobe up to 5 mm long and 2.5 mm wide, smaller, equal or longer than lateral lobes, obtriangular, oblong to ligulate, obtuse, with a very prominent rib; lateral lobes oblique, ligulate, triangular to rhombic, subacute, obtuse to rounded. Gynostemium 5-6 mm long.

Ecology: *Brachystegia* woodlands and wooded grasslands. October-November.

General distribution: Democratic Republic of the Congo (Zaire), Burundi, Tanzania, Angola, Zambia, Malawi, Zimbabwe, Mozambique. Alt. 650-1800 m.

Notes: *Schwartzkopffia lastii* is usually considered closely related to *S. pumilio* from which it should differ in the lip form. Both are generally treated as vicariant species, with *S. lastii* known from Central and SW Africa, and *S. pumilio* from West Africa. *S. pumilio* was cited from Angola, Malange by Schelpe (1976). We examined *Mechow 368* collection from Malange – type collection of *S. angolensis* – and surely it is conspecific with *S. lastii* instead of *S. pumilio.* We have examined rather wide spectrum of specimens from the entire range of both species and cannot confirm constant differences between them. Therefore, in our opinion they are conspecific.

var. *pumilio*

Lip usually longer than wide, ovate to triangular in general outline, lateral lobes obliquely triangular-semilunate, as long as ligulate middle lobe.

Ecology: No data. Flowering time: October.

General distribution: Tanzania, Angola. Alt. no data.

Representative specimens: Tanzania: Nyassa Hochland, Station Kyimbala, *Stolz 1030* (W!, UGDA-DLSz! – copy, drawing). Angola: Huambo Mission, plateau near mission. Oct. 1942, *Tisserant A189* (K!, UGDA-DLSz! – copy, drawing).

var. *lastii* (Rolfe) Olędrz. & Szlach., *stat. & comb. nov.* Basionym: *Brachycorythis lastii,* Rolfe, Fl. Trop. Afr. 7: 203. 1898; Type (Szlachetko *et al.* 2010): MALAWI, *Last s.n.* (Lectotype: K!, UGDA-DLSz! – copy, drawing). ≡ *Schwartzkopffia lastii* (Rolfe) Schltr., Orchideen (Schlechter): 63. 1914. – Summerhayes, Kew Bull. 14: 130. 1960. – Summerhayes, FTEA, Orchid. 1: 15. 1968. – Williamson, Orchid. S. Centr. Afr.: 26. 1977. – Geerinck, Fl. Afr. Centr., Orchid. 1: 46. 1984 (as *Brachycorythis lastii* Rolfe). – la Croix *et al.* Orchid. Malawi: 34. 1991. – la Croix & Cribb, Fl. Zambes., Orchid. 1: 26. 1995. – Szlachetko & Olszewski, Fl. Cam., Orchid. 34(1): 80. 1998. – Szlachetko *et al.*, Orchid. West-Centr. Afr. 1: 119. 2010.

Lip longer than wide, more or less triangular in outline, lateral lobes obliquely ligulate, middle lobe as long as lateral lobes or longer, oblong ligulate.
Ecology: In wooded savanna, in open bush, in *Brachystegia* woodland, in grass meadow with *Protea* shrubs, *Brachystegia microphylla–Julbernardia* woodland, in miombo, woodland, in *Brachystegia-Isoberlinia* woodland on slopes above evergreen riverine forest, on open woodlands, upper escarpment miobo woodland, in bush and scattered about bush, among dead leaves and grass, in fairly dense bush, in woodland on the ground, on light loam, savanna woodland, woodland with *Brachystegia spictiformis, Uapaca kirkiana, Syzygium guineense subsp. guineense, Faurea, Protea*, savanna woodland, in *Brachystegia* woodland, under trees in good loamy soil. Flowering time: January-February, April, October-December.
General distribution: Sierra Leone, Liberia, Democratic Republic of the Congo (Zaire), Tanzania, Angola, Zambia, Malawi, Zimbabwe. Alt. 100-2080 m.
Representative specimens: Sierra Leone: *Sine loc.,* Apr. 1861, *Mann 904* (K!, UGDA-DLSz! – copy). Liberia: Yoma-Gola National Forest, Bomi Hills, on border of Mahe River, near Summercamp, 5 Feb. 1966 *Sine coll s.n.* (BR!). Democratic Republic of the Congo (Zaire): Lubumbashi, *Lisowski, Malaisse & Symoens 7717* (UGDA-DLSz)!, Pastorale, section Luala, sol d'humus de la galerie forestiere, entre les feuilles tombèes sur le sol, Nov. 1931, *Quarrè 2809* (BR!, UGDA-DLSz! – copy, drawing); Katanga, Bassin Luisa, in wooded savanna, Oct. 1933, *Overlaet 846* (K!); Katanga, in open bush, alt. 1400 m, Nov. 1938 *Russell 79* (K!); Katanga, valley of ?, Oct. 1911, *Hock s.n.* (K!); Katanga, 1 Feb. 1973, *Hirschberg 129* (K!). Tanzania: About 12 km E of Songea, near Nonganonga stream, *Brachystegia* woodland, alt. 1050 m, 27 Jan. 1956, *Milne-Redhead & Taylor 7917 & 7917A* (K!); Lake Nyasa, Feb. 1903, *Johnson 574* (K!); Tanganyika, Uluguru Mts., Morogoro, grass meadow with *Protea* shrubs, alt. ca 1370, 24 Dec. 1931, *Burtt 3494* (K!); Mbeya Reg., Ufipa Distr., Mid to upper slopes of Mbaa Mountain, alt. ca 100-2080 m, above Tatanda, *Brachystegia microphylla–Julbernardia* woodland, *Goldblatt, Brummitt & Lovett 8115* (MO!); Mbeya Mt., S. foot of Peak, alt. ca 1370 m, Dec. 1982, *Brownbridge s.n.* (K!); Ruvuma, Madaba Housing Site, in *Brachystegia* woodland, alt. 1000 m, 20 Dec. 1985, *Leyser 73* (K!); Kansyana, Kasoje, Mahale Mts., Kigoma Reg., alt. 800 m, 22 Nov. 1983, *Takasaki 103* (K!); Chipia, between Nova Lisboa and Cuima, 27 Nov. 1959, *Stopp BO118* (K!). Angola: *Sine loc.*, *Gossweiler 2321 pp* (BM!). Zambia: Kitwe, miombo, woodland, 27 Nov. 1962, *Fanshawe 7167* (K); Ichimpi West, miombo woodland, 18 Nov. 1968, *Mutimushi 2830* (K!); Nothern Prov., Mbala Distr., near middle Lunzua Falls, alt. 1300 m, *Brachystegia-Isoberlinia* woodland on slopes above evergreen riverine forest, 12 Jan. 1975, *Brummitt & Polhill 13751* (K!); Nothern, Mbala Distr., 24 km W of Mbala along Mbala-Mpulungu Road to Power Station Road (D549), between 22.6-25.6 km along D549 becoming road RD2, open woodlands alt. 1740 m, 08°56'S, 31°11'E, 1 Dec.1993, *Harder & Merello 30 (*K!, UGDA-DLSz! – copy, drawing); North, Luangwa National Park, upper escarpment Miobo woodland, alt. 1200 m, 11°36'S, 32°01'E, 8 Dec.1994, *Smith 0706* (K!, UGDA-DLSz! – copy, drawing); Close to path to source of Inono, in bush and scattered about bush, alt. 1524 m, among dead leaves and grass, in fairly dense bush, 14 Nov., 1954, *Richards 2223* (K!). Malawi: Mulenje, Lichenya path, 28 Nov. 1982, *la Croix 372* (K!); Nyika Plateau, 25 miles from Zambia Rest Home, *Brachystegia* woodland, in woodland on the ground, on light loam, alt. 1800 m, 23 Nov. 1967, *Richards 22693* (K!); Ntchisi Forest Resthouse, savanna woodland, alt. 1524 m, 10 Jan. 1974, *Allon 451* (K!); Majiga, alt. c.1210 m, 20 Nov. 1979, *Morris 381* (K!); Mbeya, Mbeya Distr., Pungaluma Hills, above Mshewe village, woodland with *Brachystegia spictiformis, Uapaca kirkiana, Syzygium guineense subsp. Guineense, Faurea, Protea*, 08°50'S, 33°20'E, alt. 1400 m, 3 Dec. 1989, *Lovett, Sidwell, Kayombo 3584 (*MO!); *Sine loc.*, *Last s.n.* (K!); In woodland between Chiwno and Kanjoli, alt. 1490 m, 12 Jan. 1967, *Jake 52* (K!, UGDA-DLSz! – copy, drawing); N Prov., Rumpi Distr., Nyika, 1 mile from main road, alt. 1490 m, 20 Dec., *Pawek 3251* (K!, UGDA-DLSz! – copy, drawing); Southern Prov., Zomba Distr, Masola above secondary school, *Brachystegia-Uapaca* woodland, alt. 1000 m, 28 Nov.1984, *Pettersson 319* (K!); Nothern Prov., Mzimba Distr.,

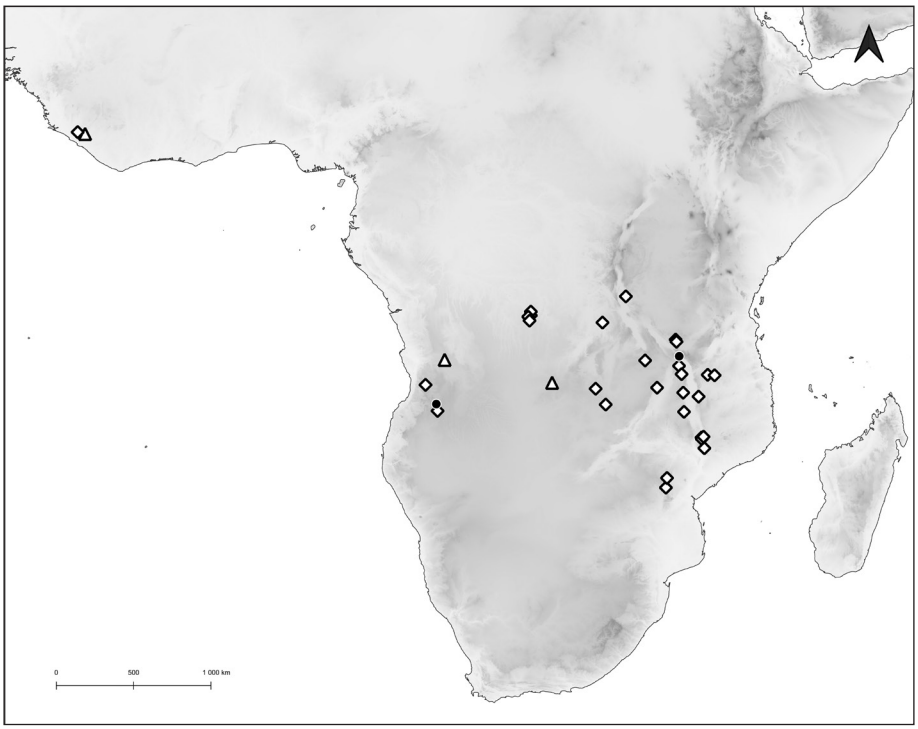

Fig. 144. Distribution map of *Schwartzkopffia pumilio* (Lindl.) Schltr.: circle – var. *pumilio*, *square* – var. *lastii* (Rolfe) Olędrz. & Szlach., triangle – var. *buettneriana* (Kraenzl.) Olędrz. & Szlach.

7 km SW Chikangawa, alt. 1630 m, 24 Dec. 1978, savanna woodland, *Phillips 4464B* (MO!); Abercorn Distr., Ndundu, in *Brachystegia* woodland, under trees in good loamy soil, alt. 1740 m, *Richards 10234* (K!). Zimbabwe: Nyanga, woodland, 18 Nov. 1960, *Wild 5280* (K!); Umtali, alt. 760 m, in *Brachystegia* woodland, 5 Dec 1961, *Wild & Chase 5580* (K!)

var. *buettneriana* (Kraenzl.) Olędrz. & Szlach., *stat. & comb. nov.*
Basionym: *Schwartzkopffia buettneriana* Kraenzl., Bot. Jahb. Syst. 28: 117. 1900. Type: Ober-Guinea: Togo, Bismarckburg, *Buttner A40* (Holotype: K! – drawing, UGDA-DLSz! – copy). = *Schwartzkopffia angolensis* Schltr., Beih. Bot. Centralbl., Abt. 2. 38(1): 123. 1921. ≡ *Brachycorythis schlechteri* Geerinck. – Geerinck, Fl. Afr. Centr., Orchid. 1: 48. 1984.

Lip wider than long, semilunate in general outline, lateral lobes oblong rhombic to obliquely triangular, middle lobe shorter than lateral one, broadly triangular-ligulate to ligulate.
Ecology: On forest floor, in sandy soil near stream
Flowering time: January-February, October-November
General distribution: Liberia, Ivory Coast, Angola, Zambia. Alt. no data.
Representative specimens: Liberia: Yoma-Gola National Forest, Bomi Hills. On border of Mahe River near Summercamp, U.L., 2 Feb. 1966, Meer 383 (BR!). Ivory Coast: *Sine loc.*, 17 Jan 1976*, Perez-Vera 868* (K!). Angola: Statio Malange. Oct. 1879, *Mechow 368* (W-R!, K! – drawing, UGDA-DLSz! – copy, drawing). Zambia: Hillwood Farm, Ikelenge, on forest floor in sandy soil near stream, 22 Nov. 2004, *Congdon 669* (K!, UGDA-DLSz! – copy, drawing). Other: *Sine loc. van Meer 383* (BR!); *Sine loc., Smyche 220* (K!), *Sine loc., Jaeger 9606* (K!).

6.1.7. *SILVORCHIS* J.J. Sm.

Bull. Dép. Agric. Indes Néerl. 13: 2. 1907; Generitype: *Silvorchis colorata* J.J. Sm. = *Vietorchis* Aver. & Averyanova, Updated Checklist Orchids Vietnam: 92. 2003.

Terrestrial plants. Roots fleshy, thick. Rhizome elongated, fleshy. Stem erect, slender, fleshy, covered with scale-like leaves. Inflorescence usually 1- to few-flowered, lax. Flowers resupinated, pedicellate. Sepals subsimilar or dissimilar, free from each other. Petals smaller. Lip subhorizontal, 3-lobed with flattened base adorned with convex callus. Spur lacking. Gynostemium slightly reflexed, dorsiventrally flattened. Anther obovoid, bent back. Pollinia oblong to obovoid. Caudiculae filiform, shorter than the pollen mass. Auriculae prominent. Stigma relatively large, oblong to elliptic. Rostellum, short, wide, 3-lobed. Viscidia 2, arranged close to each other.

This enigmatic genus has been described by J.J. Smith based on a single plant collected by J.H.J. Wolff in November 1906, in "Tjigenteng bei Garoet" in Java. It has never been collected again since then. Taxonomic affinity of *Silvorchis* was widely discussed by various taxonomists. Orginally, the genus was placed within the tribe Orchideae (subfamily Orchidoideae). The concept was followed by Comber (1990) and Dressler (1981). In 1986, Garay transferred the genus into the tribe Neottieae (subfamily Epidendroideae). Its affinity to Epidendroideae was accepted by Dressler (1993) and Pridgeon *et al.* (1999), but the latter authors transferred *Silvorchis* to the tribe Nervilieae. The genus was re-transferred to Orchidoideae (tribe Orchideae, subtribe Orchidinae) by Szlachetko & Rutkowski in 2000, due to its relationship to *Brachycorythis*. Another species was included into *Silvorchis* by Szlachetko *et al.* (2006) – *Silvorchis aurea* (Aver. & Averyanova) Szlach., which was previously described as *Vietorchis aurea* Aver. & Averyanova by Averyanov & Averyanova (2003). *Vietorchis furcata* Aver. & Nuraliev was synomized with *Silvorchis furcata* (Aver. & Nuraliev) Olędrz. & Szlach., the same as the tribe Vietorchidinae was synomized with the subtribe Orchidinae by Olędrzyńska *et al.* (2016).

Key to the species:

1. Lip apex broadening and truncate at the apex ..... *S. aurea*
1. Lip apex distinctly bifid 2
2. Lip middle lobe much longer than both laterals ..... *S. furcata*
2. Lip middle lobe much shorter than both laterals 3
3. Lip lateral lobes narrowly triangular, ensiform, fleshy, falcate, apically acuminate, incurved ... . *S. vietnamica*
3. Lip lateral lobes obliquely oblong, somewhat semi-lunate, obtuse, concave ..... *S. colorata*

6.1.7.1. *Silvorchis colorata* J.J. Sm. (Fig. 145-146)

Bull. Dép. Agric. Indes Néerl. 13: 3. 1907; Type: JAVA, *Wolff* (Holotype: BO? – not seen; K! – drawing, UGDA-DLSz! – copy).

Plant terrestrial, achlorophyllous, holomycotrophic. Tuberous rhizome occasionally branching and gives a rise to stem, glabrous, white, roots 2 cm long, 0.6 cm in diameter, cylindrical, fleshy. Stem ca 8.5 cm long, erect, fleshy, flabrous, white, in the lower part covered

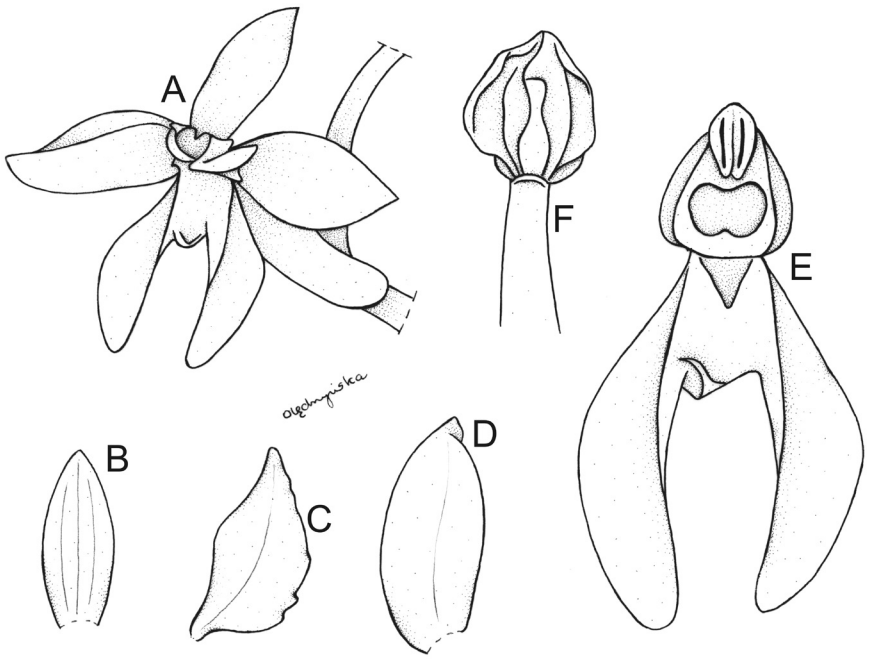

Fig. 145. *Silvorchis colorata* J.J. Sm.
Explanations: A – flower, B – dorsal sepal, C – petal, D – lateral sepal; E – lip; F – gynostemium. (redrawn from Smith – type specimen)

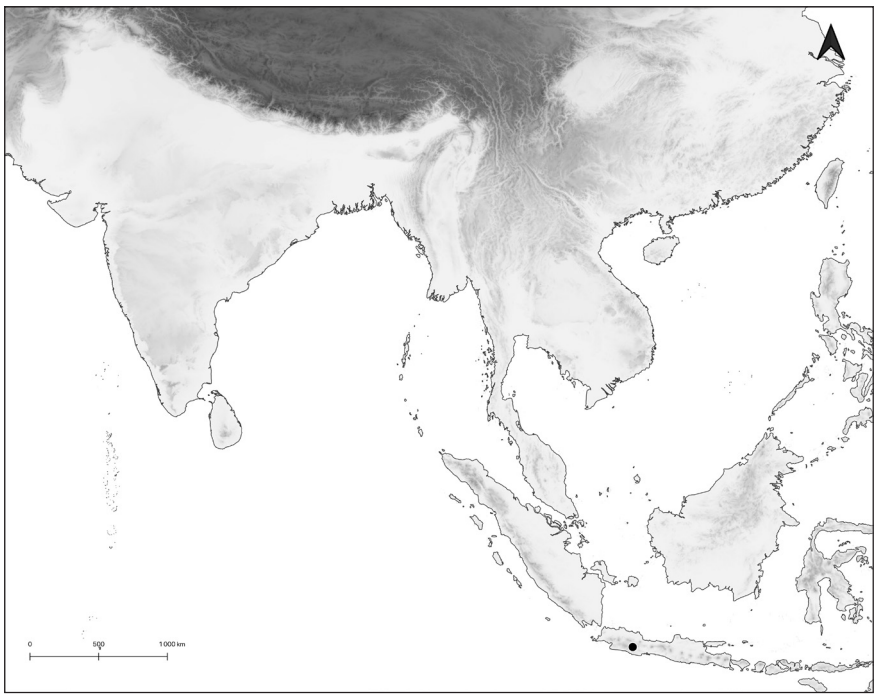

Fig. 146. Distribution map of *Silvorchis colorata* J.J. Sm.

by several, imbricating sheaths, rather distantly in the upper part. Sheaths 0.3-1.3 cm long. Inflorescence 2 cm long, 2-flowered. Flowers resupinate, broadly opened, sepals white with purple dots, petals white with purplish margins, lip yellow in the central part with line of purple dots, lateral lobes purplish, much darker towards base. Floral bracts 15 mm long, oblong elliptic-lanceolate, acute. Ovary 14-17 mm long, slender, sessile. Dorsal sepal 9 mm long, 3.5 mm wide, oblong elliptic, obtuse, somewhat concave, 3-veined, lateral veins branching. Petals 6 mm long, 3 mm wide, obliquely elliptic-ovate, apically subobtuse, outer margin dentate in the lower part, somewhat erose in the upper one, 1-veined, basally connate with the gynostemium. Lateral sepals 11.5 mm long, 5.5 mm wide, obliquely elliptic, subobtuse, somewhat concave, 1-veined, keeled outside. Lip 15 mm long in total, 8.3 mm wide, pendent, flat, deeply and very unequally 3-lobed; middle lobe 3 mm long, 2.5 mm wide at the base, obscure, divided into two apiculate lobules ca 1.3 mm long each; lateral lobes 6.7 mm long, 2.75 mm wide, much larger, obliquely oblong, somewhat semi-lunate, obtuse, concave.

Ecology: In humid, evergreen forest. Flowering time: November.

General distribution: W Java. Alt. ca 1600 m.

Representative specimens: Java: Tjigenteng near Garoet, ca 1600 m., *Wolff* (K! – drawing, BO? – not seen; UGDA-DLSz! – copy)

Notes: Known only from the type specimen. Probably extinct (Averyanov 2018). It is unique in the genus by having lip lateral lobes being obliquely oblong, somewhat semi-lunate, obtuse, and concave.

6.1.7.2. *Silvorchis vietnamica* Aver., Dinh & K.S. Nguyen (Fig. 147)

Nordic J. Bot. 36(7)-e01883: 2. 2018; Type: SOUTHERN VIETNAM, *van Dzu Nguyen, Quang Diep Dinh, NSIC 925* (Holotype: LE 01042142 – photo seen).

Miniature terrestrial achlorophyllous, leafless, glabrous, milky-white tuberiferous rootless herb. Tuber (1.5)2-2.5(3) cm long, underground, small, fleshy, pale yellowish, narrowly ovoid to shortly cylindrical, rhizome-like; stem arising from its broadening apex. Stem (6)8-10(12) cm long, erect or ascending, fleshy, covered by loose, distant, pure white, oblong to narrowly ovate, tubular, acute to shortly acuminate bracts (1.2)1.4-1.8(2) cm long, much reduced in basal part of stem. Inflorescence a lax terminal spike with 1-3(4) flowers. Floral bracts (1)1.2-1.8(2.2) cm long, pure white with minute sparse purple streaks, oblong to narrowly ovate to elliptic, tubular, erect, acute to shortly acuminate. Ovary (1)1.2-1.8(2) cm long, pure white, erect, almost straight, bent at apex, twisted at the base through 180°, untwisted in apical half. Flowers resupinate, widely opening, sepals and petals pure white; column white with red spots on basal part of lateral wings, lip white with yellow-orange center and two bright red spots; lateral lobes light violet at basal half, dull yellow to apex; median lobe white. Sepals with entire margin,

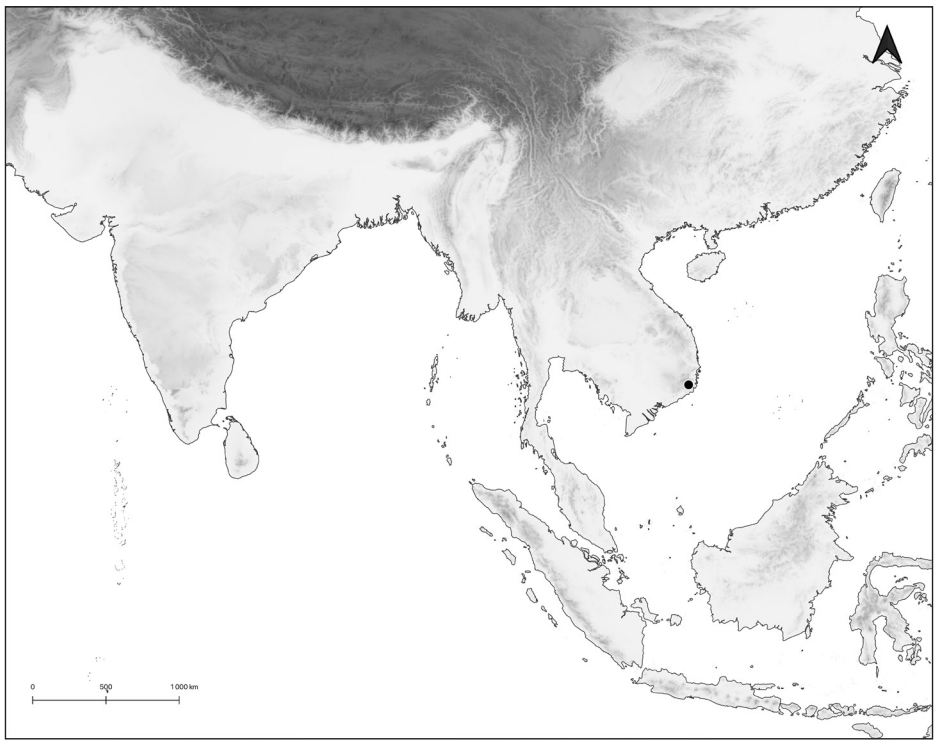

Fig. 147. Distribution map of *Silvorchis vietnamica* Aver., Dinh & K.S. Nguyen

abaxially at apex with short keel-like raised projection along median vein. Dorsal sepal (6)7-9(10) mm long, (3.5)4-5(5.5) mm wide, narrowly obovate, obtuse, slightly cucullate, 5-veined. Petals (5.5)6-7(7.5) mm long, (2.4)2.5-3(3.2) mm wide, obliquely oblong to narrowly obovate in outline, broadening from a very narrow base, suddenly attenuate in apical third, very finely serrulate along margin, irregularly erose dentate at apex, obscurely 3-veined. Lateral sepals (8)9-11(12) mm long, (4.5)5-6(6.5) mm wide, obliquely ovate, blunt to roundish at apex, 5-veined. Lip (11)12-14(15) mm long, (4)4.5-6(7) mm wide, spurless, thickened at the base, fleshy, firmly adnate to gynostemium base at a right angle, forward directed, 3-lobed, oblong in outline, disk adaxially longitudinally convex in the middle, concave below; middle lobe (3.2)3.5-4.5(4.8) mm long, 0.8-1 mm wide, rather thin, ribbon-like, back recurved, with parallel margins, at apex furcately divided into 2 thin, linear filiform, straight acuminate lobules 0.8-1 mm long; lateral lobes (7.5)8-9(9.5) mm long, (0.8)0.9-1.2(1.4) mm wide at the base, narrowly triangular, ensiform, fleshy, falcate, apically acuminate, incurved. Gymostemium with large, fleshy, half-cylindric, smooth, glossy lateral wings, each attenuate distally into fleshy finger-like processes 1-1.2 mm long, suddenly curved forward at apex.

Ecology: In semideciduous broad-leaved submontane forests, in shady humid places. Flowering time: May-June.

General distribution: Endemic to Ninh Thuan Province in Vietnam. Alt. 600-800 m.

Representative specimens: Vietnam: Ninh Thuan Prov., Bac Ai Distr., Phuoc Binh comm., Phuoc Binh National Park, 600-800 m, submontane semideciduous board-leaved dipterocarp forest, 10 Jun 2017, *van Dzu Nguyen, Quang Diep Dinh, NSIC 925* (LE 01042142 – photo seen).

Notes: *Silvorchis vietnamica* is similar to its Javan congener, *S. colorata*, from which it can be easily separated by lip lateral lobes being narrowly triangular, ensiform, fleshy, falcate, apically acuminate, and incurved.

6.1.7.3. *Silvorchis aurea* (Aver. & Averyanova) Szlach. (Figs. 148-149)

Richardiana 6: 89. 2006. ≡ *Vietorchis aurea* Aver. & Averyanova, Updated Checkl. Orch. Vietnam: 95. 2003; Type: VIETNAM, *Nguyen Manh Cuong, Mai Van Xinh & Nguyen Huy Quang NMC 1643* (Holotype: CPNP; Isotypes: HN, LE).

Achlorophyllous mycotrophic leafless terrestrial herb. Stem 10-20 cm tall, erect or ascendant, milky-white, glabrous, juicy, with 1 or 2 apical flowers and thin underground rhizome (rising from tuber?), at lowest half covered with 3-4 distant, acute, lanceolate white scales, 1-3 cm long, at the base bearing numerous

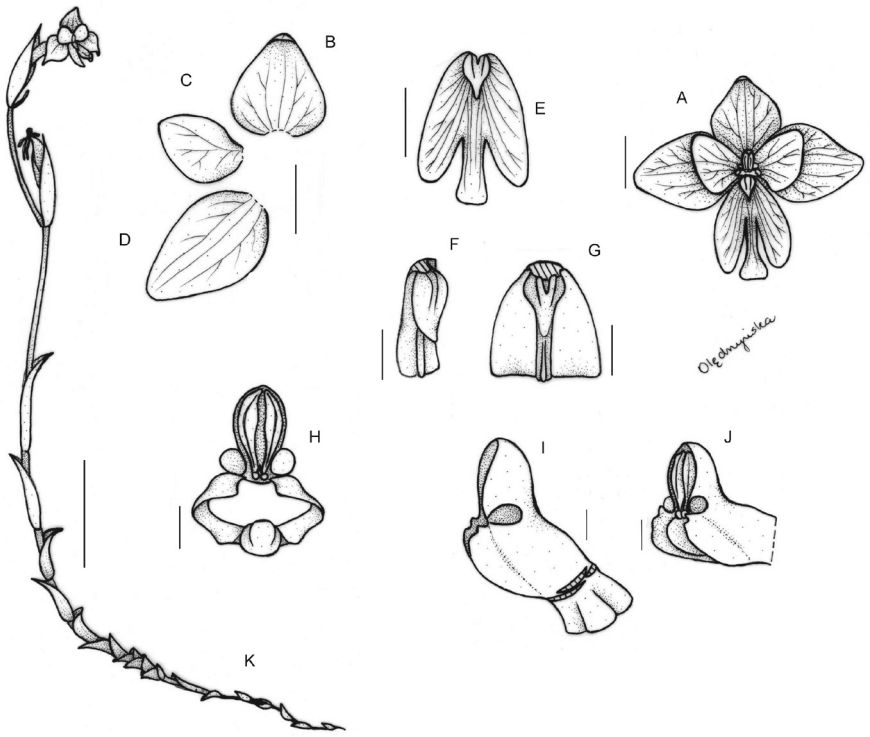

Fig. 148. *Silvorchis aurea* (Aver. & Averyanova) Szlach.

Explanations: A – flower, B – dorsal sepal, C – petal, D – lateral sepal, E – lip. Scale bar = 5 mm.; F – lip base. Scale bar = 1 mm.; G – lip base. Scale bar = 5 mm.; H – column, I & J – column (side view). Scale bar = 1 mm.; K – habit. Scale bar = 3 cm (redrawn from L. Averyanov & A. Averyanova – type specimen)

approximated broadly-ovate short white scales, which in underground rhizome become distant and very small. Flowers resupinate, odorless, brightly golden-yellow, widely spreading, lip with few broad, short orange-red stripes at the center. Flower bracts 15-20 mm long, milky-white, lanceolate, acute. Ovary 15-20 mm

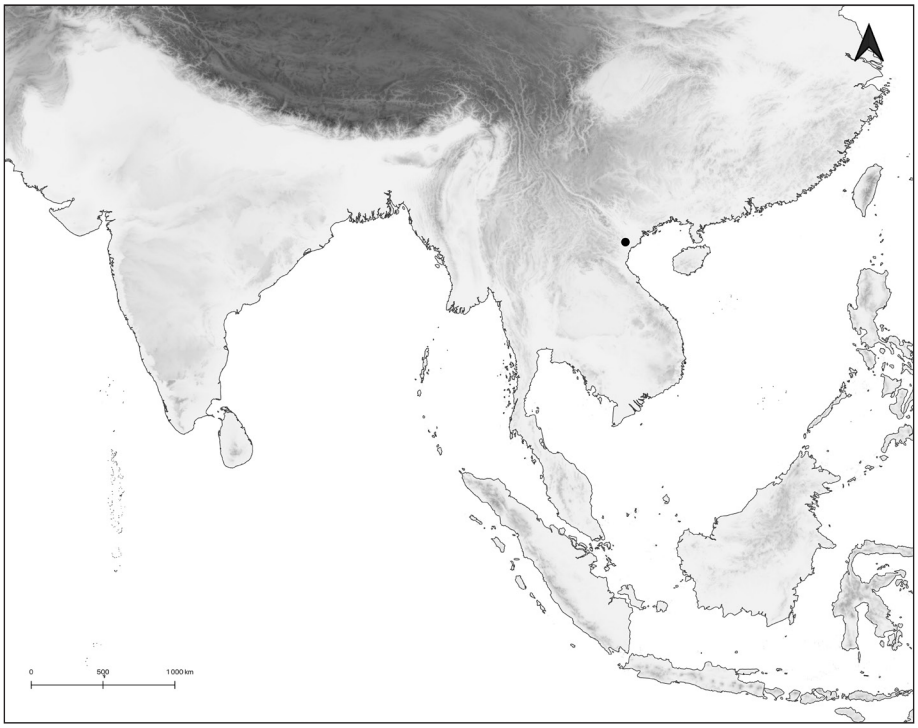

Fig. 149. Distribution map of *Silvorchis aurea* (Aver. & Averyanova) Szlach.

long, milky white, cylindrical, slightly carved. Dorsal sepal 6-8 mm long and wide, ovate-triangular, obtuse, 5-veined, lateral veins branching. Petals 6-7 mm long, 4-5 mm wide, obscurely rhombic, obtuse and finely irregularly denticulate along apical margin, 1-veined. Lateral sepals 9-11 mm long, 6-8 mm wide, obliquely ovate, obtuse, 3-veined, lateral veins branching. Lip 10-12 mm long, 7-9 mm wide, 3-lobed, at the base with large glossy prominent callus, which is narrowly ovate, massively united with its broad base to the base of the gynostemium, narrowing and shortly attenuate at the apex; middle lobe 6-8 mm long, 2-3 mm wide, rigid, distinctly upward incurved, broadening and truncate at the apex; lateral lobes 8-9 mm long, about 3 mm wide, oblong, obtuse at the apex, concave in apical part. Gynostemium 2 mm long, auricles ellipsoid.

E c o l o g y : closed evergreen broad-leaved valley forest, on alluvial soil between rocky limestone ridges. Rare. Flowering time: April-June.

G e n e r a l d i s t r i b u t i o n : Vietnam (Ninh Binh). Alt. 350 m.

R e p r e s e n t a t i v e s p e c i m e n s : VIETNAM: Ninh Binh Prov., Nho Quan Distr., Cuc Phuong Municipality, Cuc Phuong National Park. Alt. 350 m. 22 May 2002, *Nguyen Manh Cuong, Mai Van Xinh & Nguyen Huy Quang NMC 1643* (CPN, HN, LE).

N o t e s : *Silvorchis aurea* is easily separated from other genus representatives by having lip middle lobe much longer than both laterals and being truncate at the apex.

6.1.7.4. *Silvorchis furcata* (Aver. & Nuraliev) Olędrz. & Szlach. (Figs. 150-151)

Phyton (Horn) 56: 198. 2016. ≡ *Vietorchis furcata* Aver. & Nuraliev, Taiwania 58: 253. 2013; TYPE: VIETNAM, *Nuraliev 518* (HOLOTYPE: LE).

Terrestrial achlorophyllous leafless, milky-white holomycotrophic herb. Stem 3-5(7) cm tall, erect or

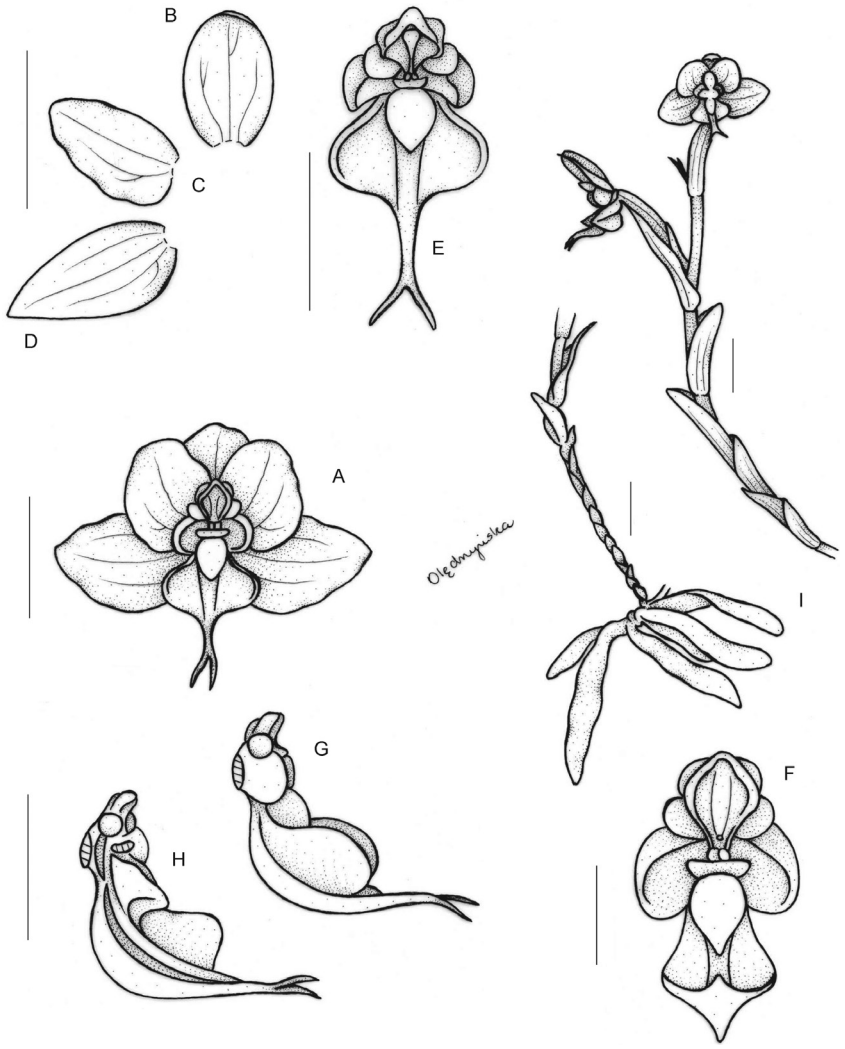

Fig. 150. *Silvorchis furcata* (Aver. & Nuraliev) Olędrz. & Szlach.

Explanations: A – flower, B – dorsal sepal, C – petal, D – lateral sepal, E – lip. Scale bar = 1 cm; F – column and lip base. Scale bar = 2 mm.; G & H – column and lip. Scale bar = 5 mm.; I – habit. Scale bar = 1 cm (redrawn from L. Averyanov & A. Averyanova, type and paratype specimens)

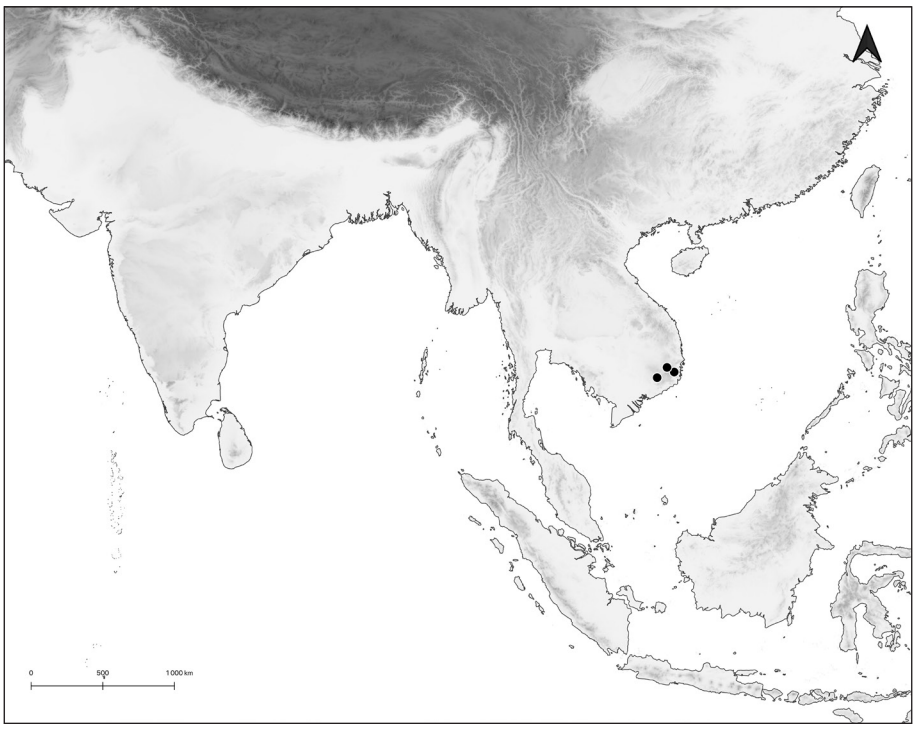

Fig. 151. Distribution map of *Silvorchis furcata* (Aver. & Nuraliev) Olędrz. & Szlach.

ascending, glabrous, with 1-2(3) lax apical flowers, covered by loose, overlapping white (to light yellowish-white), oblong, obtuse bracts (5)12-15 mm long. Flowers sessile, resupinate, widely opening, bright yellow, gynostemium wings, lip callus and lip lateral lobes with more or less heavy dull reddish-orange markings. Floral bracts 15-20 mm long, almost white, membranaceous, oblongly ovate, obtuse. Ovary 15-20(22) mm long, white to yellowish-white, erect, cylindrical, curved at apex, twisted at base on 180°, straight, untwisted in apical half. Dorsal sepal 6-8 mm long, 5-6 mm wide, broadly elliptic to broadly ovate, with rounded apex, often slightly cucullate, 3-veined. Petals 6-9 mm long, 4-6 mm wide, obliquely ovate to broadly ovate, roundish or blunt at apex, entire or shallowly irregular dentate or crenulate along margin, 2-veined. Lateral sepals 7-12 mm long, 4-6 mm wide, obliquely oblong ovate, obtuse, 3-veined. Lip 7-9 mm long, 4-6 mm wide (across flattened lateral lobes), fleshy, thick, firmly adnate to gynostemium, bent upward, 3-lobed, basally with large, glossy, prominent half ovoid callus, massively connate to column base and with tall, thick longitudinal keel on abaxial and adaxial sides; middle lobe 3-4 mm long, 0.7-0.3 mm wide, narrowly conical, narrowing from the base, at apex furcately divided into 2 flat, thin, linear, divergent lobes 1.5 mm long; lateral lobes 2.5-3 mm tall, 3-3.5 mm wide, semi-circular, oblique, concave. Gynostemium 3 mm long, auricles subglobose, very large.

Ecology: In primary evergreen broad-leaved and mixed humid forests, on leveled terraces of mountain slopes composed with silicate mother rocks. Flowering time: March-April.

General distribution: Vietnam (Dak Lak, Khanh Hoa, Lam Dong). Alt. 1000-1500 m. Very rare (CR).

Representative specimens: Vietnam: Dak Lak Prov., Lak Distr., Bong Krang Municipality Chu Yang Sin National Park, 1000 m, mixed forest on leveled terrace of Chu Yang Sin mountain system, 12°23’50’’N 108°20’50’’E", 11 Apr. 2012, *Nuraliev 518* (LE); Khanh Hoa Prov., Dien Khanh Distr., Suoi Cat Municipality, Hon Ba Range, around point 12°07’N 108°56’E, at elev. 1500 m a.s.l. 15-20 Apr. 2006, *Kuznetsov et al. s.n.* (LE – photo). Dak Lak Prov., Lak Distr., Bong Krang Municipality, Chu Yang Sin national park. Forest on slope of mountain ridge of Chu Yang Sin mountain system around point 12°23’50’’N 108°20’50’’E at elevation about 1000 m a.s.l. Locally common. 1 Apr. 2013, *Nuraliev 747* (LE). Lam Dong Prov., Bao Lam Distr., Loc Bac Municipality, around point 11°44’48’’N 107°43’04’’E, alt. 1200 m, 10 Apr. 2013, *Kuznetsov, Kuznetsova, Nuraliev 810* (LE).

Notes: *Silvorchis furcata* is the only genus representative with obliquely semi-circular, concave lip lateral lobes, which is much shorter than the middle one.

6.2. Timescale of subtribe Orchidinae

The *Brachycorythis*-complex is a member of Orchidinae. The subtribe includes nearly 47-60 genera and c. 1800 species (Chase *et al.* 2015). The phylogenetic relationships within the whole group or its genera has been tested over the years by various authors (e.g. Batista 2013; Weil-Tao *et al.* 2017; Lai *et al.* 2021). The most recent phylogeny of the subtribe in its wider sense (including the subtribes Habenariinae and Satyriinae) was presented by Weil-Tao *et al.* (2017) and Lai *et al.* (2021).

In the present research, the phylogeny and the diversification time of main lineages within the subtribe was reconstructed, using the molecular clock analysis and maximum likelihood analysis. The results are presented as the maximum clade credibility trees, obtained from molecular clock analysis of plastid markers (Fig. 152) and nuclear markers (Fig. 153).

Following the concept of Orchidinae s.l presented by e.g. Weil-Tao *et al.* (2017) and Lai *et al.* (2021), there are three main lineages within the group. The oldest one is *Satyrium*, which separated from the rest c. 27-26 Mya (based on results from both nuclear and plastid data respectively). The species diversification of *Satyrium* started between 14 Mya (nuclear dataset analysis) and 11 Mya (plastid dataset analysis). The taxonomic position of *Satyrium* was the topic of numerous discussions. Unlike the rest of Orchidinae, the representatives of this group are characterized by a number of unique characters that are non-resupinated flowers, a helmet-like, 2-spurred lip, stalked column or stigma lobes in the shape of a pad. Due to its morphological independence, some authors decided to keep *Satyrium* apart and placed it within the monotypic subtribe Satyriinae (Dressler 1981; Szlachetko 1995; Pridgeon *et al.* 1999), while the others postulated to include it into Orchidinae s.l. (e.g. Bateman 2003; Van Der Niet *et al.* 2005; Bytebier *et al.* 2011; Inda *et al.* 2012; Weil-Tao *et al.* 2017).

The next lineage separated 24 (nuclear dataset analysis) – 23 (plastid dataset analysis) Mya and consists of representatives of both the Orchidinae and, recognized only by some authors, Habenariinae. The affinity of the taxon is generally well supported, but only in the results of nuclear data.

Genera of Orchidinae s.str. form the youngest lineage within the studied group, which consists of two smaller clades and sister to them genus *Brachycorythis*. Recognized previously by e.g. Weil-Tao *et al.* (2017) and Lai *et al.* (2021), phylogenetic position of *Schizochilus* (as a sister clade to *Brachycorythis* and the rest of Orchidinae s.str.) was not confirmed in this research – the result of plastid data analysis is not supported and in the nuclear result, *Schizochilus* forms one of the oldest lineages within Orchidiinae s.l., which is sister to all other genera of the subtribe (except *Satyrium*).

As mentioned above, the Orchidinae consists of two clades of genera: first clade: *Platanthera*, *Galearis*, *Dactylorhiza*, *Gymnadenia*, *Orchis*, *Pseudorchis*, *Anacamptis*, *Serapias*, *Himantoglossum*, *Ophrys* and *Steveniella*, and second clade: *Ponerorchis*, *Neotianthe*, *Tsaiorchis*, and *Shizhenia*. Clades separated from each other c. 19 Mya. Despite of the morphological individuality, genera representing these two groups generally differ also in their geographical distribution. The diversity center of the first clade is focused in Europe and the region of Mediterranean Sea, Far East, Pan-Himalayas and N America, while the representatives of the second clade has its diversity center in E Asia and E Himalayas (Weil-Tao *et al.* 2017).

The topology obtained from both nuclear and plastid analyses confirmed the closest affinity between the clades of Orchidinae s.str. and the clade of *Brachycorythis* representatives which is sister to them. Its last common ancestor occurred c. 20-19 Mya. As long as the richer sampling of *Brachycorythis* is not possible, the main purpose of the phylogenetic analyses in this research was the estimation of its diversification time. Although the sampling of *Brachycorythis*-complex was poor, the taxa included in the analyses represent the whole geographical distribution of the complex. The species *Phyllomphax henryi*, *P. neglecta* and *P. obcordata* are distributed in Asia, while *P. macrantha* is an African species. *Brachycorythis kalbreyeri* is the only epiphyte within the studied group and also occurs in Africa. *Gyaladenia disoides* is native to Madagascar and occurs only there.

The monophyly of the *Brachycorythis*-complex was confirmed only in the plastid analysis (high PP and BS support). According to this results the diversification within the group started c. 15 Mya. The results of nuclear analysis indicate the paraphyletic character of the taxon in its wider sense, but to discuss the occurrence and reasons of topology conflict, more sampling is necessary. Despite the above differences, both trees show the similar patterns – the youngest taxa within *Brachycorythis* seem to be the species occurring in Asia, what may suggest that *Brachycorythis* derived from Africa.

7. Conclusions

The *Brachycorythis*-complex constitutes seven terrestrial genera and forty eight species occurring in sub-saharan Africa, Madagascar and southern Asia. They mainly occur in permanently or seasonally wet habitats at the elevation range between the sea level to 3750 m, flowering throughout the year. The only

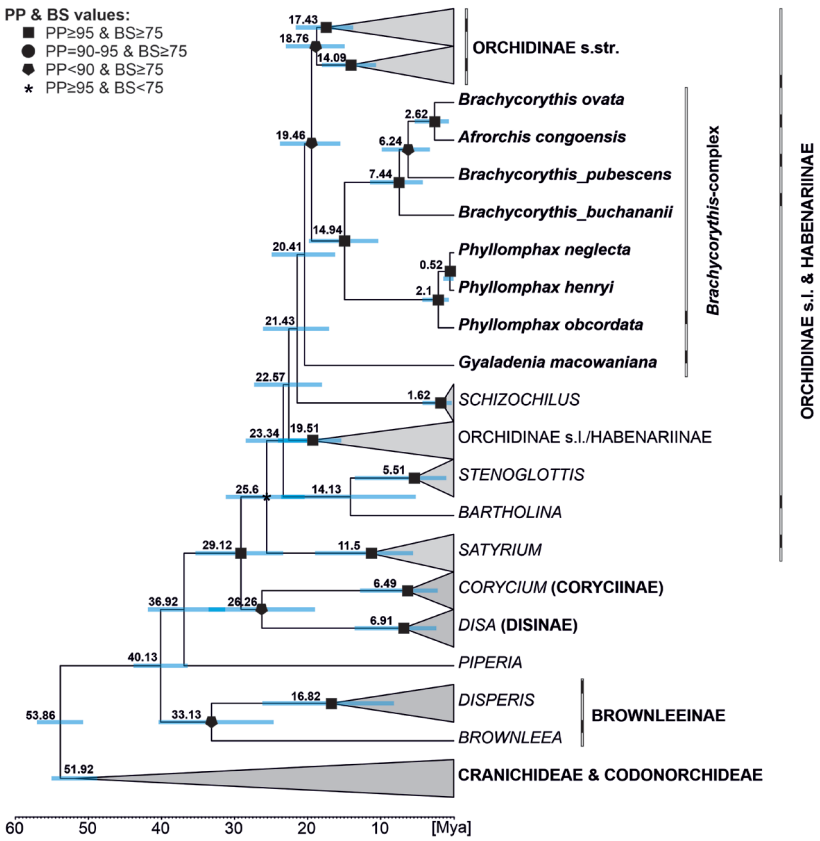

Fig. 152. Maximum clade credibility tree obtained from plastid markers analysis (values upon the branches indicate the node age)

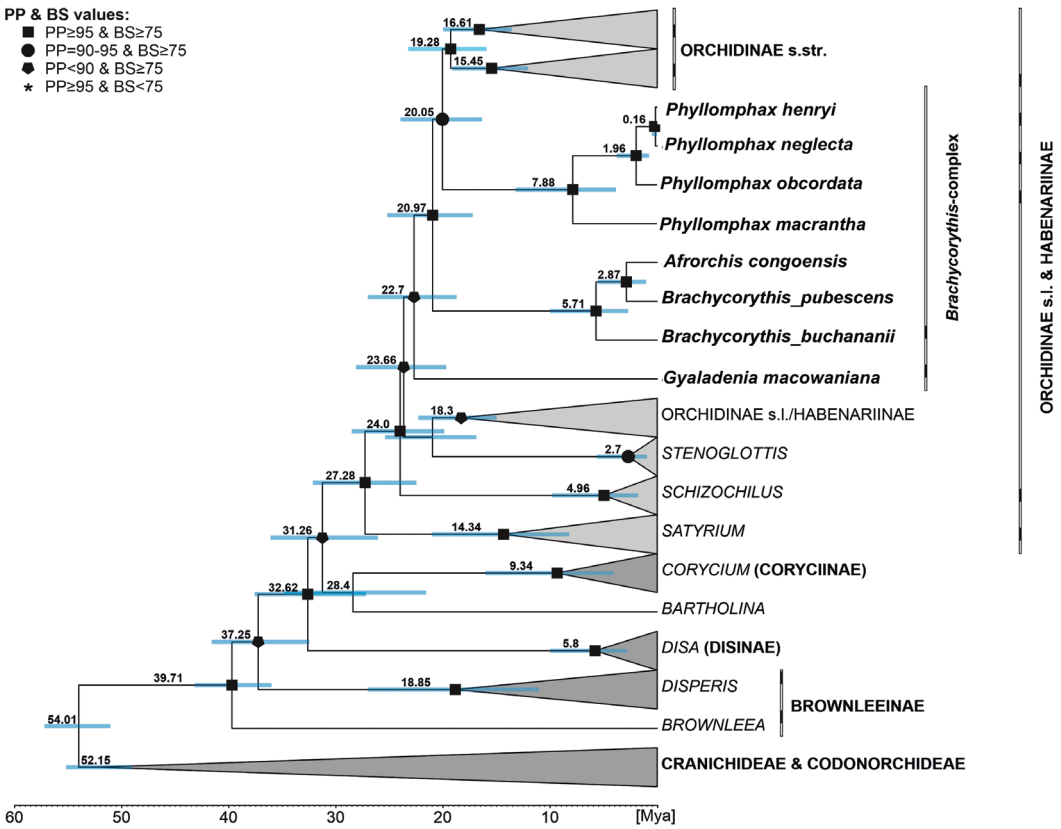

Fig. 153. Maximum clade credibility tree obtained from nuclear markers analysis (values upon the branches indicate the node age)

epiphytic species, *Brachycorythis kalbreyeri*, is found in riverine forests and rainforests. A number of species are characterized by endemic distribution.

Although the group is well recognized from the morphological point of view, there is still lack of data about its phylogeny. The timescale reconstruction shows that difersification of *Brachycorythis*-complex took place ca 20 Mya, and its youngest species seem to be those occurring in Asia, but more sampling is needed to confirm this results.

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Richards 37 (6.1.3.1. var. *friesii*), *261* (6.1.5.4. var. *welwitschii*), *307* (6.1.5.8.), *2223* (6.1.6.1. var. *lastii*), *3739* (6.1.3.1. var. *friesii*), 4085 (6.1.4.1.), *4278* (6.1.3.3. var. *rhodostachys*), 7318 (6.1.4.2.), *7347* (6.1.3.1. var. *friesii*), *7852* (6.1.3.3. var. *rhodostachys*), *8039* (6.1.5.5.), *8111* (6.1.5.6.), *10234* (6.1.6.1. var. *lastii*), *10319* (6.1.5.3. var. *pleistophylla*), *10367* (6.1.5.4. var. *welwitschii)*, *10782* (6.1.5.6.), *15415* (6.1.3.3. var. *rhodostachys*), *15904* (6.1.5.6.), 16866 (6.1.4.5.), *16993* (6.1.3.3. var. *rhodostachys*), *17316* (6.1.4.5.), *17421* (6.1.4.5.), *17435* (6.1.3.3. var. *rhodostachys*), 18561 (6.1.4.2.), *18869* (6.1.3.1. var. *friesii*), *19381* (6.1.5.8.), *19557* (6.1.5.8.), *22693* (6.1.6.1. var. *lastii*), *22946* (6.1.5.8.)
Robbinson 5837 (6.1.4.5.)
Robertson 368 (6.1.1.8.)
Robinson 4057 (6.1.4.5.), *4059* (6.1.4.5.), *4082* (6.1.4.5.), *4154* (6.1.3.3. var. *rhodostachys*), *4191* (6.1.5.6.), *5899* (6.1.3.1. var. *friesii*), *5910* (6.1.3.3. var. *rhodostachys*), *5911* (6.1.5.5.), *6011* (6.1.5.6.)
Rudatis 552 (6.1.5.4. var. *ovata*), *1526* (6.1.5.4. var. *ovata*)
Russell 79 (6.1.6.1. var. *lastii*)

Sampson 659 (6.1.1.9.)
Sanane 380 (6.1.5.8.), *1024* (6.1.5.5.)
Sanderson 482 (6.1.5.8.)
Satabie 830 (6.1.1.17.)
Sauliere 109 (6.1.1.12.)
Saxer 62 (6.1.5.4. var. *schweinfurthii*)
Scaetta 3253 (6.1.4.4.), *3285* (6.1.1.17.)
Schaijes 1113 (6.1.5.7.), *1114* (6.1.5.3. var. *pleistophylla*), *1117* (6.1.3.3. var. *rhodostachys*), *1258* (6.1.4.1.), *1590* (6.1.4.2.), *1699* (6.1.1.17.), *1772* (6.1.5.6.), *2105* (6.1.5.3. var. *pleistophylla*), *2765* (6.1.4.5.)
Schelpe s.n. (6.1.5.3. var. *leopoldi*)
Schlechter 1900 (6.1.3.2.), *12091* (6.1.5.6.), *s.n.* (6.1.3.8.)
Schlieben 1596 (6.1.5.3. var. *leopoldi*), *3240* (6.1.5.3. var. *pleistophylla*)
Schnell 3098bis (6.1.3.9.), *1853* (6.1.4.4.), *1857* (6.1.1.17.), *3405* (6.1.4.4.), *3730* (6.1.4.4.)
Schweinfurth 3577 (6.1.5.4. var. *schweinfurthii*)
Scott-Elliot 169 (6.1.3.7.), *4061* (6.1.1.17.)
Sebastine 16501 (6.1.1.12.)
Shaijes 1746 (6.1.4.1.)
Sharland 570 (6.1.1.17.)
Sharma & White 601 (6.1.1.13.)
Simons s.n. (6.1.1.6.)
Sita 1176 (6.1.5.8.), *2744* (6.1.5.3. var. *leopoldi*)
Sitha 29 (6.1.5.3. var. *leopoldi*)
Smith 0706 (6.1.6.1. var. *lastii*)
Smyche 220 (6.1.6.1. var. *buettneriana*)
Sohni s.n. (6.1.1.13.)
Soyaux 365 (6.1.3.9.)
Spurrier 107 (6.1.3.8.), *151* (6.1.5.8.)
Stachey & Winterbottom 40 (6.1.1.13.)
Stanton 119 (6.1.5.3. var. *pleistophylla*)
Stèvart 436 (6.1.5.1.)
Stèwart & Reed s.n. (6.1.5.4. var. *ovata*)
Stoliczka s.n. (6.1.1.13.)
Stolz 139 (6.1.5.5.), *190* (6.1.5.4. var. *ovata*), *463* (6.1.5.3. var. *pleistophylla*), *506* (6.1.5.8.), *568* (6.1.5.5.), *1030* (6.1.6.1. var. *pumilio*), *1053* (6.1.5.9.), *2364* (6.1.5.3. var. *pleistophylla*), *s.n.* (6.1.5.3. var. *leopoldi*)
Stopp BO 132 (6.1.5.8.), *BO118* (6.1.6.1. var. *lastii*), *BO131* (6.1.3.1. var. *friesii*), *BO251* (6.1.4.5.)
Strid 2663 (6.1.4.5.)
Summerhayes 100 (6.1.5.8.), *122* (6.1.4.3.)
Suzuki et al. 94855061 (6.1.1.13.)
Swynnerton 6632 (6.1.5.4. var. *ovata*)

Takasaki 103 (6.1.6.1. var. *lastii*)
Talbot 869 (6.1.1.17.)
Thollon 164 (6.1.3.10.), *1082* (6.1.3.9.), *4071* (6.1.3.9.), *s.n.* (6.1.5.8.)
Thomas 894 (6.1.5.2.), *2046* (6.1.1.17.), *2738* (6.1.1.17.)
Thomson 1815 (6.1.1.13.)
Thorel 2145 (6.1.1.7.), *2238* (6.1.1.14.)
Thorncroft s.n. (6.1.5.4. var. *ovata*), *s.n.* (6.1.5.8.)
Thullin & Mhoro 3060 (6.1.2.1.)
Tisserant A177 (6.1.5.7.), *A189* (6.1.6.1. var. *pumilio*), *A260* (6.1.4.5.), *A272* (6.1.5.3. var. *pleistophylla*), *326* (6.1.4.5.), *638* (6.1.4.3.), *640* (6.1.4.3.), *816* (6.1.4.3.), *1194b* (6.1.3.9.), *2872* (6.1.4.3.), *s.n.* (6.1.3.9.)

Trochain 8466 (6.1.5.3. var. *leopoldi*)
Troupin 1926 (6.1.3.10.)
Tuck s.n. (6.1.3.2.)
Turner s.n. (6.1.1.17.)
Tyson 131 (6.1.1.13.)

Ujor FHI 30324 A (6.1.5.4. var. *schweinfurthii*)

van Der Ben 1735 (6.1.5.4. var. *welwitschii)*, *1744* (6.1.3.1. var. *friesii*)
van Dzu Nguyen, Quang Diep Dinh, NSIC 925 (6.1.7.2.)
van Meer 383 (6.1.6.1. var. *buettneriana*)
Van Tilborg s.n. (6.1.3.3. var. *rhodostachys*)
Verdcourt 3421 (6.1.3.1. var. *friesii*), *3437* (6.1.3.1. var. *friesii*)
Verdoorn 90 (6.1.3.5. ssp. *transvaalensis*)
von Hilschberg 134 (6.1.4.1.), *174* (6.1.3.8.)

Walker s.n. (6.1.4.3.)
Wallich 7050A (6.1.1.13.), *7050B* (6.1.1.13.), (6.1.1.13.)
Walters, *Stone*, *Nziengui & Moussavou 461* (6.1.5.3. var. *leopoldi*)
Wang 40872 (6.1.1.15.), *75463* (6.1.1.7.), *75490* (6.1.1.7.), *75986* (6.1.1.6.)
Ward 13914
Warner 139 (6.1.5.2.)
Wawra 770 (6.1.1.9.)
Welwitsch 693 (6.1.5.8.), *707* (6.1.5.4. var. *welwitschii)*
Wenger 245 (6.1.1.1.), *313* (6.1.1.6.)
Werdermann & Oberdieck 1446 (6.1.5.4. var. *ovata*)
Westwood 249 (6.1.5.4. var. *schweinfurthii*), *576A* (6.1.5.8.), *s.n.* (6.1.5.8.)
Wight 1031 (6.1.1.10.), *3002* (6.1.1.12.), *3025* (6.1.1.9.), *525* (6.1.1.9.), *912* (6.1.1.12.), *s.n.* (6.1.1.12.)
Wild & Chase 5567 (6.1.5.3. var. *pleistophylla*)*, 5580* (K!)
Williamson & Simon 650 (6.1.3.1. var. friesii), *1807* (6.1.4.5.)
Williamson 207 (6.1.3.3. var. *rhodostachys*), *440* (6.1.3.5. ssp. *longilabris*), (6.1.3.3. var. *rhodostachys*)
Wolff s.n. (6.1.7.1.)

Young 1129 (6.1.5.3. var. *pleistophylla*), *1139* (6.1.3.3. var. *rhodostachys*), *1166* (6.1.3.4.)*, 1199* (6.1.3.4.), *1206* (6.1.5.3. var. *leopoldi*), 1264 (6.1.4.5.), *1265* (6.1.5.5.)

Zenker s.n. (6.1.3.10.)
Zenry 215 (6.1.5.3. var. *leopoldi*)

Appendix 1. List of NCBI Genbank accession number. Numbers are cited for followed markers: ITS *Xdh, matK*, *psaB*, *psbA-trnH*, *rbcL*, *trnL-trnF* respectively. Minus (-) indicates the missing sequence

Afrorchis congoensis: MT500588, -, MT533492, -, -, MT506397, -. Amerorchis rotundifolia: JN998913, -, JN966076, -, -, JN965228, -. Anacamptis laxiflora: KY512519, -, KU697384, -, AM711707, KF997401, -. Anacamptis pyramidalis: KY512500, -, JN895643, -, -, -, KU931755. Bartholina burmanniana: MK801518, -, MK732067, -, -, MT506412, MK803218. Benthamia latifolia: -, -, EF079301, -, -, -, -. Bonatea porrecta: DQ522064, -, DQ522088, -, -, -, -. Brachycorythis buchananii: MT500607, -, MT533512, -, -, MT506421, MT507696. Brachycorythis ovata: -, -, -, -, -, -, MT506440, MT507751. Brachycorythis pubescens: MT500606, -, MT533511, -, -, MT506419, MT507695. Brownleea coerulea: AJ000138, -, FR832734, -, -, AM235038, AF360512. Caladenia marginata: GQ866493, -, GQ866548, -, GQ866597, -, GQ866811. Chamorchis alpina: -, -, FR832740, -, -, FN870786, -. Codonorchis lessonii: AF348005, -, DQ414993, AY380965, -, AY381113, DQ415136. Corycium ingeanum: EU301446, -, EU301499, -, -, -, EU301552.

Corycium nigrescens: EU301461, -, EU301514, -, -, -, AF360514. Cranichis ciliata: FJ473317, -, AM900811, FJ571220, -, FJ571321, FJ571271. Cryptostylis subulata: AF348015, GU004501, AJ310015, -, -, AF074140, AJ409395. Cynorkis fastigiata: JQ045490, -, MT533536, AY380979, -, AY381117, MT507720. Dactylorhiza fuchsii: MH016587, MF944992, MF945400, MF944423, MF944633, MF944836, MF945192. Dactylorhiza majalis: MG924890, GU004481, -, -, -, MG227484, -. Dactylorhiza viridis: MH016602, MF945117, MH659884, MF944555, MF944762, MK924899, MF945322. Diplomeris pulchella: MF944270, MF945181, MF945535, MF944619, MF944826, MF944971, MF945386. Disa tripetaloides: DQ414868, -, DQ415011, AY380988, -, AF074151, AF360497. Disa uniflora: DQ414864, -, DQ415007, -, -, -, AF360492. Disperis sp. (CPG 29188)*: MF944273, MF945085, MF945487, MF944519, MF944728, MF944922, MF945287. Disperis sp.* (*MD-2015*)*: KP064101, -, KP064100, -, -, -, -. Diuris sulphurea: DQ904018, GU004502, AF263655, AY380990, -, AF074152, AY851053. Galearis roborowskyi: KM651265, KM651348, KM651429, -, KM651511, -, KM651591. Galearis spathulata: KJ460094, MF945156, KJ452850, MF944594, MF944801, KJ451548, MF945361. Galearis wardii: MF944274, MF945110, MF945417, MF944548, MF944755, MF944853, MF945315. Gavilea littoralis: JQ045515, GQ917022, -, -, -, -, -. Gennaria diphylla: AY351380, -, AY368383, -, -, AY368341, -. Gennaria griffithii: -, MF944987, -, MF944418, MF944627, -, MF945188. Goodyera schlechtendaliana: HM021571, MK451762, MK451804, MK451825, KC704366, KC704900, MK451783. Goodyera velutina: KT338712, -, KT385651, -, -, KC704902, AY449387. Gyaladenia macowaniana: MT500611, -, MT533516, -, -, MT506426, MT507699. Gymnadenia conopsea: JF414051, MF945115, KJ452795, MF944553, KC704373, KJ451493, MF945320. Gymnadenia nigra: DQ022892, -, AM883565, -, -, -, KU974016. Habenaria arenaria: MK413691, -, MK413696, -, -, -, MF695632. Habenaria arietina: MF944283, MF945187, MF945541, MF944625, MF944832, MF944977, MF945392. Habenaria clavata: DQ522074, -, DQ522093, -, -, -, -. Habenaria dentata: MT500674, MF945032, KY966891, KR350217, KR350272, KF296645, MT507765. Habenaria foliosa: JN114529, -, JN004457, -, -, -, JN005487. Habenaria grandifloriformis: JN114542, -, JN004463, -, -, JN005500, -. Habenaria josephi: MF944300, MF945186, MF945540, MF944624, MF944831, MF944976, MF945391. Habenaria laevigata: DQ522076, -, MT533496, -, MT507682, -, AF360460. Habenaria mannii: HF560579, -, HF560603, -, -, -, -. Habenaria marginata: MF944307, MF945101, MF945503, MF944536, MF944745, MF944939, MF945304. Habenaria obtusa: HM777588, -, HM777863, -, -, -, -. Habenaria panchganiensis: JN114569, -, -, -, -, JN005528, -. Habenaria praetermissa: MF944313, -, MF945543, -, -, MF944979, -. Habenaria reflexa: MF944314, MF945183, MF945537, MF944621, MF944828, MF944973, MF945388. Habenaria rotundiloba: HM777717, -, HM778017, -, -, -, -. Habenaria stenopetala: MF944324, MF945062, MF945467, MF944496, MF944706, MF944901, MF945265. Habenaria tridens: DQ522080, -, DQ522101, -, -, -, -. Habenaria weileriana: HF560585, -, HF560609, -, -, -, -. Habenaria wolongensis: MF944328, MF945178, MF945532, MF944616, MF944823, MF944968, MF945383. Hemipilia calophylla: KM651269, MF945158, KM651433, MF944596, MF944803, -, MF945363. Hemipilia flabellata: KM651271, KM651354, KM651435, -, KM651517, KJ451504, KM651597. Hemipiliopsis purpureopunctata: KJ460051, MF945123, KJ452807, MF944561, MF944768, KJ451505, MF945328. Herminium fallax: KR350164, KR350453, KR350186, KR350256, KR350310, KR350345, KR350401. Herminium gracile: -, KR350428, -, KR350230, -, -, KR350375. Herminium humidicola: KR350143, KR350416, -, KR350216, -, KR350324, KR350361. Herminium lanceum: MH808055, MF945106, MF945510, MF944544, MF944751, MN185061, MF945311. Herminium macrophyllum: MF944333, MF945107, MF945511, MF944545, MF944752, MF944948, MF945312. Herminium mannii: KR350162, KR350451, KR350198, KR350254, -, KR350343, KR350399. Herminium monorchis: MH808057, KR350419, MK435667, KR350220, -, KR350326, KR350365. Herminium pusillum: MF944337, MF945040, MF945446, MF944473, MF944682, MF944880,*

MF945242. Herminium yunnanense: KR350159, KR350448, KR350195, KR350251, -, KR350340, KR350396. Himantoglossum comperianum: KU931664, -, -, -, -, KU931786. Himantoglossum robertianum: -, -, -, KJ596227, MW316729, -, -. Microtis parviflora: DQ104554, -, AF263671, -, -, AF074194, AJ409428. Neolindleya camtschatica: KT338754, -, KF262003, -, KF262121, KF296612, -. Neotinea maculata: AY364873, -, -, -, AM711706, FN870882, -. Neotinea ustulata: AY364883, -, -, -, -, KF997335, -. Neottianthe compacta: JN696455, MF945116, KJ452796, MF944554, -, KJ451494, MF945321. Neottianthe fujisanensis: KM651280, KM651363, KM651444, , KM651524, -, KM651606. Ophrys apifera: KY512506, -, HE858504, AY381047, MH681198, AF074202, KU931794. Ophrys insectifera: MF944348, MF945090, MF945396, MF944525, MF944734, MF944928, MF945293. Orchis anatolica: HQ657131, -, KU697379, -, -, -, -. Orchis mascula: MW422859, -, MK925600, -, HG800547, MK925129, KU931823. Orchis militaris: AY699977, -, KF997352, -, -, KF997273, -. Pecteilis gigantea: JN114652, -, JN004548, -, -, JN005610, -. Pecteilis susannae: MF944351, MF945100, MF945502, MF944535, MF944744, MF944938, MF945303. Peristylus affinis: MF944353, MF944999, MF945406, MF944430, MF944640, MF944842, MF945199. Peristylus chapaensis: MF944357, MF945167, MF945520, MF944604, MF944811, -, MF945371. Peristylus densus: MF944359, MF945048, MF945453, MF944480, MF944690, MF944887, MF945249. Peristylus lacertifer: MF944366, MF945075, MF945478, MF944509, MF944718, MF944912, MF945278. Peristylus tentaculatus: KJ460035, KR350415, KJ452787, KR350215, -, KJ451485, KR350360. Peristylus tradescantiifolius: MF944371, -, MF945441, MF944468, MF944678, MF944876, MF945237. Phyllomphax henryi: MF944262, MF945034, MF945438, MF944465, MF944675, -, MF945234. Phyllomphax neglecta: KM651261, KM651344, KM651425, -, KM651507, -, KM651587. Phyllomphax obcordata: MF944263, MF945098, MF945500, MF944533, MF944742, MF944936, MF945301.

Physoceras boryanum: MT500635, -, MT533539, -, -, FN870897, MT507723. Piperia elegans: MN846649, -, -, -, -, MG226484, -. Piperia transversa: MG216464, -, -, -, -, MG227495, -. Platanthera ciliaris: MK356062, -, AF263678, -, -, AF074215, -. Platanthera japonica: KJ460082, -, KJ452838, KR350236, KF262137, KJ451536, KR350381. Platanthera minor: KJ460079, MF945138, KJ452835, MF944576, , KJ451533, MF945343. Platanthera minutiflora: KJ460070, MF945139, KJ452826, MF944577, MF944784, KJ451524, MF945344. Platanthera orbiculata: MW112814, -, -, -, -, MG228129, -. Platanthera oreophila: KJ460060, MF945130, KJ452816, MF944568, MF944775, KJ451514, MF945335. Platanthera sachalinensis: KJ460074, MF945143, KJ452830, MF944581, MF944788, KJ451528, MF945348. Platanthera stenantha: JN696463, MF945053, JN696442, MF944486, MF944696, JN696427, MF945255. Platanthera stenophylla: KJ460072, MF945141, KJ452828, MF944579, MF944786, KJ451526, MF945346. Platycoryne crocea: MT500614, -, MT533519, -, -, MK191890, MT507702. Ponerorchis alpestris: KJ460093, MF945155, KJ452849, MF944593, MF944800, KJ451547, MF945360. Ponerorchis camptoceras: MF944400, MF945002, MF945409, MF944433, MF944643, MF944845, MF945202. Ponerorchis chusua: MF944401, MF945055, KJ452786, MF944488, MF944698, MF944894, MF945257. Ponerorchis faberi: KM651230, KM651311, KM651391, -, KM651475, -, KM651554. Ponerorchis farreri: KJ460047, MF945120, KJ452803, MF944558, MF944765, KJ451501, MF945325. Ponerorchis physoceras: KM651248, KM651330, KM651410, -, KM651493, -, KM651573. Ponerorchis simplex: MF944407, MF945022, KM651416, MF944453, MF944663, MF944863, MF945222. Ponerorchis trifurcata: KJ460055, MF945127, KJ452811, MF944565, MF944772, KJ451509, KM651583. Pseudorchis albida: DQ022894, -, FR832817, -, -, MK925390, -. Satyrium bracteatum: EF601480, -, EF612540, -, -, -, EF601433. Satyrium trinerve: AY705003, -, EF612595, -, -, -, AY705043. Satyrium yunnanense: MF944415, MF945086, MF945489, MF944521, MF944730, MF944924, MF945289. Schizochilus crenulatus: MT500597, -, MT533502, -, -, MT506407, MT507688. Schizochilus flexuosus: MT500598, -, MT533503, -, -, MT506408, MT507689. Serapias cordigera: AY364884, -, HM850510, -, -, HM850348, EU045537. Serapias lingua: AF348062, -, -, -, -, FN870933, EU045542. Shizhenia pinguicula: MF944417, MF945093, MF945495, MF944528, MF944737, MF944931, MF945296. Spiranthes sinensis: MH802050, MH751575, MH036728, MK936427, KC704396, KC704926, LT600888. Stenoglottis longifolia: MN240678, -, AY368387, -, -, AY368349, -. Stenoglottis woodii: MN240680, -, -, -, -, -, AM235042. Steveniella satyrioides: KU931666, -, FR832840, -, KJ596233, -, KU931833. Thelymitra carnea: MG694966, -, MG695085, -, -, KT626790, AJ409454. Traunsteinera globosa: KT318279, -, -, -, HG800585, HG417055, -. Tsaiorchis keiskeoides: KM651564, MF945114, KM651402, MF944552, MF944759, -, -. Tsaiorchis neottianthoides: -, -, KJ452794, -, -, KJ451492, -. Tylostigma nigrescens: MT500661, -, -, -, -, MT506441, MT507752. Tylostigma perrieri: MT500648, -, MT533551, -, -, MT506432, MT507737.

Plates

Plate I. *Phyllomphax helferi* – flowers (A-B); *Phyllomphax henryi* – flowers (C), inflorescences (D-E), habit (F-G)
Photo credits: A-B – John Varigos, C-G – Vijay Anand Ismavel

Plate II. *Phyllomphax wightii* – flowers (A), habit (B)
Photo credits: A – Dinesh Valke, B – Siddarth Machado

Plate III. *Gyaladenia tenuior* – inflorescence (A-C)
Photo credit: Judith Becker

Plate IV. *Afrorchis angolensis* – flower (A), inflorescence (B-C)
Photo credit: Warren McCleland

Plate V. Inflorescences: A – *Brachycorythis kalbreyeri*, B – *Brachycorythis pleistophylla*, C – *Brachycorythis pleistophylla*
Photo credits: A – Darrin Norton, B – Bart Wursten, C – Stefano Pagnoni