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THE AFRICAN DICHAPETALACEAE

A taxonomical revision

*This first instalment contains the treatment
of the species a-b in Dichapetalum
A provisional key to the continental African species is added*

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INTRODUCTION

In 1919 E. DE WILDEMAN published his 'Notes sur les espèces africaines du genre *Dichapetalum* Thou.'. In an introduction to this article he made some critical remarks about ENGLER's 'incomplete and artificial' classification of the African species (1912-a) and noted: 'Le travail de revision, qui devient nécessaire, ne peut être entrepris que par un monographe qui aura sous la main tous les originaux dispersés dans les divers herbiers'.

ENGLER and his collaborators KRAUSE and RUHLAND have described more than one third of the African species, mainly based on material of German collectors. Thus it is evident that the destruction of the African herbarium at Berlin during the last world war caused a great obstacle to future revisions of the genus. HAUMAN (1955: 341) went as far to remark, that a revision as DE WILDEMAN intended, would not be possible anymore.

Nevertheless, the present author has undertaken such a revision and this paper forms its first instalment. The type-problem proved to be less insuperable than was estimated. The majority of the types concerned, especially those of ZENKER, are duplicated in several herbaria. Only those in the LEDERMANN collection from Cameroun, on which 10 species are based, could have posed serious problems as no duplicates had been distributed. Fortunately, however, fragments of the LEDERMANN and of other types were found in the British Museum. They had been acquired by Mr. EXELL during a visit to Berlin in the course of preparing his account of the Angolese species (1927). Although these fragments are often very poor, they proved to be extremely useful in the interpretation of ENGLER's often rather inaccurate descriptions. As a result only in a few, rather clear cut cases neotypes have to be designated.

The present revision was initiated in 1961 during botanical exploration in the former French Cameroun. The author having serious problems in identifying *Dichapetalum* specimens came across KEAY's revision (1958) of the West African species and as a consequence of his remark on the taxonomy of this difficult genus, it was decided to revise the African representatives. Special attention was given to this family during further exploration.

Spending a year at Wageningen, literature of the *Dichapetalaceae* was collected and studied. The Paris herbarium where the rich collections of KLAINÉ and LE TESTU from Gabon are conserved, was visited.

This work was interrupted by a three years' stay at Merida, Venezuela, but at the end of 1966 the investigation was taken up again. The herbaria of Brussels, Paris, Kew, London, and Oxford were visited, most of them on two or more occasions, and during three separate trips to Africa field exploration could be continued.

In 1968 collecting was carried out in Liberia, Ivory Coast, Cameroun, and Gabon. In 1970 Cameroun and Gabon were revisited. During both visits to Cameroun the author collected together with J. J. BOS who stayed at Kribi at

the time. Togo was explored in 1971 and once more a short visit was paid to Cameroun where he collected together with A. J. M. LEEUWENBERG.

This fieldwork as well as the continuous attention paid to this family in botanical exploration by other collectors, as J. J. BOS, J. J. F. E. & W. J. J. O. DE WILDE, J. JANSEN, and A. J. M. LEEUWENBERG, added considerably to the present knowledge of the family. More specifically this regards morphology and intraspecific variation and even stronger geographical distribution, ecology, and habit and growth of the species.

As regards this revision, preference was given to publication in instalments. As it was not possible to make a satisfactory division of the genus *Dichapetalum* on systematical or geographical grounds, the chosen arrangement is not a natural one, and though somewhat unusual very practical: the alphabet. All specific names, whether being validly published or not, are treated in alphabetical order.

As HAUMAN (1955: 340) noted, the species of *Dichapetalum* are rather uniform in their morphology, not only in their vegetative aspects, but in their generative aspects as well, showing rather few sound differential characters. For that reason it is rather astonishing to note the number of species that have been described. An explanation may be found in the enormous variability in habit, leafshape and leafsize, indumentum, inflorescence, flower dimensions, and even fruit shape and fruit indumentum of the species. It has taken considerable time of critical investigation of numerous specimens before it could be established, that wide differences do indeed exist within one species and that commonly accepted differential characters are quite useless even for infraspecific delimitation. More detailed information regarding this variation is given in the chapter on morphology.

As a result only about 90 species out of a total of over 220 described can be maintained for Africa. To return once more to DE WILDEMAN, it is illustrative to note, that out of the 21 new species proposed by him in 1919, the present author can uphold but a single one.

GENERAL PART

HISTORY OF THE GENUS

In 1806 DU PETIT THOUARS described the genus *Dichapetalum*, basing it on a specimen from Madagascar, but he made no combination for the species intended as a base for the genus. This was done by POIRET (1812) and he named it *D. madagascariense*. ROEMER & SCHULTES (1819), overlooking POIRET's combination, named the type species *D. thouarsianum*.

For a long period the synonym *Chailletia* DC. (1811) has been used for the genus and more than 30 African species have been described in it. BAILLON (1874) was the first author who gave priority to the name *Dichapetalum* and from 1895 on almost all new species were described in *Dichapetalum*.

With the era of extensive exploration of Central Africa, especially by German explorers, the great production of specific names started, mainly in Berlin, and to a lesser extent, in Brussels and Paris. ENGLER and his collaborators KRAUSE and RUHLAND are the authors of a hundred names, DE WILDEMAN, partly in collaboration with TH. DURAND is responsible for thirty names, and PELLEGRIN for eleven. Later (1927), EXELL described some new species from Angola. In all over 220 specific names have been published for Africa alone.

PELLEGRIN (1913) was the first author to work critically in the African species, but his work was overlooked, at least not taken into account, by most authors. Besides some revisional work for regional floras (e.g. Flore du Congo, Flore de Madagascar) no comprehensive critical study has been published hitherto on the African species.

The American representatives have recently been revised by PRANCE (1972), and the Asiatic species by LEENHOUTS (1956-1972).

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY

In Africa the main centre of distribution of *Dichapetalum* is Central Africa, comprising Cameroun, Gabon, Equatorial Guinea, Congo, Zaïre, Central African Republic and the northern part of Angola. Over 60 species occur within this area, of which 40 are endemic, often with a very limited distribution. Future exploration is expected, however, to reveal considerable extension of these small distribution areas.

In the area of the Flora of West Tropical Africa (2nd ed.), i.e. excepting Western Cameroun, 28 species occur of which only 7 are confined to this area, while the remaining 21 occur in Central Africa as well. *D. bocageanum* is endemic on Sao Tomé and Príncipe.

Central- and East Africa (Uganda, Kenya, Tanzania, and Moçambique) have only four species in common, except *D. ugandense* which occurs mainly in

the border region between Zaïre and Uganda, and *D. angolense* which has only been collected in western Uganda.

The East African species occupy a second centre of distribution mainly restricted to the coastal area of Kenya, Tanzania, and Moçambique, where 13 species are found of which at least 8 species are confined to this area, some of them (*D. braunii*, *D. edule*, *D. macrocarpum*) even to a very small part of it in S.E. Tanzania and N.E. Moçambique. From this small area the present East African species, at least those which are entirely confined to this second centre of distribution, may have migrated in two opposite directions: *D. arenarium* and *D. eickii* to the north, and *D. barbosa* and *D. deflexum* to the south, while some species, like *D. mossambicense*, have spread in both directions.

Only two species are confined to South Tropical Africa: *D. cymosum* and *D. rhodesicum*, of which the former extends into the northern part of the Republic of South Africa. Besides these, some Central African species like *D. bangii* penetrate into this area.

Madagascar forms a third centre of distribution, comprising ca. 12, partly very closely related species, which are mainly characterized by having entire petals. It is interesting to note that the type species, *D. madagascariense*, has the largest distribution, as it occurs also on the continent, from Guinea to the east coast.

The dispersal in *Dichapetalum* is effected by fruits. Several species (e.g. *D. cymosum*, *D. filicaule*, *D. madagascariense*) produce fruits with edible pulp, which may be eaten by various animals, as has been reported for species like *D. integripetalum* (eaten by chimpanzees) and *D. mombuttense* (eaten by small antilopes). Others, however, like *D. acuminatum*, *D. altescandens*, and *D. pallidum*, have their exocarp covered by easily caducous, acicular, barbed, irritating hairs, rendering them hardly attractive to animals. As regards *D. acuminatum*, HAUMAN (1958-a: 309) noted: 'Les poils caducs des fruits mûrs, pénétrants et très irritants sont évités par les hommes et les singes'. It is interesting to note that all such species but one (*D. staudtii*) possess a dehiscent exocarp, exposing the pyrenes covered by, sometimes brilliantly coloured, pulp, which may attract animals, especially birds.

Most species inhabit the forest, and only two (*D. cymosum*, *D. rhodesicum*) show adaptations to semi-arid conditions. They are most abundantly represented in the Central African rain forest, not only as regards the number of species, but also in individual numbers. As HAUMAN (1958-a: 288) noted, it seems that, at least locally, they play a rather important role in the composition of such forests.

Towards the savannah's, i.e. in the drier parts of the tropical forest, they become notably less abundant. There are no species which penetrate effectively from the forest into the anthropogenous savannah, except when annual burning does not occur.

SYSTEMATIC POSITION OF THE DICHAPETALACEAE

In a recent article by BECKER (1973) a comparison concerning *Angiosperm* classification systems is given. Although not all systems are listed, it is evident that the systematic position of the *Dichapetalaceae* is not a settled one.

Listed below are the most important classification systems indicating the position given to *Dichapetalaceae* and their suggested relationships.

BENTHAM & HOOKER (1862):	<i>Geraniales</i> , related to <i>Celastraceae</i> & <i>Rhamnaceae</i>
ENGLER (1896–1936):	<i>Geraniales</i> , related to <i>Phyllantoideae</i> (<i>Euphorbiaceae</i>)
HUTCHINSON (1926–1969):	<i>Rosales</i>
WETTSTEIN (1935):	<i>Tricoccae</i> , related to <i>Phyllantoideae</i> (<i>Euphorbiaceae</i>)
WAGENITZ in MELCHIOR (1964):	<i>Thymelaeales</i> , related to <i>Thymelaeaceae</i>
CRONQUIST (1968):	<i>Celastrales</i> , relationship see below
TAKHTAJAN (1969):	<i>Euphorbiales</i> , related to <i>Phyllantoideae</i> (<i>Euphorbiaceae</i>)

Most authors are not very satisfied with the position given to *Dichapetalaceae*. BENTHAM & HOOKER, although placing the family in *Geraniales*, indicate relationship with two families of the *Celastrales*. ENGLER underlined the special position of the *Dichapetalaceae* by placing it in a suborder (Unterreihe) of its own. The relationship to *Euphorbiaceae* as suggested by ENGLER was certainly based on BAILLON's critical work (1873, 1874) in which the latter author even merged the *Dichapetalaceae* into the *Euphorbiaceae*. ENGLER's idea about the affinity of the family has been followed by several authors (e.g. WETTSTEIN, 1935; GUNDERSEN, 1950; TAKHTAJAN, 1969), and also LEENHOUTS (1957) accepted this view.

HUTCHINSON (1969: 65) noted that its position in *Rosales* may be faulty, but just as good as at the end of the *Geraniales*, where it is found in the two previous systems.

In the 12th edition of ENGLER's *Syllabus der Pflanzenfamilien* by MELCHIOR (1964), WAGENITZ did not follow the previous editions in placing *Dichapetalaceae* in the *Geraniales*, but he placed them in the *Thymelaeales*. There is very little support for this position (PRANCE 1972: 6) and WAGENITZ's ideas seem to be founded on a single remark by DOMKE (1934: 3), which is not further worked out in the latter's work.

CRONQUIST (1968) does not seem to be very satisfied with *Dichapetalaceae* within his *Celastrales* either, as 'having no very close relatives' (l.c.: 255). However, discussing the relationship with *Euphorbiaceae* as proposed by several authors, CRONQUIST (l.c.: 258) does not see serious problems in placing *Dichapetalaceae* in the *Celastrales*. PRANCE (1972) favours CRONQUIST's classification and found even some support for it (l.c.: 7) in comparing the pollen of *Dichapetalaceae* and *Celastraceae*.

Essential for establishing the relationship of *Dichapetalaceae*, as WETTSTEIN (1935) pointed out, is the understanding of the true nature of the tube bearing petals and stamens. In other words, is this tube a true corolla tube or a tube formed by stamens and staminodes? In my chapter on morphology it has been stressed that the petals are of staminodial nature and should not be regarded as true petals as was done by several authors (e.g. HUTCHINSON, WAGENITZ, CRONQUIST, PRANCE). The tube is a staminal tube, a familiar recurrence in ENGLER's *Geraniales*, especially in *Meliaceae*, and not a corolla tube with the stamens adnate to it (e.g. PRANCE, 1972). This view implies that we must regard the flower of *Dichapetalaceae* as having no petals. A strong tendency towards apetalous flowers is manifest in several families of ENGLER's *Geraniales*, e.g. *Polygalaceae*, *Trigoniaceae*, *Vochysiaceae*.

An actinomorphic staminal tube as in *Dichapetalum* and *Stephanopodium* is, as mentioned above, common in *Meliaceae*. A zygomorphic staminal tube as in *Tapura*, is seen in *Polygalaceae* and *Trigoniaceae*. Of the latter family especially the genus *Trigonia* shows close affinities to *Tapura* in the arrangement of the stamens and staminodes in the androecium.

In ENGLER's *Geraniales* the morphology of the gynoecium as well as its evolutionary tendencies from multiovulate carpels towards biovulate carpels (*Meliaceae*, *Trigoniaceae*) or even uniovulate carpels (*Polygalaceae*), also suggests that *Dichapetalaceae* fit well within this order. The *Geraniales* seem to be more natural than is accepted by several authors (e.g. LAWRENCE, 1963: 550), especially when fruit development and the general morphology of the inflorescences are also taken into account.

It remains to be seen to which of the families of ENGLER's *Geraniales* *Dichapetalaceae* are most closely related. On anatomical grounds BARTH (1896) pointed to a close relationship with *Trigoniaceae*, which is endorsed by the present author on morphological grounds. More evidence from other botanical disciplines is needed, however, and it is suggested that *Malpighiaceae*, as a possibly closely related group, be taken into account in future work.

In conclusion the view is upheld here, that *Dichapetalaceae* belong in ENGLER's *Geraniales* and not in HUTCHINSON's *Rosales*, WAGENITZ's *Thymelaeales*, or CRONQUIST's *Celastrales*, but that its close relatives are not the *Euphorbiaceae* but most probably the *Trigoniaceae* and maybe the *Malpighiaceae*.

MORPHOLOGY

Habit and growth

Most species of *Dichapetalum* are lianescent and so far only a few species have not shown any linanoid tendencies; they are shrub- or tree-like (e.g. *D. barteri*), or are suffrutescent with a woody base, e.g. *D. rhodesicum* and *D. cymosum*, occurring in southern tropical Africa, the latter also in South Africa.

Trees in the arborescent or partly arborescent species may reach a height of 17 m in the West African *D. barteri* and 24 m, with a diameter (at 1.50 m) of

52 cm, in *D. michelsonii* (= ?*D. stuhlmannii*) from eastern Zaïre (*Pierlot 3256*). Trees of *D. madagascariense* (syn. *D. guineense*) have been found as tall as 6 m, with a diameter (at 1.30 m) of 30 cm (*Breteler 6186*).

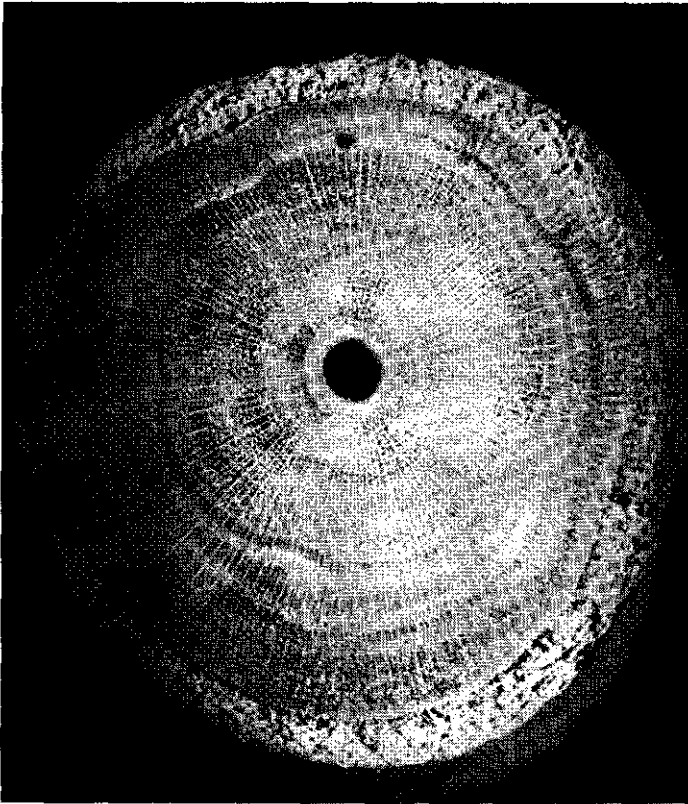
The total length of lianescent species rarely exceeds 100 m; it is usually not more than 50 m, while the maximum diameter found was 12 cm in a specimen of *D. pallidum* (*Breteler cf. 6898*). Usually the diameter of a full-grown liana does not exceed 6 cm.

The habit of species with lianoid tendencies may be quite variable even within one population: *D. ndongense* (syn. *D. martineau*) has been found in the Banco forest near Abidjan as a shrub, as a treelet, and as a liana reaching the forest canopy, while in the same small forest all intermediary growth forms could be observed as well. From field observations made in various parts of tropical Africa, it may be concluded that in most cases strict environmental conditions seem to decide whether a plant develops into a liana, a shrub or a small tree. The most striking examples have been observed in *D. glomeratum* and in *D. insigne* where plants with a tree habit and with a liana habit grew close together, i.e. at a few meters distance in the same forest. The lianas apparently had met more favourable light conditions, whereas the crown of the tree-like plants had remained in deep shade.

The primary growth form of a *Dichapetalum* after the seedling stage is that of a shrub. In forest this shrub stage may last for a considerable time or the plant may develop into a treelet. As soon as sufficient light is caught through an opening in the canopy above, long slender lianescent shoots are produced which ascend into this opening. Thus the liana is born, and when eventually the small crown of the former treelet or shrub has disappeared, there is apparently nothing to indicate this primary stage. To some extent the different growth forms represent different stages of development, as each lianoid species starts its life as a small shrub, but in the case of *D. ndongense* quoted above, all growth forms produced flowers and fruits, indicating that maturity, i.e. the possibility of reproduction (flowering), may be achieved by any one of these growth forms. Nevertheless, generally more flowering is observed in exposed plants than in plants growing in deep shade, and all African *Dichapetalum* may be considered to be heliophilous. The shrub- or treelet stage in which plants await as it were their chance to develop into a liana may be rather long, but the potentiality of developing into a liana remains.

In open, usually secondary, vegetations the shrub-like habit prevails, but often some lianescent branches may be observed. These shrubs, with or without lianescent branches, usually show the branching system of true lianas (see below).

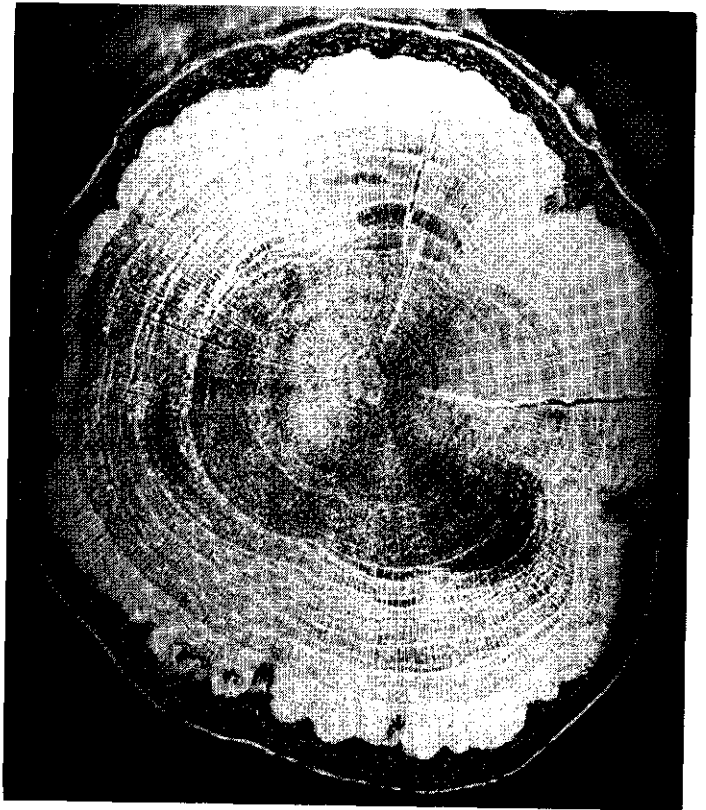
However, in some lianoid species, local races may exist in which a tree- or shrub-like habit seems to be the ultimate stage. Within the complex species *D. madagascariense* the former *D. guineense* has usually the habit of a shrub or a small tree, while the former *D. flaviflorum*, occurring in Congo and Zaïre, is a forest shrub, rarely a liana. Such local races show a certain fixation of the habit, but exceptions still occur.



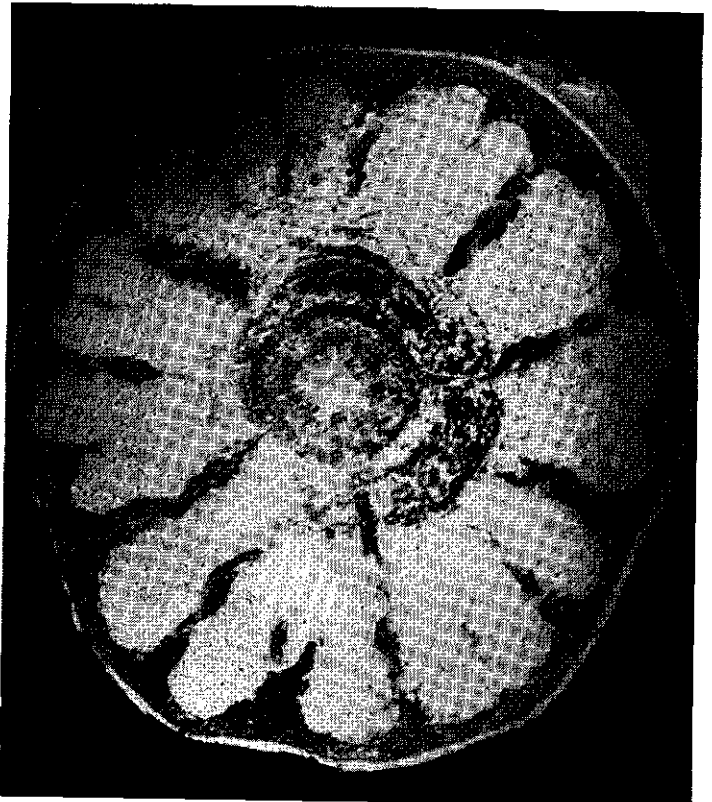
PHOT. 1. *D. gabonense*: cross section of main stem from a specimen with tree-like habit. Note the entire xylem cylinder. (Bretelet 5781; diam. 4 cm; phot. H. C. D. DE WIT).



PHOT. 2. *D. gabonense*: cross section of main stem from a lianescent specimen. Note the deeply lobed xylem cylinder. (Bretelet 6576; diam. 5 cm; phot. H. C. D. DE WIT).



PHOT. 3. *D. choristilum*: cross section of main stem from the basal part of a liana. Note the almost entire xylem cylinder (Bos & Breteler 7198; diam. 4,5 cm; phot. H. C. D. DE WIT).



PHOT. 4. *D. choristilum*: cross section of a lianescent stem, away from the basal part. Note the deeply lobed xylem cylinder. (Bos 4542; diam. 3 cm; phot. H. C. D. DE WIT).

Generally it may be concluded that most species of *Dichapetalum* show a great plasticity as regards adaptations to environmental conditions. As most species are forest dwellers and do not develop into tall trees, their demand for light is only met with when adopting the lianoid habit. Thus the liana may be considered as the ultimate or dominant habit.

As has been stipulated above the primary habit of a *Dichapetalum* after the seedling stage is the shrub. Rather soon after the seedling stage a specialisation occurs into two kinds of branches: orthotropic and plagiotropic. At first the orthotropic branches bear normally developed leaves, but sooner or later only strongly reduced leaves or sometimes only stipules are produced on such shoots. Exceptions are found in species with a tree habit (e.g. *D. barteri*) and in trees of *D. madagascariense* (e.g. the former *D. guineense*) where normal leaves are continuously being produced on orthotropic branches. In lianoid species normally developed leaves are very seldom observed on orthotropic branches.

Together with these orthotropic shoots short lateral (plagiotropic) branches are developed on them, which are at first rather fastigiate, forming a narrow angle with the orthotropic shoot. As the development continues, the angle becomes wider and finally a hook is formed: the climbing apparatus (see fig. 1,1). Winding has not very often been observed in African *Dichapetalum*.

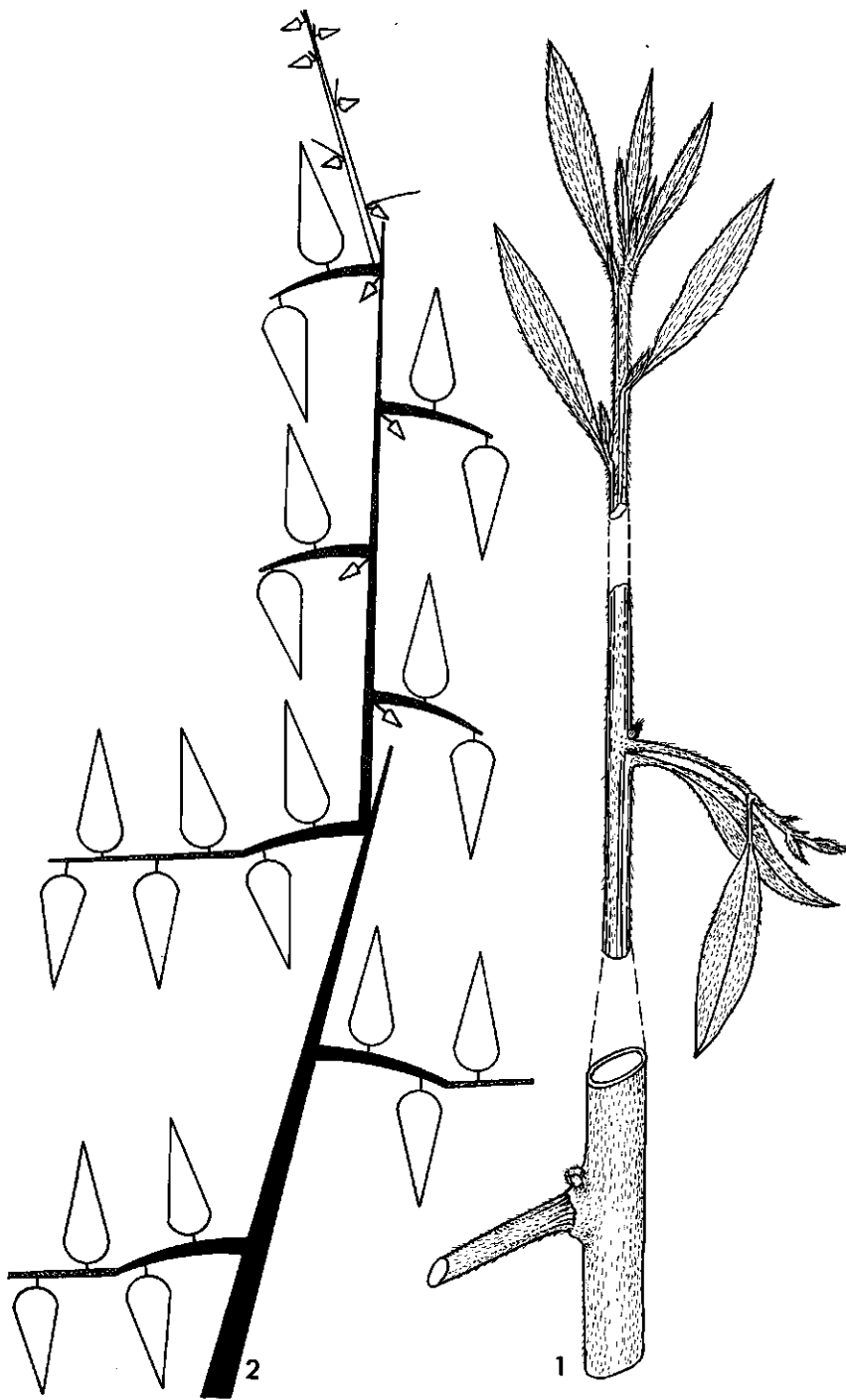
As the apical portion of the orthotropic shoot usually withers, orthotropic growth is continued by the development of a bud directly above a plagiotropic shoot in the lower part. Such, normally remaining dormant, buds must be considered to be serial to the axillary buds that produced the plagiotropic branches. This pattern of continued orthotropic growth by means of such serial buds is repeated. The construction of a *Dichapetalum* plant is thus sympodial and its growth rhythmic (fig. 1,2).

Orthotropic shoots, originating from a serial bud as described above, have two lateral buds at their very base. Thus before the orthotropic shoot has developed, there seem to be three collateral buds in a serial position. These three buds may develop simultaneously, producing three orthotropic shoots of which the central one is the most vigorous. Usually only one or two buds develop, the other(s) remaining dormant.

The short hook-like plagiotropic branches usually bear normal leaves and may produce flowers, whereas flowering has never been observed on orthotropic branches. Phyllotaxis on the latter is $2/5$, but the leaves are arranged in 2 rows (pseudo-distichous) on the plagiotropic branches by twisting of the leaf-stalks. The branches are thus two-sided, having an upper and a lower side.

The plagiotropic branches continue their growth by development of the axillary bud of the top leaf and may branch by development of other axillary buds. The apical bud remains dormant or dies, sometimes even the apical portion of

FIG. 1. 1. *D. zenkeri*: three stages in the development of a hook-like plagiotropic shoot, $2\frac{1}{2} \times$. (Bos & Breteler 3099); 2. Sympodial growth in a *Dichapetalum* liana, schematic. For explanation see text.



the branch may die back. The prolongation of the primary hook-like part is usually in a more horizontal direction (fig. 1,2).

The differentiation between orthotropic and plagiotropic branches may further be illustrated by the indumentum and the stipules. In species with an appressed indumentum the hairs are normally, i.e. as usually seen in herbarium specimens, where orthotropic shoots are mostly lacking, appressed towards the top of the shoot, but in orthotropic shoots the hairs are appressed in the opposite direction. On orthotropic shoots the stipules at one node are equal in size and shape, but on plagiotropic branches they are different in size and sometimes also in shape, i.e. the larger stipules are found on the upper side of the horizontal branch, the smaller on the lower side.

In fig. 2 these two phenomena are demonstrated on a shoot of *D. oblongum*: 1 shows the upper part of an orthotropic shoot (a-b) with its prolongation from one of the upper axils (c) into shoot c-d. The situation at node c is represented in 2, slightly turned and enlarged, where b is the end of the orthotropic shoot. The part c-b has withered. The hairs on this part and below c are appressed towards the base, whereas on c-e, representing a short plagiotropic shoot in the axil of the pendent leaf, the hairs are appressed towards the top. Of the original three 'collateral' buds placed in a serial position to this plagiotropic shoot c-e, the central one has produced the vigorous shoot c-d, one of the lateral ones shoot c-f, while the third (*) remained dormant.

The hairs on the lower part of shoot c-d are more or less appressed towards the top, in the middle part (3) a reorientation takes place, but at the top (4) the hairs again are appressed towards the base.

The stipules at the top of shoot c-d (4) are equal, but those at the top of a plagiotropic shoot (5) are unequal, and here the hairs are once more appressed towards the top.

Dichapetalum lianas have a very strong vitality. This can easily be demonstrated in forest exploitations, where in the course of road construction lianas are frequently severed deep below ground level. Thus only a part of the original root system remains and this may produce flowering shrublets within 2 years after the accident. Also collecting *Dichapetalum* specimens is often most successful when laterite quarries are visited. Here the forest soil and its vegetation have been removed entirely as well as a part of the underlying laterite. *Dichapetalum* specimens found in such localities have sprouted from parts of the original root system. Further, the toughness of Gifblaar (*D. cymosum*) is very well known in South Africa.

Stems and branches

The main stem is formed by the subsequent orthotropic shoots. In lianoid species main stems are usually subcylindrical or very slightly lobed or grooved, but seldom fluted.

The wood cylinder in lianescent stems is often deeply lobed or divided by intruding phloem. This phloem is not always present in young stems or in parts

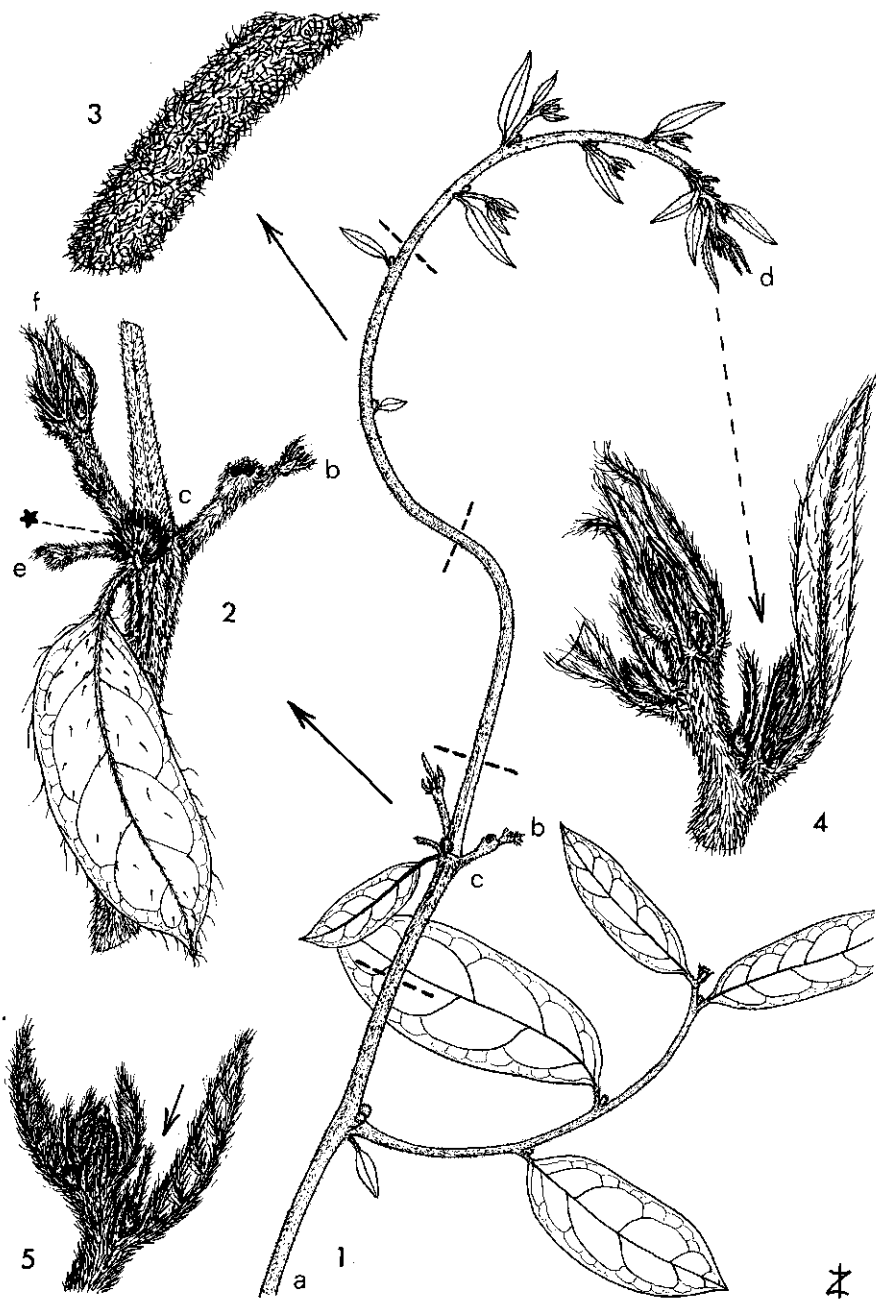
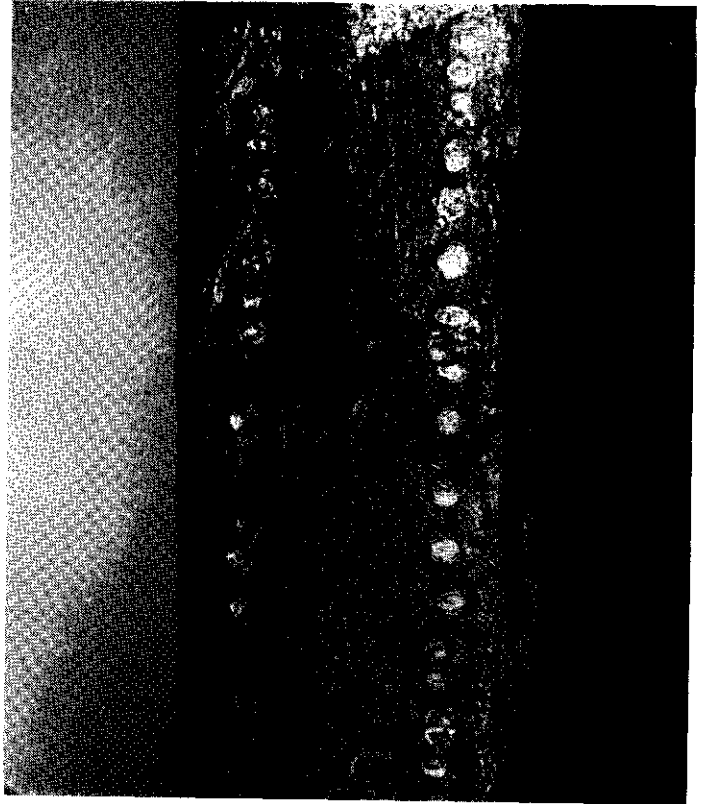


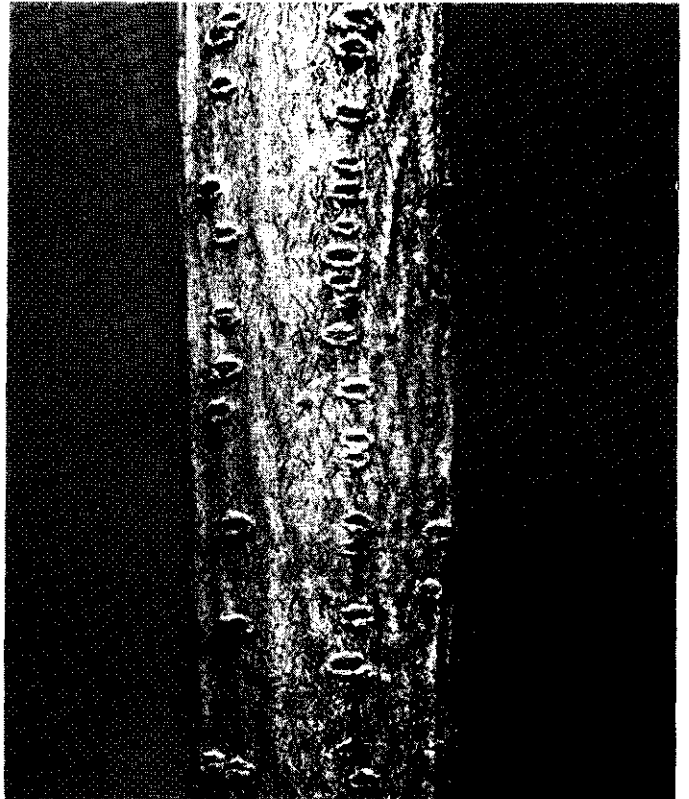
FIG. 2. *D. oblongum*: 1. orthotropic shoot a-b with prolongation c-d, $\frac{5}{6} \times$; 2. node c enlarged, $2\frac{1}{2} \times$; 3. indumentum on shoot c-d, $5 \times$; 4. apical portion of c-d, $5 \times$; 5. apical portion of a plagiotropic shoot, $5 \times$. (1-5. Breteler & De Wit 5488). See also p. 12.



PHOT. 8-9. *D. congoense*: typical lenticels, 4-5 mm long. (8. *Breteler 1257*; 9. *Breteler 5785*; phot. H. C. D. DE WIT). See text p. 18.



PHOT. 10. *D. pallidum*: orthotropic shoot with vertical rows of lenticels. (*P. Wit* 2313; diam. 2 cm; phot. H. C. D. DE WIT).



PHOT. 11. *D. zenkeri*: orthotropic shoot with vertical rows of lenticels. (*Bos* 3580; diam. 2 cm; phot. H. C. D. DE WIT).

and inconspicuous or large and striking, numerous or few. Very characteristic are the type of lenticels of *D. congoense* (see photographs), which have not been found in any other species. Moreover the lenticels may be scattered or arranged in 5 vertical rows, and then often located in shallow grooves. Later on additional rows or scattered lenticels may be formed between the rows. The number 5 corresponds with the phyllotaxis 2/5. These characters should be observed on orthotropic branches, as plagiotropic branches usually show a more obscure pattern.

The bark is often rather smooth, even in old lianas, at least rarely deeply fissured. A bark peeling off in thin flakes is found in some species, like in *D. angolense* and in *D. congoense*. In *D. corrugatum* the lenticels extend horizontally to form sharply marked transverse fissures in the bark (photograph). This character could not be observed in the very closely related *D. unguiculatum* (photograph), which supports the maintenance of *D. corrugatum* as a distinct taxon.

The branches are always hollow in some species (e.g. *D. angolense*, *D. chatotii*, *D. gabonense*), in other species always solid. A few species are very variable in this character (e.g. *D. madagascariense*). Then, very often, the orthotropic branches are hollow and the plagiotropic ones solid. In specimens formerly named *D. flaviflorum* (= *D. madagascariense*) usually all the branches are hollow.

In a few species wounded phloem exudes a sour, sticky, pale or reddish slime, like in some lianescent species of *Papilionaceae* or in the genus *Pterocarpus* of the same family. In young branches little exudate is produced, and often difficult to observe, especially when it is pale-coloured. In drying it becomes darker and may even turn dark-brown or black. So far this phenomenon has only been observed in three species: *D. brazzae*, *D. crassifolium*, and *D. librevillense* (see phot. 14).

Stipules

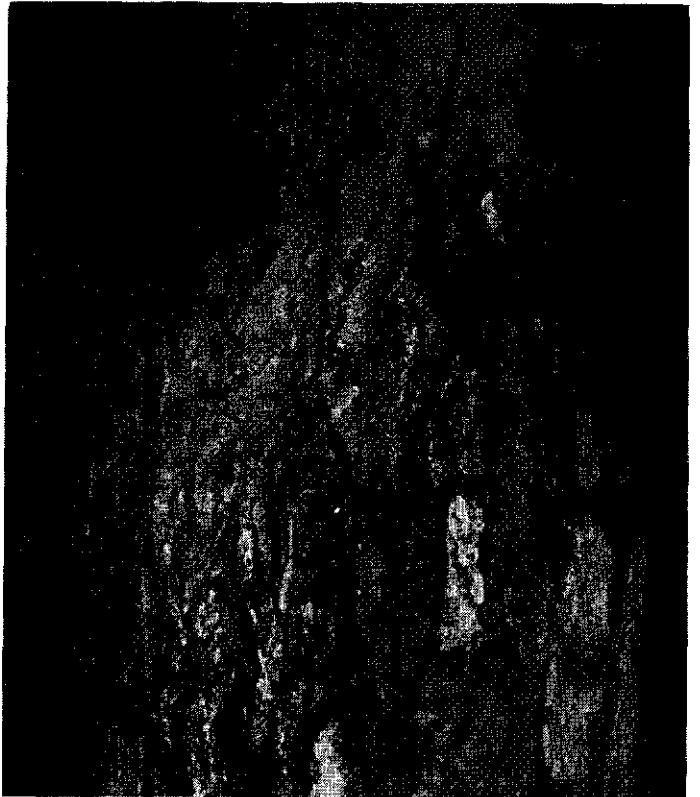
The stipules are usually early caducous, sometimes very early so (e.g. *D. acuminatum*), rarely rather long persistent (e.g. *D. insigne*). They are always inserted on the branch, never on the petiole nor entirely or partly intra-axillary. Usually they are triangular, often narrowly so, or subulate, sometimes deltoid. Some species have them pinnatisect (e.g. *D. angolense*, fig. 12), some others entirely palmately divided into filiform segments, which leave separate scars.

At the same node, stipules are equal in orthotropic branches, but unequal in plagiotropic ones (see also under Habit and growth, and fig. 2,5). Stipules of the upper and those of the lower side of a plagiotropic branch are always different, the difference usually being restricted to size, i.e. the smaller stipules are always situated on the lower side. The latter are usually inserted slightly more towards the apex of the shoot than are the upper; this is very evident in some species (e.g. *D. bodyi*). In species with divided stipules there may be a difference in shape as well. In *D. bangii* the upper stipules usually consist of 2 filiform segments,

PHOT. 12. *D. corrugatum*: bark of lianescent stem. (Breteler 6434; diam. 4,5 cm; phot. J. W. MUGGE). See text p. 18.



PHOT. 13. *D. unguiculatum*: bark of lianescent stem. (Breteler 6758; diam. 4 cm; phot. J. W. MUGGE). See text p. 18.





PHOT. 14. *D. librevillense*: cross section of lianescent stem showing exudate. (Breteler 6840; diam. 3 cm; phot. F. J. BRETELER). See text p. 18.

whereas the lower ones are simple or nearly so (fig. 15, 2-3). In *D. lujaei* stipules are divided in a similar manner, the upper having 3-5 filiform parts, the lower but 2-3.

The variation in stipules within one species as regards size and shape is rather wide. Nevertheless, in some species they offer good characters in specific delimitation.

Leaves

As was already mentioned above, phyllotaxis in *Dichapetalum* is 2/5. The leafshape is usually obovate-elliptic, often narrowly so. They are always entire and penninerved and usually acuminate. The variation is mostly restricted to size and may be considerable (e.g. *D. barbatum*, fig. 16), although the variation in shape may be quite impressive in some species (e.g. *D. madagascariense*). Normally the midrib is impressed above, but some species have a distinctly raised midrib. The petiole may be rather short, but it is always present, and in species with an impressed midrib it is often canaliculate above. When adnate to the peduncle of the inflorescence, the petiole may be longer than in leaves which do not subtend an inflorescence. This may be noteworthy as in *D. affine* (see description).

The leaves of *Dichapetalum* are usually glandular. The glands are only found on the leafblade and mostly on the lower surface; if present on both sides then they are usually more numerous beneath. They are often concentrated near the base or on the acumen and frequently along the midrib as well. The glandular pattern within one species is not very constant and glands may even be present or absent in the leaves of a single specimen. As an additional character the gland pattern may sometimes be used in delimitation of a species, but usually its inconstancy renders it useless as a distinguishing character.

In young leaves the glands may be nectariferous, as has been observed in several species, in older leaves they apparently cease to function. In species with a dense, rather long persistent indumentum on the leaves beneath (e.g. *D. pallidum*) glands are present, but they do not seem to function at all.

The position of the glands on the lower surface of young leaves is often marked on the upper side by a more intensively green spot.

Indumentum

Dichapetalum species are usually rather hairy and there are no species which are entirely glabrous in their vegetative or generative parts. The hairs are always one-celled, but they are very variable. They may be long and arachnoid or short, stiff, bristle-like and often barbed, or flexible. The indumentum formed by different types of hairs may sometimes be characteristic for a species or a species group (e.g. the arachnoid indumentum), but usually the indumentum shows such a wide variation within one species, that its value for taxonomic delimitation is almost void or even negative, as it may deviate one's attention from the true characters.

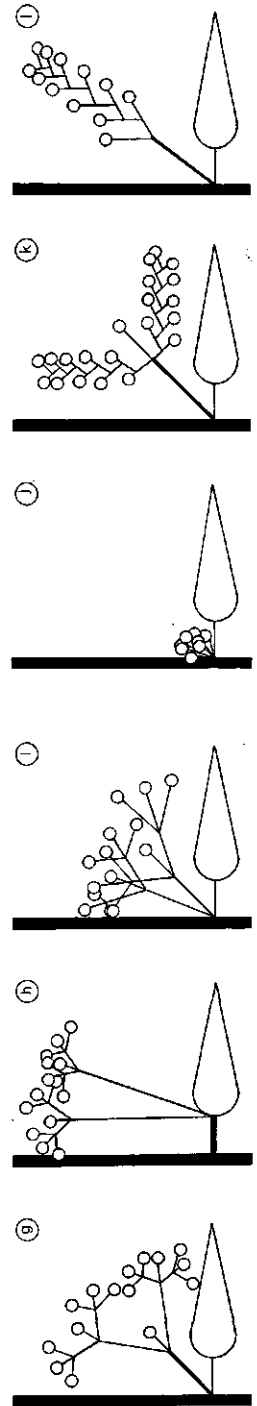
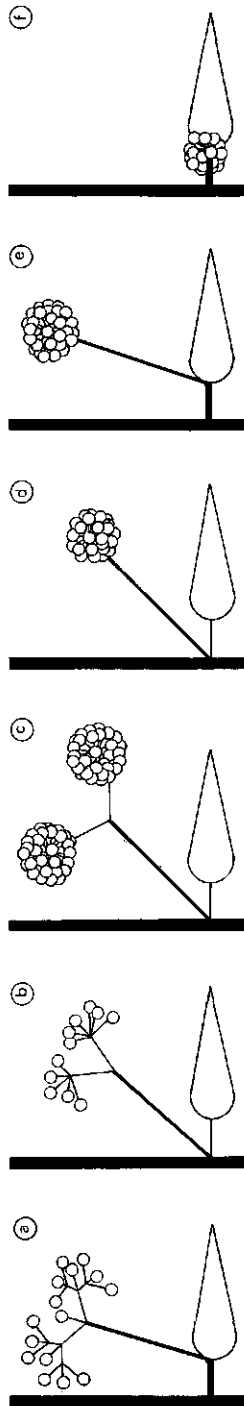
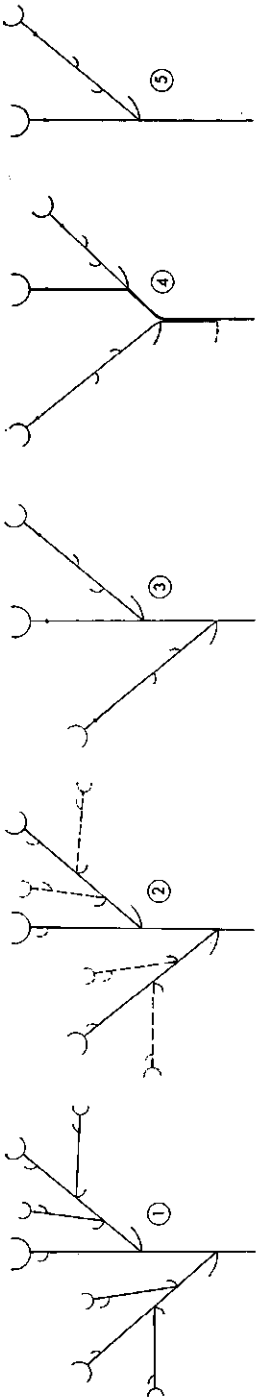
Some species often show an indumentum consisting of a mixture of 2 or 3 different types of hairs, but in the same species different specimens may show different combinations of hair-types or may have an indumentum with one single type only.

Indumentum characters become even more unreliable, as presence or absence of a certain hairtype is usually not constant. An indumentum may be long persistent in one specimen, but it may disappear very early or it may even be hardly at all present in another specimen of the same species. These differences within one species are most probably due to a certain genotypic variation which is influenced by microclimatic conditions.

The variation in indumentum as described above is not only restricted to the vegetative parts, but extends also, although usually in lesser extent, to the inflorescence and the calyx.

Inflorescences

The inflorescences in *Dichapetalum* are rather variable in appearance, but they all show similar, more or less dichotomous branching, usually with a median flower, and therefore they have been described as cymose. The two unequal branches are rarely completely opposite; usually the lower develops earlier and often it bears more flowers than the upper.



Hypothetically the inflorescence was derived from a short thyrses with 2 principal branches in which all the axis have essentially but three nodes and are terminated by a flower (fig. 3,1). The articulation on the pedicel, as observed in all *Dichapetalum* species, is obtained after reduction (fig. 3,2-3) and represents the reduced upper node. The lower two nodes of the axis are provided with a bract or bracteole. Reduction in length of the internode between the two principal branches and/or fusion of the lower branch with the main axis, may cause a subopposite position of the two branches (fig. 3,4). Further support that these branches are in reality not opposite, is found in the usual position of the median (top) flower, as it is apparently inserted on the upper branch, the central axis bearing this median (top) flower being deviated by the vigour of the upper branch.

A simple dichasium as presented in fig. 3,4, can be observed amongst others in *D. cinereo-viride*, *D. minutiflorum*, *D. ndongense*, the more reduced form (fig. 3,5) has so far only been observed in *D. cinereo-viride*. Usually the dichasium is compound, bearing many flowers on repeatedly subdichotomously branched 3-noded flowering axis.

The bracts are very often partly adnate to the branch they sustain, and in compound dichasia they even may be adnate up to the next fork, appearing then as a transverse bract to this fork (e.g. *D. angolense*, fig. 12). The median flower is often wanting in the lower forks of a multiple-branched dichasium, but it is rarely absent in the upper ones.

From this basic type of inflorescence, characterized by 3-noded axis, of which the top node is a mere articulation while the lower nodes are provided with a bract or bracteole, all types of inflorescences in *Dichapetalum*, whether being simple or compound, seem to have been evolved. The main types are illustrated in fig. 3, a-1.

In several species the inflorescence always belongs to only one of these types, but in others it may show the widest possible variation. This may be illustrated in fact by a single specimen of *D. parvifolium* (*Le Testu 8794*) in which type d and j have been observed. In *D. madagascariense* the inflorescence is extremely variable and may show the types b, d, e, g, i, j, k.

The fusion of the peduncle with the petiole of the sustaining leaf, is a phenomenon which occurs very often in *Dichapetalum*, while it is quite usual in *Tapura*. This character is often not constant within one species, sometimes not even within one specimen (e.g. *D. angolense*, *D. bojeri*), but in some cases it may be sufficiently constant to serve in specific delimitation (e.g. *D. affine*, *D. mombutense*).

A most confusing circumstance impeding proper understanding of the nature of the inflorescences in *Dichapetalum* occurs where several inflorescences are

FIG. 3. Inflorescences, schematic: 1-5. the hypothetical derivation of the dichasium in *Dichapetalaceae*; a-1. different types of inflorescences in *Dichapetalum* (bracts, bracteoles, and the articulation in the pedicel are not shown). For explanation see text.

grouped together on leafless axillary or terminal shoots, giving the impression of true inflorescences. Such shoots, however, are always terminated by a vegetative bud, and never by a flower. Moreover, the wanting subtending leaf of each inflorescence on the shoot is represented either by a small bract with stipules or by stipules alone. When such 'compound' inflorescences occur in species that have the peduncle adnate to the petiole, this latter character may seem lacking due to the strong reduction of the lamina of the sustaining leaf. However, in such cases the adnate parts of peduncle and petiole are usually recognized by a marked difference in indumentum, i.e. the peduncle being usually more densely hairy than the petiole (e.g. fig. 9, 3).

These leafless flowering shoots are most variable in appearance and may easily not be recognized as such. When present in *D. pallidum* and in *D. albidum* for instance, such a shoot will be extremely short and the (usual) 2 inflorescences inserted on them look like paired in the axil of a normal leaf. Exceptionally the vegetative bud at the top of such an extremely short flowering shoot may develop into a normal leafy branch, as has been observed in a specimen of *D. albidum* (Jansen 871).

In other species (e.g. *D. integripetalum*) the shoot may be knoblike. In case the internodes are more or less normally developed, the whole shoot with inflorescences has a paniculate appearance as LEENHOUTS (1956: 76) pointed out.

Such an arrangement of dichasial inflorescences on a leafless shoot with a vegetative terminal bud may be observed in several African species of *Trichilia* (*Meliaceae*) as well, but here the subtending leaf of each single inflorescence is even further reduced or may be completely absent.

Flowers

The flowers are as a rule 5-merous, but occasionally a 4- or 6-merous flower may occur. Contrary to studies in American (PRANCE, 1972) and Asiatic (LEENHOUTS, 1956) species, the flowers in African species are always bisexual, in so far that no significant reduction of one of both sexes could be observed (see also under Flower biology).

For a better understanding of their significance, as regards the relationships with other families, the different elements of a *Dichapetalum* flower are briefly reviewed and discussed below.

Pedical. For convenience, i.e. in descriptions and keys, the parts above and below the articulation in the flower stalk together have been called pedicel. In true sense, however, the pedicel is the part between the articulation and the calyx. It forms part of the flower as it develops together with it and eventually falls off with it. When the articulation is situated just below the calyx, the flower is, strictly morphological, sessile, although the lower part of the stalk may be very distinct. In its upper part the true pedicel may be somewhat hypanthium-like in species with a concave receptacle and BAILLON (1873: 104) has in these cases interpreted the perianth as perigynic or even epigynic. This opinion is not shared by the present author who could not confirm BAILLON's findings and

considers the perianth as hypogynic. The receptacle in most species is rather flat or only slightly concave.

The true pedicel may increase substantially in length after the flower has opened.

The sepals are always imbricate, flat or more often concave, free or slightly united at base, seldom forming a distinct tube like in *D. longitubulosum*. They may be erect, spreading, or reflexed, which may be characteristic in some species but most variable in other. Usually they are unequal in size and/or shape, and in some species (e.g. *D. rudatisii*, *D. toxicarium*) this may be quite strongly so, the outer sepals being usually shorter and wider than the inner, and often much thicker than the latter as well. As could be observed in specimens of *D. toxicarium* (e.g. *Bos* 2245, *Leeuwenberg* 3811) at least the outer sepals may increase in length after opening of the flowerbud, and their shape may change from sub-orbicular to ovate-oblong.

The petals are usually bilobed at the apex. In several Madagascar species and in a few continental species the petals are entire or at most emarginate at the apex.

The lobes are usually slightly cucullate, facing each other in bud by the convex sides. Thus the concave sides of two adjacent petals face each other, and cover the anther of the stamen in between (see fig. 14, 6).

As a rule the petals are adnate to the filaments at their base, the filaments being more or less arranged in the same whorl and filling the gaps between the petals, the latter being at base as wide as the filaments. Usually this adnate part is less than 0,5 mm long, but in some species (e.g. *D. crassifolium*, *D. longitubulosum*) this fusion is usually very distinct, only the upper part of the petals and filaments remaining free. These examples may be considered as transitions between the more common situation in the flowers of *Dichapetalum* and in those of *Stephanopodium*, where the fusion of petals and stamens is complete and where the anthers are sessile. Usually the short fused part is also adnate to the calyx.

The development of the petals needs some more discussion, as in some local revisions (F.W.T.A., 2nd ed.; Flore du Congo) the relative length of the lobed part has been used in keys. The petals, like the stamens, are always erect in bud. After expansion of the calyx, the petals and stamens may grow considerable in length. Closer scrutiny learns, however, that only the entire lower part of the petal becomes elongated (fig. 4, a, b, c), and in consecutive stages of petal development the relative length of the lobed part differs, while its absolute length remains nearly constant. As the different stages of development may not always be found on a single specimen (often only one stage is present) the absolute length of the lobed part should be a better character than the relative length, although the former also shows considerable variation within one species.

This manner of growth of the petals strengthens the idea, that the petals are of staminodial nature, the lobes being homologous with an anther, the lower entire part with a filament. Also their shape, with the two cucullate lobes, gives

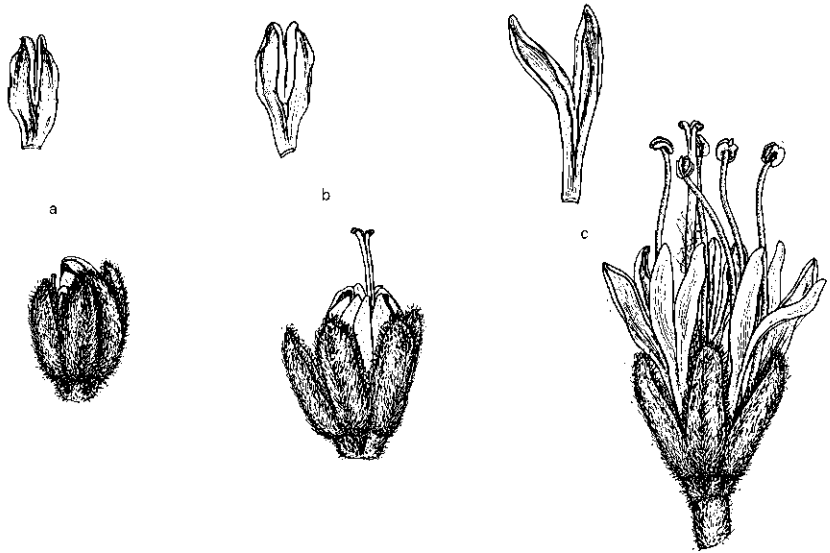


FIG. 4. *D. madagascariense*: a-c. 3 stages in flower development, showing growth of the petals, 6 × (a-c. Thomson 79). For explanation see text.

this impression. The examples of teratologic petals given by LEENHOUTS (1956: 77), describing petals with a normal lobe on one side and a fertile theca on the other side, have also been observed in several African species. In a specimen of *D. pallidum* (Le Testu 8338) a varying number of petals has been replaced by perfect stamens, in such way that the total of petals and stamens together remained 10. In the same specimen transitions between petals and perfect stamens can be observed as well.

The assumption that the petals may be of staminodial nature may be further strengthened by the indumentum, which is often similar on the filaments and on the entire part of the petals. In some species (e.g. *D. affine*, fig. 9,6), the few, usually curly or bristle-like hairs on the outside of the petals just below the lobes, are also present on the connective of the stamens.

Although it is demonstrated that the petals are in reality staminodes, for convenience they are referred to in this treatment as petals, as has been customary in the past.

The stamens are equal to or longer than the petals; very rarely they are distinctly shorter. The anthers are introrse, opening by longitudinal slits and have usually a conspicuous, dorsally thickened connective. The thecae are parallel, but after dehiscence they may fold back, the anther taking thus a rather horseshoe-like shape.

Staminodes. This name has been adopted for the structures commonly described as hypogynous glands (BENTHAM & HOOKER, 1862; HUTCHINSON,

1959; PRANCE, 1972), disk glands (HUTCHINSON, 1964), nectar glands (GUNDERSEN, 1950), or nectariferous glands (CRONQUIST, 1968; PRANCE, 1972), while the more 'neutral' term: 'disk-lobes' has been employed for them by LEENHOUTS (1956). But for their shape, these structures do not seem to have anything in common with glands. Hence describing them as nectar- or nectariferous glands does not seem to be correct, at least not for the African species. PRANCE's statement (1972: 6) that these structures are nectariferous, notably in *Dichapetalum*, seems to be doubtful, as it is not further elaborated upon in his work, while the present author has never observed such nectariferous glands, neither in the African species, nor in the American ones as far as investigated.

The staminodes are epipetalous and rather uniform, usually subquadrate or slightly oblong, often slightly tapering to the base and usually with an emarginate or obscurely bilobed top. Thus, they resemble young undeveloped anthers, as was pointed out by LEENHOUTS (1956). In fact in some specimens of *D. barbosa* (Barbosa & Carvalho 4272, Torre & Correia 13359) shallow thecae can be observed on them, and LEENHOUTS's (l.c.) example of a specimen with an inner circle of 5 stamens instead of 5 small lobes supports a staminodial nature of these structures even further. For these reasons the term staminode was considered to be more appropriate than the terms disk-glands or disk-lobes.

In *D. bellum* (fig. 20) the staminodes resemble small petals. Usually they are separate, but they also may constitute a lobulate or subentire ring or cupula (e.g. *D. cymosum*, *D. oblongum*), in which it is difficult to distinguish single staminodes. Such a ring or cupula is usually adnate to the short tube formed by petals and filaments.

Sepals, petals, stamens, and staminodes are usually persistent in fruit.

The pistil consists of 2–3(4) united carpels with usually (in African species) coherent styles. The coherent part of the styles is often very variable in length, even within one species, but rarely (e.g. *D. choristilum*) the styles may be entirely free as in several American species. Each carpel bears two paired, axial, pendulous ovules, which are anatropous with a ventral raphe. The micropyle is often covered by an obturator (caruncle), but as the latter is usually very small, its presence or absence can not always easily be established.

The pistil is usually hairy, and the indumentum can be classified in two main types, woolly and velutinous, which character proved to be of great value in specific delimitation.

Usually the species have a 2-locular or a 3(4)-locular ovary, the latter being far more common than the former, but a few species proved to be variable in this character (e.g. *D. filicaule*, *D. deweyrei*).

Fruits and seeds

The fruit is a 1–3(4)-seeded, usually fleshy drupe with the pyrenes free from each other. More often the fruit has one pyrene only. The pyrenes are always one-seeded, at least as far as the African species are concerned, as apparently only one of the two ovules in each locule develops.

The shape is subglobose, ellipsoid, or obovoid, often apiculate or beaked, but usually rather variable within one species, as globose as well as long-beaked fruits may occur in one species (e.g. *D. mundense*). Whether one or more seeds have developed may not be apparent from the outside of the fruit as in *D. cymulosum*, but usually the mericarps are quite distinct, and 2- or 3-seeded fruits may be lobed or deeply partite, the mericarps being connate by a narrow central margin (*D. arachnoideum*, fig. 13). In some species aborted cells remain distinct as a small lobe or narrow ridge, but in others they are not detectable.

The fruiting pedicel may be strongly accrescent in some species (e.g. *D. chorisilum*, *D. pallidum*), in other species not or hardly so.

The colour is yellow to orange, and red fruits, as reported by some collectors, have never been observed by this author and may probably not occur at all.

The exocarp is usually rather hairy, only a minority of species having glabrous fruits. The type of indumentum is rather variable and not always constant within one species. Some species (e.g. *D. acuminatum*, *D. albidum*, *D. altescandens*) have acicular readily caducous hairs which lodge in the skin when touched and are most irritating, like *Mucuna*-hairs. The woolly indumentum of the ovary of many species disappears rapidly after fertilisation.

Usually the fruits are rather smooth, but they may be lenticellate, prominently veined, warty, or even tuberculate in some species. Once more, the variability is rather large, as the same species may produce smooth and tuberculate fruits (e.g. *D. pallidum*, *D. stuhlmannii*).

In some species the exocarp of the fruit, which is usually not sharply demarcated from the mesocarp, is often dehiscent or may show distinct sutures (e.g. *D. acuminatum*, fig. 8; *D. albidum*, fig. 10). In instances of such dehiscence the pyrenes, usually covered by some mesocarp, are exposed. The remainder of the mesocarp remains attached to the exocarp.

The mesocarp may be very juicy and then usually somewhat fibrous (e.g. *D. longitubulosum*) or rather mealy (e.g. *D. affine*, *D. rudatisii*), and it is known to be edible at least in some species (e.g. *D. filicaule*). Usually it has more or less the same colour as the exocarp or it is slightly paler, but it may be darker coloured also, as in *D. albidum*, where it is scarlet.

The endocarp is sharply demarcated from the mesocarp and it is always indehiscent, but shows a more or less distinct suture from the top downwards on the ventral side (e.g. *D. albidum*, fig. 10; *D. angolense*, fig. 12). The endocarp may be leathery to bony, as in fact a bony endocarp has a bony outer layer which is wanting in the leathery endocarp. Such a bony outer layer is usually rugose on the outside, sometimes even tuberculate (e.g. *D. pallidum*). The leathery endocarp, which is usually rather smooth outside, as well as the inner lining of the bony endocarp, consists of cross-grained fibrous layers and are usually minutely striate inside. The fibers of the inner layer may become partly loose, remaining attached at one end, and the endocarp is then called hairy inside, as is the case in several species. When the fibers become entirely free, as in *D. albidum* (fig. 10), the seed is embedded in these, often acicular, minutely barbed, irritating hairs. The ultimate stages of the inner surface of the endocarp,

being rather smooth and minutely striate on the one hand and with completely loose hairs on the other hand have been observed to occur in a single species: *D. pallidum*. In the same species all conceivable intermediates could be observed as well. Glabrous combined with hairy surfaces are more often observed within one species.

The inner lining of the endocarp often leaves an impression on the seedcoat, which is usually rather thin, but often strongly reticulately veined, rather smooth and glossy, and as a rule glabrous. Only in two specimens of *D. bojeri* (*Cons. Rés. Nat. 11415, Viguier & Humbert 14*) a hairy seedcoat has been found.

In two species an aril has been observed so far (*D. angolense*, fig. 12,8; *D. toxicarium*), but usually the seeds are exarillate.

The cotyledons are firm, plano-convex, the convex sides often showing the impression of the strongly veined seedcoat. Endosperm is lacking.

Seedlings

Germination is always hypogeal and the cotyledons remain enclosed in the endocarp. The taproot and the epicotyl are produced through a slit at the suture of the endocarp, which opens by the swelling of the cotyledons. It may take several months before seeds show the first signs of germination, especially so in seeds with a bony endocarp.

The first leaves do not markedly differ from those which follow, but in some species the first two leaves are opposite (fig. 5) whereas in other species these are at once alternate (fig. 6). So far of 15 species only the seedlings are known, as it is difficult to obtain viable seeds and even then germination is not always successful. However, it seems that this character, whether the first two leaves are opposite or alternate, is constant within one species and may be characteristic for groups of species.

In seedlings starting with alternate leaves, the epicotyl below these leaves bears some bracts of which the upper ones are 3-lobed or 3-partite or may be completely divided into 3 parts, not unlike the reduced leaves with stipules found on the orthotropic lianescent shoot. In seedlings with the first two leaves opposite, the epicotyl below these leaves does not have such bracts nor does it show any nodes. When the epicotyl in such seedlings dies, a new sprout may be sent up, likely from the axil of one of the cotyledons. Such a sprout, however, shows the same features as in seedlings of the first type, i.e. it has nodes and bracts below the first leaves.

As has been pointed out in the preceding paragraph 'Habit and growth', the prolongation of a shoot after a period of rest, is always effected by an axillary bud, never by the apical bud. Before germination a period of rest has elapsed as well, and a possible explanation of the differences as described above, may be found in assuming that in seedlings of the first type the apical bud does not develop and growth is sympodial from the very start, whereas in seedlings of the second type the apical bud does develop and growth starts monopodial, which, however, is not continued in further development.

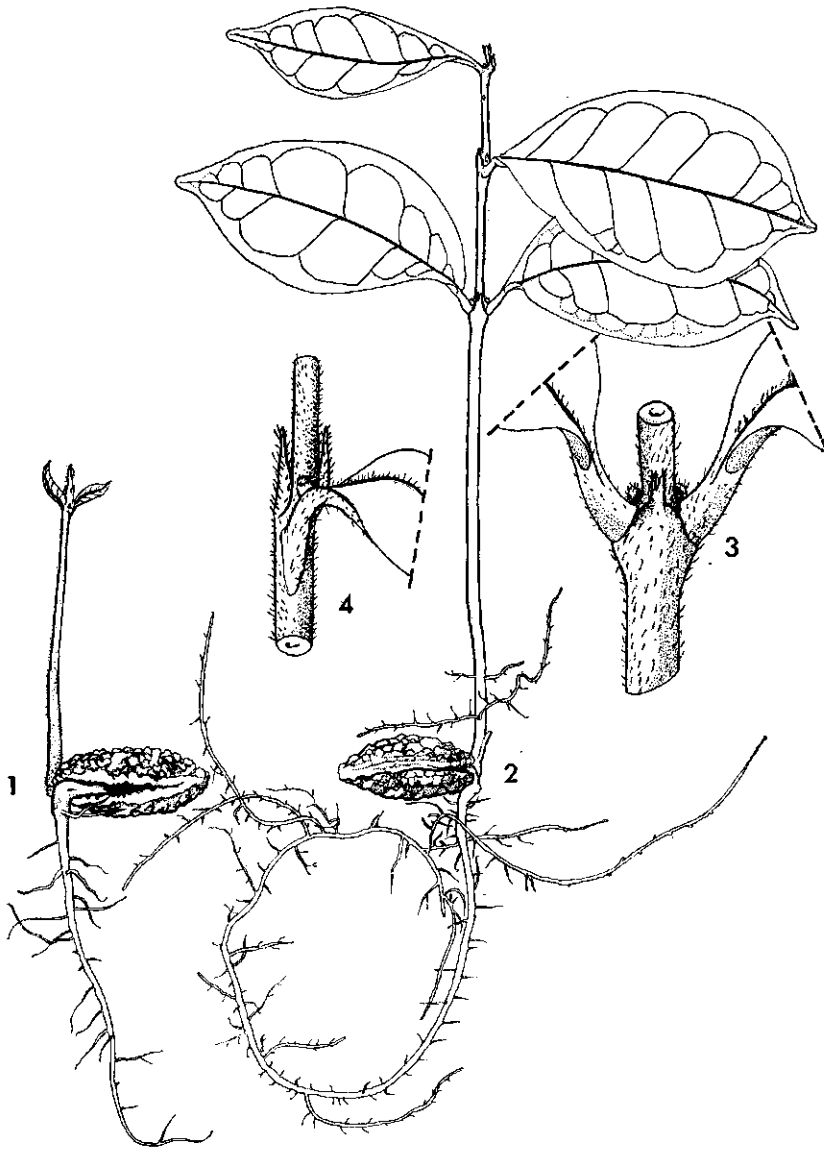


FIG. 5. *D. mombuttense*: 1-2. seedlings, $\frac{5}{6} \times$; 3. node with 2 opposite leaves, $3\frac{1}{3} \times$; 4. node with a single leaf, $3\frac{1}{3} \times$. (1-4. *Breteler 7012*). For explanation see text.

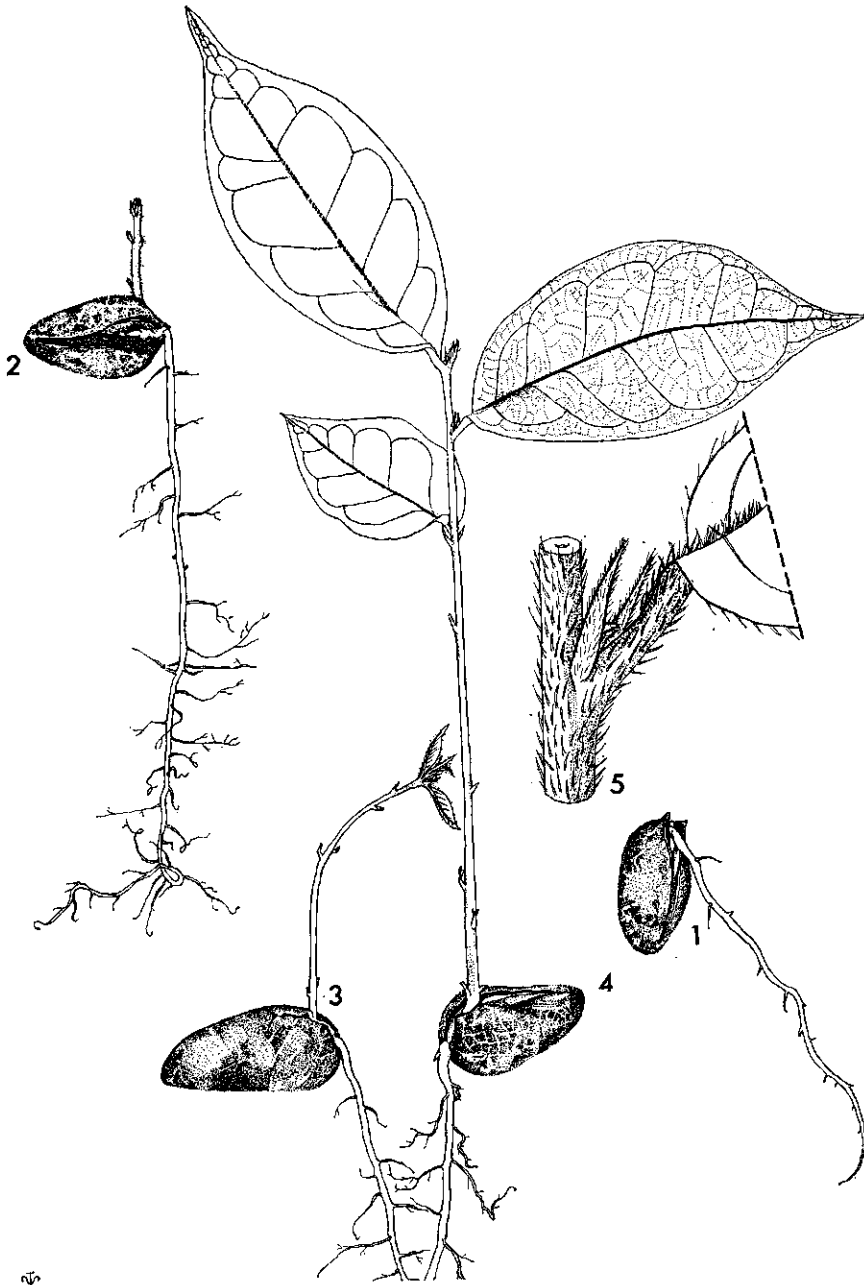


FIG. 6. *D. zenkeri*: 1-4. seedlings, $\frac{5}{6} \times$; 5. node with leafbase, $3\frac{1}{3} \times$. (1-5. Breteler 7013).
 For explanation see text.

POLLEN MORPHOLOGY

In the past the pollen of *Dichapetalaceae* has been studied only occasionally and briefly (ERDTMAN, 1952; HALLÉ & HEINE, 1967; LOBREAU, 1969; PRANCE, 1972), comprising one or a few species. Mainly in connection with the revisional work of the present author, but also in connection with LEENHOUTS and PRANCE and their revisional work on the Asiatic (1956, 1957, 1972) and American (1972) representatives respectively, Dr. W. PUNT of Utrecht undertook an extensive investigation of the pollen of this family. PUNT studied almost all species, basing his work on often more than one, sometimes several, specimens of each species. At present PUNT's work has been completed and will be published within a short time.

With the author's consent, some important conclusions from PUNT's work may be mentioned here. More detailed information as regards description of the pollen, the distinction of the different pollen types, etc. is referred to PUNT's forthcoming publication.

The pollen of *Dichapetalum* shows a great range of variation, wider than shown by the gross morphology of the species. This holds equally for the variation within several species. The pollen in *Dichapetalum* is certainly not conservative, but very advanced.

The main centre of diversification is Africa, where most species occur, and where the most primitive and the most advanced pollen types are found. Africa must therefore be considered as the centre of origin, not only for the genus *Dichapetalum*, but for the entire family as well, as the primitive pollen types of *Tapura* occur in Africa as well.

In *Dichapetalum* the most primitive pollen is seen in the *Bangii*-type, comprising among others the species *D. arachnoideum*, *D. bangii* and *D. rhodesicum*. Regarding this most primitive type it is interesting to note that its species are almost completely confined to Central Africa, only *D. rhodesicum* being exceptional.

Most advanced are the *Barteri*- and the *Madagascariense*-types. The former comprising next to *D. barteri*, *D. cymosum*, *D. integripetalum*, *D. stuhlmannii* and a few more species, the latter, among others, *D. gabonense* and *D. madagascariense*. These advanced pollen types show a much wider distribution. Species of the *Barteri*-type are found in West- (*D. barteri*), Central- (*D. integripetalum*), East- (*D. stuhlmannii*), and South Africa (*D. cymosum*), whereas *D. madagascariense* of the *Madagascariense*-type ranges from Guinea in the west to Madagascar in the east.

A second point of interest, regarding these advanced types, is that in species of these types the flowers are most probably functionally unisexual (see also under Flower biology).

CYTOLOGY

Up to the present, chromosome counts have been made for 16 African species of *Dichapetalum*, which are listed below. So far little variation in chromosome number has been found as all species investigated by GADELLA (1969, 1970, 1972) have the same basic number $2n = 24$. MANGENOT & MANGENOT (1963), however, reported the number $2n = 20$ for an African species, also investigated by GADELLA (1972). Until present no extra-African species of *Dichapetalum*, nor any species of the genera *Stephanopodium* and *Tapura*, have been investigated.

The herbarium material of the mother plants as well as that of the seedlings, is, as regards GADELLA's investigations, preserved at the Herbarium Vadense (WAG).

Species	2n	Author
<i>D. altescandens</i>	24	GADELLA (1970)
— <i>choristilum</i>	24	GADELLA (1970)
— —	24	GADELLA (1972)
— <i>congoense</i> (as <i>D. mekametane</i>)	24	GADELLA (1970)
— —	24	GADELLA (1972)
— <i>cymulosum</i>	24	GADELLA (1969)
— —	24	GADELLA (1970)
— <i>filicaule</i>	24	GADELLA (1972)
— <i>liberiae</i>	24	GADELLA (1972)
— —	20	MANGENOT & MANGENOT (1963)
— <i>longitubulosum</i>	24	GADELLA (1970)
— —	24	GADELLA (1972)
— <i>madagascariense</i> (as <i>D. brevitubulosum</i>)	24	GADELLA (1970)
— <i>mombuttense</i>	24	GADELLA (1969)
— —	24	GADELLA (1972)
— <i>ndongense</i> (as <i>D. martineau</i>)	24	GADELLA (1969)
— <i>oblongum</i>	24	GADELLA (1969)
— —	24	GADELLA (1970)
— <i>pallidum</i>	24	GADELLA (1972)
— <i>rudatisii</i>	24	GADELLA (1970)
— <i>thollonii</i>	24	GADELLA (1972)
— <i>toxicarium</i>	24	GADELLA (1969)
— —	24	GADELLA (1970)
— <i>zenkeri</i>	24	GADELLA (1972)

FLOWER BIOLOGY

Very little is known about the pollination of *Dichapetalum*. The flowers have never been reported as being very fragrant (in a few cases only some odour could be observed), nor do they produce any nectar, and insect visit has never been observed, at least not by day. It may be that the flowers are fragrant nocturnally and that insects visit them by night, or that the flowers are ant-pollinated. The latter possibility seems not so unlikely as the flowers are usually

produced on young shoots where the leafglands are still producing nectar. Usually *Dichapetalum* specimens bloom most profusely when in an exposed position, either as a shrub in an open vegetation or as a liana on the forest canopy, and under such circumstances pollination by wind seems likely as well. Lacking any data whether or not self-fertilisation occurs in *Dichapetalum*, the necessity of cross-fertilisation seems to be most probable.

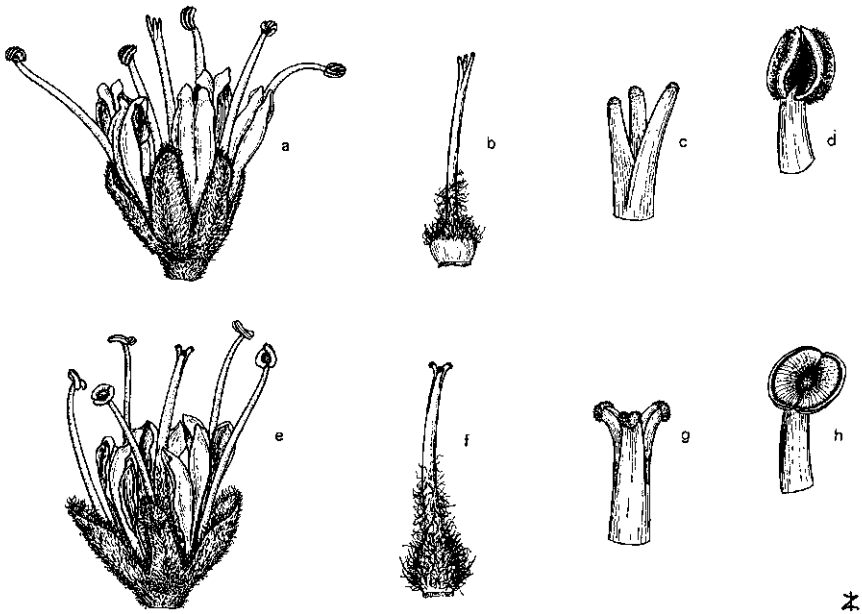
As a rule fruiting material is rather scarce. This may partly be due to the fact that plant collecting is usually done during the dry season when fruiting is generally less abundant. However, field observations by the present author and other fieldworkers have revealed that in the rainy season fruiting is not abundant either, at least not proportional to the often abundant flowering. In November 1971 H. C. D. DE WIT searched for fruits of *D. barteri* near Accra, Ghana. A large number of specimens grew along a path bordering a small protected forest-area. Although over a distance of nearly half a mile dozens of shrubs were inspected for fruits or flowers, all appeared to be sterile. However, at last one single shrub was found bearing hundreds of well-developed, although still immature fruits, while all surrounding shrubs, again, seemed to lack any flower (or fruit).

Scrutiny of many richly flowering herbarium specimens learns that even fruit initiation in such specimens is rare: flowering specimens showing any fructification are far out-numbered by specimens not showing any. This phenomenon was especially manifest in *D. madagascariense*, but according to field observations from South Africa it is also known to exist in *D. cymosum*. A possible explanation may be found in assuming, that the flowers, although morphologically bisexual, are in fact unisexual, at least functionally.

Studies in Asiatic and American *Dichapetalum* by LEENHOUTS (1956, 1957) and PRANCE (1972) respectively, show that on these continents species of *Dichapetalum* often produce unisexual flowers, which may even be dioecious. Morphologically unisexual flowers have never been observed in Africa: all flowers appear to have dehiscing pollen producing anthers and completely developed pistils with, apparently, normal ovules in their ovaries.

A possible tendency of reduction towards unisexual flowers has been discovered by comparing two specimens of *D. madagascariense*. In fig. 7 one flower of each of the specimens concerned is reproduced in detail. The upper one is from an abundantly flowering specimen lacking any signs of fructification. The stigmata in this flower are rather small in comparison to those of the lower flower, taken from a fructifying specimen. The anthers in the upper flower are clearly dehiscent, whereas those in the lower flower remain closed, but research by Dr. PUNT revealed that they contained normally developed pollen. No significant difference could be observed in the ovaries of both specimens.

In conclusion it may be observed, that in *Dichapetalum* specialisation as regards the separation of the sexes is much more advanced in areas which may be regarded as being remote from the main centre of distribution than in the centre itself.



✱

FIG. 7. *D. madagascariense*: a, e. flowers, 6 ×; b, f. pistils, 6 ×; c, g. style lobes, 18 ×; d, h. anthers, 18 ×. (a-d. *Bequaert 2174*; e-h. *Louis 1014*). For explanation see under Flower biology.

ANATOMY

Anatomically the *Dichapetalaceae* have never been investigated closely. BARTH (1896) made a comparative study of branches and leaves of *Dichapetalaceae* and *Trigoniaceae* and concluded that these two families are very closely related. SOLEREDER's (1899) treatment of the family is mainly based on BARTH's work. HEIMSCH (1942) studied the secondary xylem of several families including *Dichapetalaceae*. Of the latter six specimens were investigated. HEIMSCH concluded (l.c.: 192) that there is no evidence, 'whether or not the *Dichapetalaceae* belong with families of the *Gruinales*, the *Rosaceae* or the *Euphorbiaceae*'. The treatment of the family given by METCALFE & CHALK (1950) is mainly based on previous studies by other workers, especially those cited above.

PRANCE (1972) prepared some anatomical slides to verify the descriptions of the authors mentioned above, and based his anatomical treatment mainly on their work.

The wood of some species has been studied on the basis of a single or on very few specimens, but a general survey has never been undertaken, and would, in fact, not have been possible for want of woodsamples. The late J. H. WISSE of Wageningen, taking advantage of the rapidly expanding woodcollection at the Herbarium Vadense, prepared many slides and made a preliminary investiga-

tion of the woodstructures. His untimely death in 1969 brought an end to this very promising research. His collection of slides, together with a duplicate set of woodsamples, comprising some 45 species of *Dichapetalum*, has been sent to Dr. N. PARAWESWARAN at Hamburg, who is now undertaking a study of the bark and wood of this family.

PHYTOCHEMISTRY

Some species of *Dichapetalum* are very poisonous due to a remarkable toxic compound: fluoroacetic acid (FCH_2COOH). This organo-fluorine compound was first isolated (MARAIS, 1944) from leaves of Gifblaar, *D. cymosum*, and it was then unique in the plant kingdom. Later on it was also found to be present in species of other families (see ELOFF, 1968). In seeds of the Ratbane, *D. toxicarium*, fluoro fatty acids are present (WARD et al., 1964). Leaves of this species contain monofluoroacetate and fluoride ions, especially in those leaves sustaining an inflorescence, but the presence of free monofluoroacetic acid could not be demonstrated (VICKERY & VICKERY, 1972).

Besides the species mentioned above, some others are known to be poisonous to livestock, e.g. *D. braunii*, *D. ruhlandii*, *D. stuhlmannii* (see also VERDCOURT & TRUMP, 1970).

The poisonous principle of fluoroacetic acid is that it is transformed by the reactions of the tricarboxylic acid cycle to form a fluorotricarboxylic acid, which then jams oxidation of citrate.

VICKERY and collaborators at Njala University College, Freetown, Sierra Leone, are carrying out further investigation on other species to see whether fluoroacetic acid or monofluoroacetate are present. This work is done in cooperation with the present author who supplies samples. So far the results have not been positive for the species already investigated, of which *D. affine*, *D. mombuttense* and *D. rudatisii* are closely related to *D. toxicarium*. As Dr. VICKERY suggests in a personal communication, it might be, that in air dried or in conventionally dried herbarium specimens, a plant enzyme may have caused defluorinisation of the monofluoroacetate, or that the latter may have been converted into some other organo-fluorine compound not detectable with the analytical method employed.

ELOFF and GROBBELAAR (1967, 1969) investigated amino acids of *D. cymosum*. The former, also in collaboration with the present author, continues research on the presence of important amino acids in other species of this genus.

TAXONOMIC PART

DESCRIPTION OF THE GENUS DICHAPETALUM THOU.

Dichapetalum Du Petit Thouars, 1806: 23; Poiret, 1812: 470; 1819: 178; Roemer & Schultes, 1819: 324; Engler, 1896-a: 348; 1912-a: 562; Pellegrin, 1913: 579; De Wildeman, 1919: B1; Moss, 1928: 115; Hutchinson & Dalziel, 1928-a: 321; Engler & Krause, 1931: 5; Exell & Mendonça, 1951-b: 320; Hauman, 1958-a: 288; Keay, 1958: 433; Descoings, 1960: 63; 1961: 3; Torre, 1963: 319; Hutchinson, 1964: 218.

Type species: *D. madagascariense* Poir.

Leucosia Du Petit Thouars, 1806: 23; Roemer & Schultes, 1819: 324; De Candolle, 1825: 58. Type species: *L. thouarsiana* R. & S. (= *D. leucosia* (Spreng.) Engl.).

Chailletia De Candolle, 1811: 153; 1825: 57; Sprengel, 1825: 931; Endlicher, 1840: 1105; Tulasne, 1857: 83; Bentham & Hooker, 1862: 341; Oliver, 1868: 339. Type species: *Ch. pedunculata* DC. (= *D. pedunculatum* (DC.) Baill.).

Stephanella Van Tieghem, 1903: 230. Type species (lecto): *Dichapetalum kamerunense* Engl. (= *D. oblongum* (Hook. f. ex Bth.) Engl.).

Isacinosia Roberly, 1953: 1420, f. 6; 1954: 89. Type species: *I. annonoides* Roberly (= *D. barteri* Engl.).

Lianas, lianescent shrubs, shrubs, or small trees with sympodial, rhythmic growth. *Stems* often with intruding phloem. *Branches* solid or hollow, often distinctly lenticellate, the lenticels in vertical rows or scattered. *Stipules* caducous or persistent, simple, entire, or variously lobed or divided. *Leaves* spirally arranged on the orthotropic shoots, but pseudo-distichous on the plagiotropic shoots, strongly reduced to absent on orthotropic shoots in lianas; short-petioled, pinnatinerved, margins entire; orbicular, usually flat glands nearly always present on the leafblade, mostly beneath. *Inflorescences* axillary, sometimes arranged on leafless axillary or terminal shoots, cymose, distinctly branched or subglobose, sessile or pedunculate; the peduncle free or adnate to the petiole. Bracts and bracteoles usually small. *Pedicel* articulate, the upper part (the true pedicel) variable in length, absent to very distinct. *Flowers* small, actinomorphic, 5-merous, bisexual in African species, whitish to pale yellow. Receptacle flat or slightly concave. *Sepals* unequal to subequal, imbricate, free or shortly united, rarely forming a tube. *Petals* equal, alternating with the sepals, more or less spatulate in outline, at base usually as wide as the filaments and adnate to them, rarely the petals entirely free, bilobed to entire, the lobes flat or concave. *Stamens* 5, equal, episepalous; anthers introrse, opening by longitudinal slits, usually with a strongly thickened connective. *Staminodes* 5, epipetalous, variously shaped, sometimes united into a disk-like lobulate ring or cupula. *Pistil* 2–3(4)-merous; styles free or coherent; ovules two in each cell, anatropous,

pendulous, with a ventral raphe; obturator often present. *Fruit* a drupe, with 1-3(4), 1-seeded free pyrenes, subglobose or deeply lobed, usually yellow to orange at maturity; exocarp dehiscent or indehiscent; mesocarp fleshy; endocarp indehiscent, with a distinct apical, and usually partly ventral, suture, leathery or bony, often hairy inside. *Seeds* exalbuminous, usually with a rather thin testa; cotyledons planoconvex, often grooved on the convex sides.

Distribution: Circumtropical; about 120 species, of which ca. 90 in Africa.

Notes. DESCOINGS (1960, 1961), followed by TORRE (1963), adopted the name *D. thouarsianum* R. & S. for the type species, rejecting *D. madagascariense* Poir., which in fact was published slightly earlier when only POIRET's publication of 1819 is taken into account. PRANCE (1972), however, found that the latter combination was already published by POIRET in 1812.

Leucosia was described by DU PETIT THOUARS in the same publication as *Dichapetalum*. For a long period both names were treated as synonyms of *Chailletia*, thus falling out of usage. Contrary to LEENHOUT's conclusion (1956: 77), also ENDLICHER (1840) treated both names as synonyms of *Chailletia*. BAILLON (1874) was the first author who gave priority to the name *Dichapetalum*, reducing *Leucosia* and *Chailletia* into synonymy. He was followed by CHODAT (1895) and ENGLER (1895). The latter author (1896-a) combined the type species of *Leucosia* in *Dichapetalum*.

SECTIONAL ARRANGEMENT

ENGLER (1896-a, 1902, 1912-a) described four sections. The extra-African species as well as several African species are arranged by him in his section *Dichapetalum* (*Eudichapetalum*). His other three sections comprise African species only. ENGLER's arrangement is not very satisfactory (see also DE WILDEMAN, 1919) as it is based mainly on rather artificial characters.

The sectional arrangement will not be discussed here, but at the completion of the revision a new subdivision of the genus will be presented.

TYPIFICATION AND CITATION OF SPECIMENS

The lecto- or neotypes have been chosen by the present author, unless stated otherwise. Duplicates of the lectotypes are cited as isotypes.

All specimens cited have been seen by the author, unless marked: n.v. Within one country the cited specimens are arranged in an alphabetical order according to the collector's name. The countries are cited in a geographical order, from West to East and from North to South.

D. abrupti-acuminatum De Wild. = *D. madagascariense* Poir.

D. abrupti-acuminatum De Wildeman, 1919: B14; Hauman, 1958-a: 321 (in synonymy to *D. glandulosum* De Wild. var. *fulvialabastrum* (De Wild.) Haum.). Type: Zaïre, Likimi, *Malchair 185* (holotype: BR; no isotypes).

Note. The great variability in the type species *D. madagascariense* will be discussed in detail when this species is treated. This variability is mainly restricted to inflorescence, leafshape, and indumentum of the vegetative parts. The flowers and fruits, however, are rather constant in their characters. The type of *D. abrupti-acuminatum* fits well within this wide variation and its flowers do not show any dissenting character.

D. actidalum Engl. = *D. ndongense* Engl.

D. actidalum Engl. nomen in Herb. ZENKER (no. 355); De Wildeman, 1919: B16.

Note. The MS. name *D. actidalum* has only been found on *Zenker 355* from Bipindi, Cameroun. This collection number is identified as belonging to *D. ndongense*.

***D. acuminatum* De Wild.**

Fig. 8 Map 1

D. acuminatum De Wildeman, 1911-a: 221, t. 8; Engler, 1912-a: 569; De Wildeman, 1919: B16; Pellegrin, 1924: 55; Hauman, 1958-a: 309, partly (except *Gillet 2154*).

Type: Zaïre, Mombonge, *Thonner 150* (lectotype: BR; isotypes: BM, K, W, WAG).

D. acuminatum De Wildeman var. *laurentii* De Wildeman, 1911-a: 222; 1919: B16. Type: Zaïre, Mogandjo, *Laurent 1500* (holotype: BR; isotype: Z).

D. claessensii De Wildeman, 1911-b: 269; 1912: 419; 1919: B24; Hauman, 1958-a: 310. Type: Zaïre, Kasai, Bena Dibele, *Claessens 235* (holotype: BR).

D. tessmannii Engler, 1912-a: 569. Type: Equatorial Guinea, Campo area, Akonango, *Tessmann 894* (lectotype: K; isotype: BM, photograph WAG).

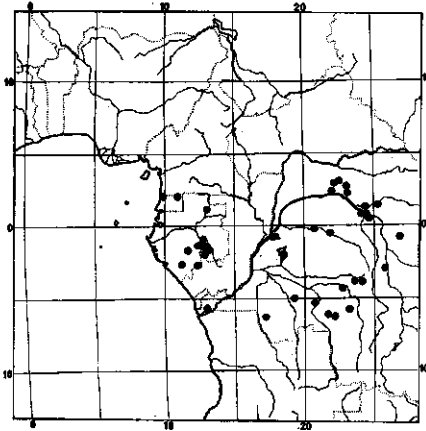
Diagnostic characters. Usually a liana, up to 6 cm in diam. Branches with scattered inconspicuous lenticels, glabrous or glabrescent. Stipules usually very early caducous. Leaves usually narrowly obovate-elliptic, (4)6–10(14) × (1)2–4(5) cm, glabrous or nearly so, midrib prominent above. Inflorescence a



FIG. 8. *D. acuminatum*: 1. flowering branch, $\frac{5}{6} \times$; 2. leaf, $\frac{5}{6} \times$; 3. leaf base, $2\frac{1}{2} \times$; 4. detail of midrib, $2\frac{1}{2} \times$; 5. axil with stipules, $5 \times$; 6. flower just opened, $10 \times$; 7-8. mature flowers, $10 \times$; 9. pistil with staminodes, $10 \times$; 10. fruit, $\frac{5}{6} \times$; 11. detail of fruit wall, $10 \times$. (1, 4-5. Bamps 608; 2. Le Testu 8785; 3. Tessmann 894; 6. Louis 6339; 7, 9. Thonner 150; 8. Le Testu 2030; 10-11. Louis 11190).

loose, stalked cyme. Sepals reflexed. Petals erect or spreading, up to 1.5 mm incised, usually glabrous. Ovary 3-locular, densely lanate. Fruits up to ca. 3 cm in diam., densely covered by acicular, caducous, irritating hairs.

Description. Shrub or lianescent shrub, but usually a liana reaching the top of the forest canopy, up to 6 cm in diam. *Branches* with narrow pith, mostly with scattered inconspicuous lenticels, glabrous or glabrescent. *Branchlets* at most obscurely lenticellate, glabrous, tomentose-puberulous and glabrescent, or with long hispid hairs that may be mixed with a rather tomentose indumentum. *Stipules* usually very early caducous, narrowly ovate-subulate, (1.5)2–4(5) mm long, glabrous or glabrescent. *Leaves*: petiole semiterete, usually canaliculate above, (1)2–5(7) mm long, often with white curly or rather hispid hairs above, occasionally entirely white hairy; blade narrowly elliptic to narrowly obovate, usually cuneate occasionally rounded at base, abruptly or more gradually caudate-acuminate at apex, (4)6–10(14) × (1)2–4(5) cm, (2)3–4(5) times as long as wide, the acumen erect or laterally curved, ca. 0.5–2.5 cm long with an emarginate to rounded or even acute tip; midrib prominent above with 4–7 lateral nerves on each side, more prominent beneath, usually glabrous or soon glabrescent, in specimens from the western part of the area often with white, hispid or short hairs (or with a mixture of these two) on midrib above, beneath with white hispid hairs on midrib and often also on the lateral nerves (sometimes a few between the nerves), usually eglandular above, beneath with small, inconspicuous, scattered glands. *Inflorescence* a loose, (3)15–50(60)-flowered cyme, up to 6 times branched, 1.5–5 cm long, puberulous-tomentose; peduncle ca. 0.5–2.5 cm long; bracts and bracteoles deltoid-ovate to ovate-oblong, 0.5–2 mm long. Pedicel puberulous-tomentose, lower part 2–8(10) mm long, upper part 0.5–1(1.5) mm long. *Sepals* reflexed, very shortly united at base, ovate-elliptic to obovate-elliptic, rounded to acute at top, 2–3(4) × 1–1.5 mm, outside appressedly tomentose-puberulous (the part covered in bud villous), inside similar but usually only in the upper part. *Petals* erect, spreading or geniculate below the lobes (occasionally reflexed), spatulate in outline, (2.5)3.5–4.5(5) mm long, (0.5)1–1.5 mm incised, glabrous (sometimes a few petals with a villous indumentum outside below the lobes), lobes concave, rounded to subacute at top. *Stamens* erect, (3.5)4.5–7 mm long, glabrous; anthers globular to reniform ca. 0.5 mm long. *Staminodes* rather flat, subquadrate, separate or sometimes adnate to each other, up to ca. 0.5 mm long and wide, top truncate-emarginate or lobulate, glabrous or with a few lanate hairs inside. *Pistil* (3)4–5(7) mm long; ovary subglobose, 3-locular, densely lanate; ovules with or without a small fimbriate obturator; style glabrous or the lower part lanate, 3-lobed at top, the lobes at most 1 mm long, but usually much shorter. *Fruits* ovoid-ellipsoid to broadly ellipsoid or even subglobose, 2–3 cm long, ca. 1.5–3 × 1–2 cm across, 1–3-seeded; exocarp and mesocarp collectively dehiscent from the top by 1–3 slits, 2–3 mm thick, outside covered by a dense, caducous, pale brown indumentum of up to 1 mm long, acicular, barbed, irritating hairs; endocarp with a bony outer layer which is rugose outside, and a fibrous, finely striate inner lining.



MAP 1. *D. acuminatum*

Seed subellipsoid, 14–17 mm long, 10–12 mm in diam.; testa brown, glabrous, strongly veined, fibrous.

Distribution. Equatorial Guinea, Gabon, Congo, Zaïre.
Ecology. Rain forest, gallery forest.

Specimens examined. Equatorial Guinea: Bebao, *Tessmann 848* (K, paratype of *D. tessmannii*); Campo area, Akonango, *Tessmann 894* (K, BM, type of *D. tessmannii*).

Gabon: km 48 Lastoursville–Moanda, *Breteler 6445* (WAG); km 8 Moanda–Bakoumba, *Breteler 6478* (WAG); km 33 Moanda–Bakoumba, *Breteler 6752* (WAG); 70 km S.S.W. of Moanda, *Breteler 6884* (WAG); km 6 Moanda–Bakoumba, *Breteler 6990* (FHI, WAG); Bélinga, N. *Hallé 3588* (P); *3963* (P, WAG); *Hallé & Le Thomas 724* (WAG); Nyanga region, *Le Testu 2030* (BM, P, WAG); Imeno, *Le Testu 6450* (BM, P, WAG); Liyembo, *Le Testu 8785* (BM, P, WAG).

Congo: 45 km W. of Mossendjo, *Braakenburg van Backum 1* (WAG).

Zaïre: Yangambi, *Bamps 608* (BR, K, PRE, SRGH); 30 km E.-S.E. of Lubutu, *Bokdam 3484* (WAG); Kakuluba, *Callens 4257* (Z); Bena Dibebe, *Claessens 235* (BR, type of *D. claessensii*); Kinshasa–Kinkoko, *Compère 1935* (WAG); Yambata, *De Giorgi 1722* (P, Z); Tshuapa, *Dubois 591* (BR); Bobanda, *Evrard 3845* (P); Banalia, *Gérard 1095* (BR, M, W); Yangambi, *Germain 4896* (BR); Yambula, *Germain 8441* (BR, LISU); Yangambi, *Germain 8493* (BR); *8579* (BR); *8586* (BR); Banalia, Bengamisa Rd., *Gilbert 2154* (BR, WAG); s.l., *Goossens 2474* (BR); Bolima, *Hulstaert 487* (BR); Boende, *Hulstaert 1056* (BR); Bokela, *Hulstaert 1315* (BR); Limbutu, *Laurent 985* (BR); Mogandjo, *Laurent 995* (BR, P, Z, paratype of *D. acuminatum*); *1499* (BR, Z, paratype of *D. acuminatum*); *1500* (BR, Z, type of *D. acuminatum* {var. *laurentii*}); Kole, *Lebrun 6308* (BM, BR); *6358* (BR, LISU); *6438* (BR); Mobwasa, *Lemaire 154* (BR); Mandungu, *Lemaire 463* (BR); Yangambi, *A. Léonard 188* (P, WAG); Moyengo, *A. Léonard 5906* (BR, WAG); Badibanga, *Liben 1762* (K); Kasai, near Miao R., *Liben 3496* (K); Yangambi, *Louis 324* (BR, EA, WAG); *390* (BR, LISC, P); *432* (BR); *995* (BR, SRGH); *2493* (BR); *2841* (BR, EA, Z); *2979* (BR); *3805* (BR); *4140* (BM, BR, COI, LISU, M, SRGH, Z); *4232* (BR, EA, Z); *6084* (BR, COI, LISC); *6339* (BR, PRE, U, W); *7228-bis* (BR); Yaosuka, *Louis 8408* (BM, BR, L, LD, LISC, M, P, PRE, SRGH, UPS); 25 km N.W. Yangambi, *Louis 8830* (BR); Yangambi, *Louis 9049* (BR, UPS); *9320* (BR, L, LD); *10558* (BM, BR, LISC, M, P, PRE, SRGH, W); *11190* (BR, EA, L, LD, M, SRGH); *12961* (BR, U); *14377* (BR); *14759* (BR, COI); *15902* (BR); *16820* (BR); Dundusana, *Mortehan 922* (BR, Z); *Reygaert 91* (BR); *270* (BR); Mobwasa, *Reygaert 1253* (BR); *1306* (BR, Z); near Yambuya, *Solheid 69* (BR);

Bikoro, *Thonet 113* (BR, L, M, SRGH); Mombongo, *Thonner 150* (BM, BR, K, W, WAG type of *D. acuminatum*); Dundusana, *Vermoesen (herb. Bany) 186* (BR).

Notes. The differential characters of *D. acuminatum* and *D. claessensii* as mentioned by HAUMAN (l.c.: 310) fall completely within the variability of the former, even in the sense as HAUMAN treated this species, and thus *D. claessensii* cannot be maintained as a distinct taxon.

D. tessmannii was based on two specimens collected by TESSMANN (848, 894). Of these the original material was lost at Berlin and of the duplicates *Tessmann 894* (K) has been designated lectotype. *D. tessmannii* represents a very hairy form from the N.W. part of the area of *D. acuminatum*. This hairiness, which is almost completely absent in specimens from the eastern part, is not correlated with any other differential character. Moreover, intermediary specimens have been found in Gabon (e.g. *Hallé 3963, Le Testu 2030*).

D. acuminatum is closely related to *D. pedicellatum*, as may be illustrated by some misidentifications by HAUMAN, of which *Gillet 2154* has been cited (see above). The differences between the two related species can be defined as follows:

Branchlets mostly glabrous, if hairy then hairs white; leaves usually long- and abruptly acuminate, midrib raised above; inflorescences corymb-like; fruits with deciduous, acicular, irritating hairs **D. acuminatum**

Branchlets short- brown-hairy; leaves gradually and short-acuminate, midrib not raised above; inflorescences rather umbellate; fruits velutinous
. **D. pedicellatum**

D. acutifolium Engl. = **D. tomentosum** Engl.

D. acutifolium Engler, 1896-b: 136; 1896-a: 348, nomen; 1912-a: 578; Keay, 1958: 438 (in synonymy to *D. tomentosum* Engl.). Type: Cameroun, Victoria, *Preuss 1103* (holotype: B†; lectotype: P; isotypes: BM, BR, K).

Note. When revising the *Dichapetalaceae* for the second edition of the Flora of West Tropical Africa, KEAY united *D. acutifolium* and *D. tomentosum*, both species which were published at the same time. KEAY adopted *D. tomentosum* as the name of the species, reducing *D. acutifolium* into synonymy. This is fully supported by the present author.

D. acutisepalum Engl. = **D. heudelotii** (Planch. ex Oliv.) Baill.

D. acutisepalum Engler, 1896-b: 140; 1896-a: 349, nomen; 1912-a: 587; Hutchinson & Dalziel, 1928-a: 322; Keay, 1958: 438. Type: Sierra Leone, near Kurusu, *Scott Elliot 5526* (holotype: B†; lectotype: BM; isotype: K).

Note. When describing this species, ENGLER compared it with *D. schweinfurthii*. According to him *D. acutisepalum* could easily be separated from the

former by the sharply acuminate and mucronate leaf apex. This character, very variable as it proves to be, makes it even impossible to separate the types of the two species: but for the fact that the type of *D. schweinfurthii* originates from Zaïre, they could have been collected from the same plant. Moreover *D. schweinfurthii* is conspecific with *D. heudelotii* (see also under *D. adolfi-friederici*).

D. adnatiflorum Engl. = **D. mombuttense** Engl.

D. adnatiflorum Engler, 1896-b: 142; 1896-a: 350, f.188-B, nomen; Th. & H. Durand, 1909: 94; Engler, 1912-a: 594; De Wildeman, 1919: B16; Engler & Krause, 1931: 9, f.4-B. Type: Zaïre, Kasai, Jambe, *Pogge 691* (holotype: B†; lectotype: BM, photograph WAG).

Note. HAUMAN (1958-a: 327) reduced *D. adnatiflorum* into synonymy of *D. mombuttense*, a species published by ENGLER in the same paper. HAUMAN's decision is accepted here and, although the fragment of the original material in BM is very poor (one small leaf only), it certainly fits within *D. mombuttense*.

D. adnatiflorum was first mentioned by ENGLER in June 1896 (1896-a: 350) in a key accompanied by a drawing of a part of the corolla with stamens. The present author does not consider this a valid publication under article 44 of the Code (1972: 44): the drawing is not 'an illustration with analysis showing essential characters'. It certainly represents a part of a *Dichapetalum* flower, but not particularly of a certain species, and an important character, the adnation of the peduncle to the petiole is not shown.

The original diagnosis of *D. adnatiflorum* differs in a few points quite strongly from *D. mombuttense*. ENGLER mentioned a 2-locular ovary and a deeply 2-fid style, which is not very well admissible in the latter species. The present author feels that the flower described must have been aberrant, or that it may have belonged to a different species.

D. adolfi-friederici Engl. = **D. heudelotii** (Planch. ex Oliv.) Bail.

D. adolfi-friederici Engler, 1912-b: 441, t. LI, A-D; 1912-a: 585, nomen; De Wildeman, 1919: B17; Hauman, 1958-a: 328 (in synonymy to *D. schweinfurthii* Engl.). Type: Zaïre, between Beni and Irumu, *Mildbraed 2824* (holotype: B†; lectotype: BM, photograph WAG).

Note. HAUMAN (l.c.) treated this species as a synonym of *D. schweinfurthii*. These species are indeed conspecific. However, a comparison of the Zaïre material of the latter with *D. heudelotii* from West Africa did not show any distinguishing character by which to separate these two species.

Basionym: *Chailletia affinis* Planchon ex Bentham, 1849: 276; Oliver, 1868: 341 (in synonymy to *Ch. toxicaria* G. Don); De Wildeman, 1919: B69 (in synonymy to *D. toxicarium* (G. Don) Baill.); Keay, 1958: 438 (see note).

Type: Fernando Po, *Vogel 149* (holotype: K; isotype: UPS).

D. dusenii Engler, 1896-b: 135; 1896-a: 348, nomen; 1912-a: 568; Pellegrin, 1913: 644 (in synonymy to *D. toxicarium* (G. Don) Baill.); De Wildeman, 1919: B29. Type: Cameroun, sin. loc., *Dusen 271* (holotype: B†; no isotypes seen). Neotype: Cameroun, Bipindi, *Zenker 3160* (holotype: Z; isotype: B, BM, BR, E, G, GOET, K, L, LISC, M, P, PRE, W, WU).

D. fallax Ruhland, 1902: 78; Engler, 1912-a: 568; Pellegrin, 1913: 644 (in synonymy to *D. toxicarium* (G. Don) Baill.); De Wildeman, 1919: B29. Type: Cameroun, Bipindi, *Zenker 2444* (holotype: B†; lectotype: L; isotypes: B, BM, BR, COI, E, G, GOET, K, M, P, W, WU, Z).

Diagnostic characters. Branchlets glabrous or very early glabrescent, often green. Branches without or with a few inconspicuous lenticels. Leaves glabrous or nearly so, beneath usually with pilose acarodomatia in the axils of the main lateral nerves. Inflorescences subumbellate. Peduncle completely adnate to the petiole, (6)11–17(26) mm long. Upper part of pedicel at most 1 mm long. Calyx, corolla, and stamens subequal in length. Fruits glabrous, almost smooth, with a rounded or obtuse and sometimes abrupt, short-apiculate top.

Description. Liana or scandent shrub, sometimes a shrub. *Branches* glabrous, lenticels absent or obscure. *Branchlets* often green, mostly finely striate when dry, appressed short-hairy, often sparsely so, mostly very soon glabrescent, lenticels absent. *Stipules* triangular to narrowly triangular, appressed-short-hairy, the upper 1.5–3 mm long, the lower 1–2 mm long, soon deciduous. *Leaves*: petiole canaliculate above, (5)6–10(16) mm long, (6)11–17(26) mm long when united with the stalk of the inflorescence (the leafblade then often reduced or absent), appressed short-hairy when young; blade usually coriaceous when fresh, obovate or elliptic, sometimes oblong, (1.5)2–3 times as long as wide, (6)8–18 × (3)4–7(9) cm, cuneate at base, gradually to abruptly acuminate at apex, the acumen obtuse, rounded or acutish, ca. 0.5–1.5 cm long, sometimes twisted; sparsely appressed short-hairy when young, soon glabrescent; above sometimes with a few glands on the base, beneath usually with some large glands along the midrib, mainly in the lower part, and a few scattered glands on the remaining surface; midrib impressed above, at least in the lower part, prominent beneath, with 4–6 main lateral nerves on each side, their axils mostly furnished with pilose acarodomatia. *Inflorescences* subumbellate, with short, mostly indistinct branches, ca. 6–25-flowered, tomentose; peduncle completely adnate to the petiole, seldom partly so, (6)11–17(26) mm long, the corresponding leafblade often absent or strongly reduced (petiole and peduncle differing in indumentum, see fig. 9–3). *Bracts* and bracteoles deltoid, minute. *Flowers* pedicellate; pedicel tomentose, the lower part 2.5–4.5 mm long,

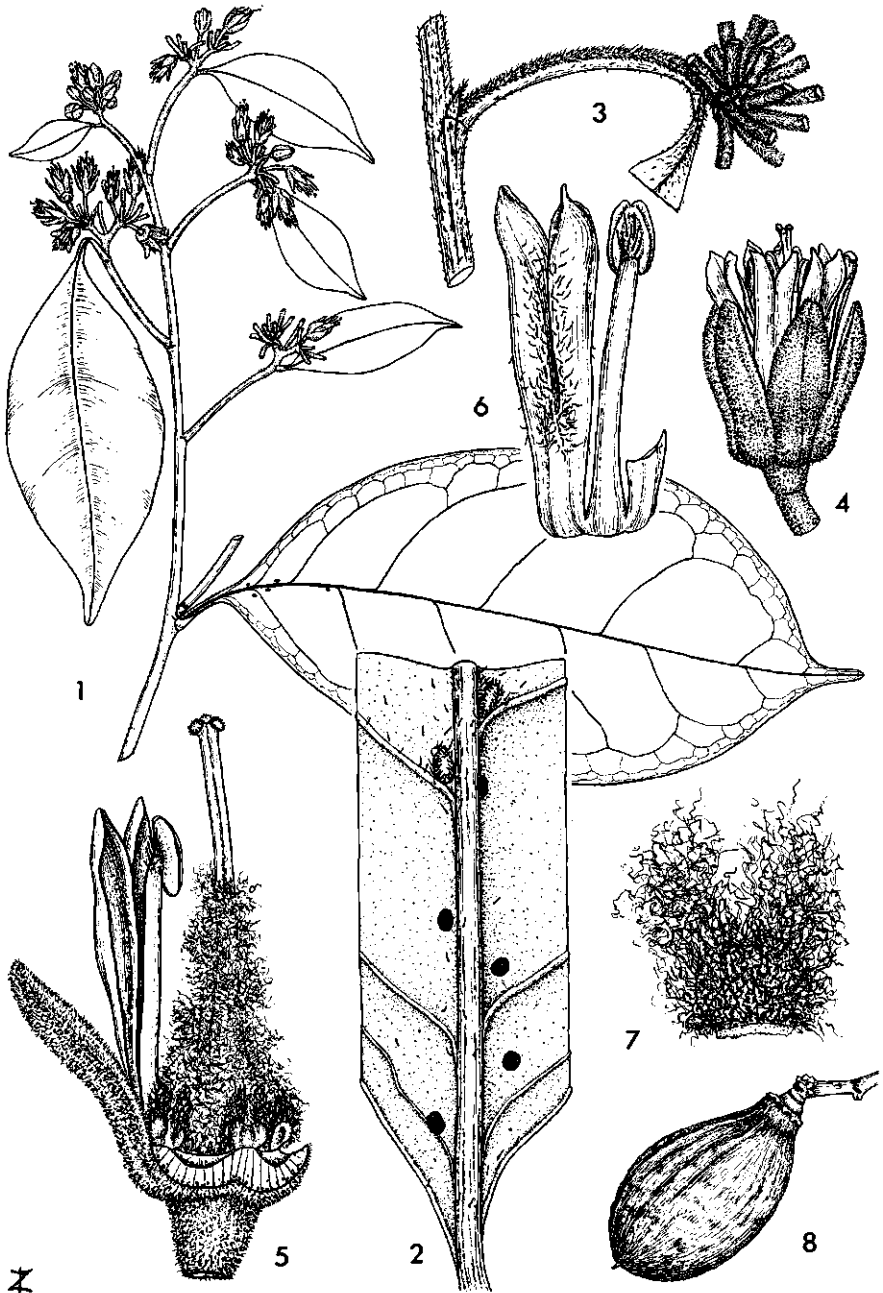


FIG. 9. *D. affine*: 1. flowering branch, $\frac{5}{6} \times$; 2. part of leaf beneath with glands and domatia, $5 \times$; 3. detail of inflorescence, showing adnation of petiole and peduncle, $2\frac{1}{2} \times$; 4. flower, $5 \times$; 5. pistil with staminodes, $10 \times$; 6. petal and stamen outside, $10 \times$; 7. staminode inside, $20 \times$; 8. fruit, $\frac{5}{6} \times$. (1-7. Leeuwenberg 5631; 8. Zenker 2776).

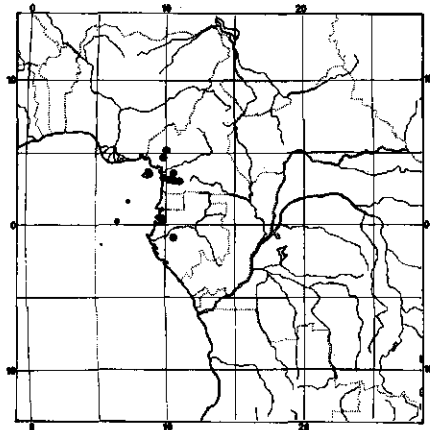
the upper part up to 1 mm long. *Calyx* obtuse at base. *Sepals* unequal, erect, nearly free, oblong, ovate-oblong, or ovate-elliptic, (2.5)3.5–4.5 × 1.5–2(2.5) mm, flat or slightly concave, rather thick, especially at base, rounded, obtuse or emarginate at apex, outside finely tomentose, inside similar, but mainly in the upper part. *Petals* erect, narrowly oblong-obovate, 4.5–5.5 mm long, 2 mm wide at most, 1–1.5 mm incised, inside firmly keeled, outside tomentose, especially in the middle, lobes and base glabrous, inside glabrous or loosely tomentose mainly on keel. *Stamens* erect, (4.5)5–5.5 mm long; connective prominent, mostly with a few stiff hairs dorsally, usually glabrescent; filaments glabrous or with a few scattered hairs. *Staminodes* subquadrate-cordate, ca. 0.5 × 0.5 mm, top obtuse-emarginate or bilobed, inside long-hairy, outside glabrous or with a few long hairs. *Pistil* 5–6 mm long; style obscurely 3-lobed at top, glabrous in the upper part, the lower part densely covered by long, white, curly hairs like the ovary; ovary 3-locular. *Fruits* usually 1-seeded, obovoid, slightly laterally compressed, broadly obtuse to truncate at base, top rounded to obtuse, sometimes shortly and abruptly apiculate, often mucronate, 3–4.2 cm long, 1.9–3.2 × 1.7–2.7 cm across, glabrous, smooth when fresh, finely wrinkled when dry, the aborted cells not at all or barely visible by an inconspicuous rib; exocarp thin; mesocarp firm, mealy, up to 9 mm thick; endocarp with a ca. 1 mm thick, bony, wrinkled outer layer and a thin finely striate, fibrous, glossy inner lining. *Seeds* ovoid, somewhat laterally compressed, ca. 2.5 cm long, ca. 1.5 cm in diam. *Seedcoat* thin, glossy, glabrous.

Distribution: Fernando Po, Cameroun, Gabon.

Ecology: Rain forest.

Specimens examined. Equatorial Guinea: Fernando Po, *Vogel 149* (K, UPS, type of *D. affine*).

Cameroun: km 27 Kribi – Lolodorf, *Bos 4883* (WAG, YA); 65 km S.S.W. of Eséka, *W. de Wilde 2748* (WAG, YA); 26 km N. of Kribi, *Leeuwenberg 5631* (WAG, YA); 16 km S. of



MAP 2. *D. affine*

Nkongsamba, *Leeuwenberg* 8285 (WAG); km 14 Melong - Dschang, *Leeuwenberg* 9551 (WAG, YA); *Leeuwenberg* 9944 (WAG, YA); near Ebolowa, *J. & A. Raynal* 10.341 (P); Bipindi, *Zenker* 2444 (B, BM, BR, COI, E, G, GOET, K, L, M, P, W, WU, Z, type of *D. fallax*); 2776 (BM, BR, E, G, GOET, K, L, M, W, WU, Z); 2819 (BR, E, G, GOET, K, L, M, P, W, WU, Z); 3160 (B, BM, BR, E, G, GOET, K, L, LISC, M, P, PRE, W, WU, Z, type of *D. duseonii*); 3226 (B, BM, BR, COI, E, G, GOET, K, L, M, P, W, WU, Z); 4749 (BM, BR, COI, E, GOET, K, L, LE, M, P, W, WAG, Z).

Gabon: 50 km S.E. of Lambaréné, *Breteler* 5720 (WAG); near Libreville, *Klaine* 14 (P); 2590 (K, P); 2942 (P); 3028 (P); 3529 (K, LE, P).

Notes. When BENTHAM described *Chailletia affinis* he expressed some doubt whether his species was really distinct from *Ch. toxicaria*, but he clearly indicated the main differences: longer petioles and glabrous fruits. Nevertheless OLIVER treated *Ch. affinis* as a synonym of *Ch. toxicaria* and was subsequently followed by several authors (e.g. DE WILDEMAN, 1919; ENGLER & KRAUSE, 1931). The distribution of the two species is quite different, and they may be distinguished as follows:

Fruit glabrous; petiole (5)6-10(16) mm long, (6)11-17(26) mm long when united with peduncle. Fernando Po, Cameroun, Gabon **D. affine**

Fruit tomentose; petiole 3-5(13) mm long, slightly or not any longer when united with peduncle. From Guinea to W. Ghana **D. toxicarium**

KEY mentioned this species as imperfectly known and named it '*D. affinis*'. I do not suppose that KEY intended to publish the new combination: he still considered the species as imperfectly known and secondly the epithet '*affinis*' was not changed into '*affine*'. I consider therefore '*D. affinis*' as an error of citation.

There is no doubt that *D. duseonii* is conspecific with *D. affine*. Although I could not trace either the original material or a duplicate of it, ENGLER's description is quite unmistakable. The neotype which has been chosen was, together with its duplicates, distributed as *D. duseonii* and fits the original diagnosis.

The isotypes of *D. fallax* have slightly smaller leaves than generally found in *D. affine*, however, this character, together with some minor differences in the flowers, do not justify its segregation.

D. alaotrense Desc., ined.

Note. Mr. DESCOINGS intends to publish this combination based on Madagascar material, but it was not effected at the moment this manuscript went to the printer. This name will be dealt with later, after effective publication.

D. albidum Chev. ex Pellegr.

Fig. 10 Map 3

D. albidum Chevalier ex Pellegrin, 1913: 645; Chevalier, 1920: 119 (partly); Hutchinson & Dalziel, 1928-a: 324 (in synonymy to *D. liberiae* Engl. & Dinkl.); Keay, 1958: 436 (in synonymy to *D. pallidum* (Oliv.) Engl.).

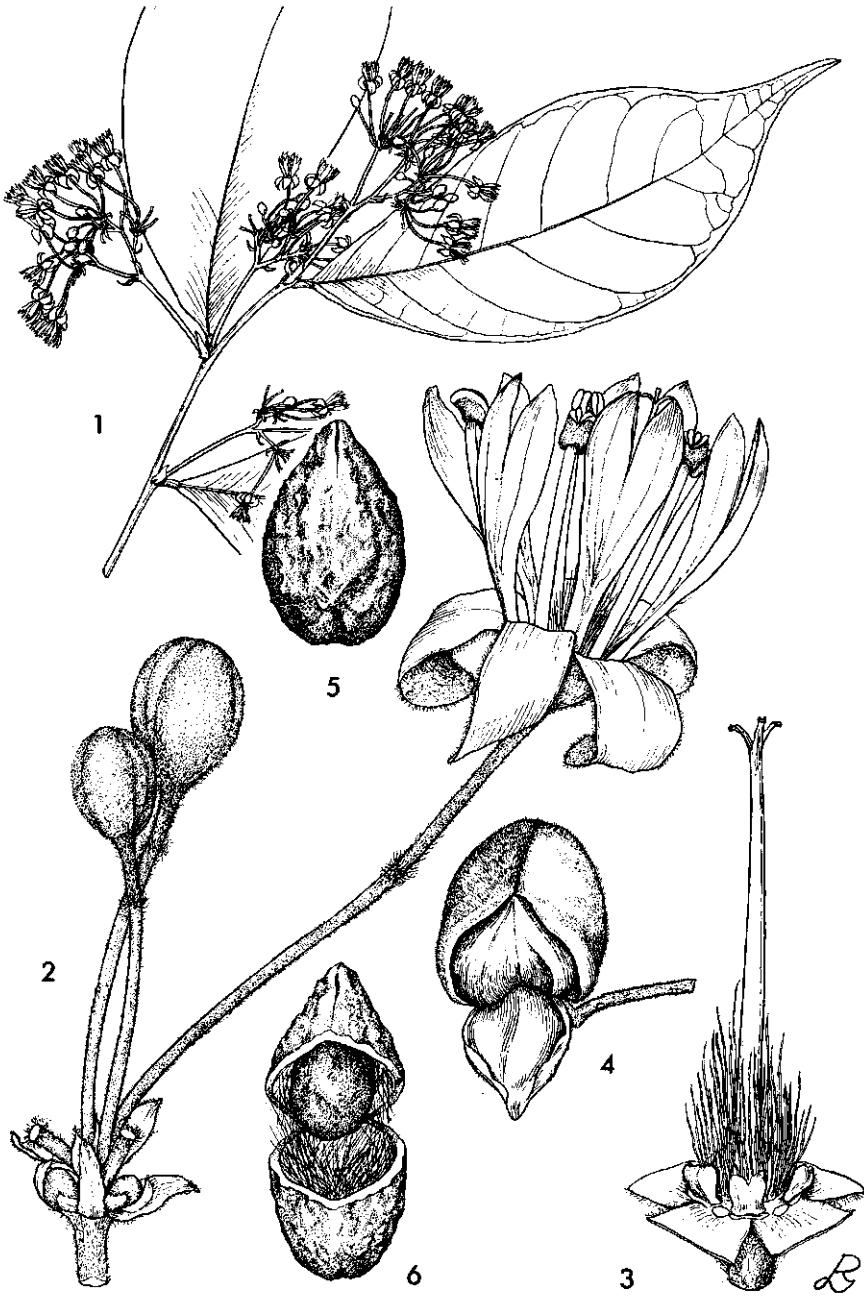


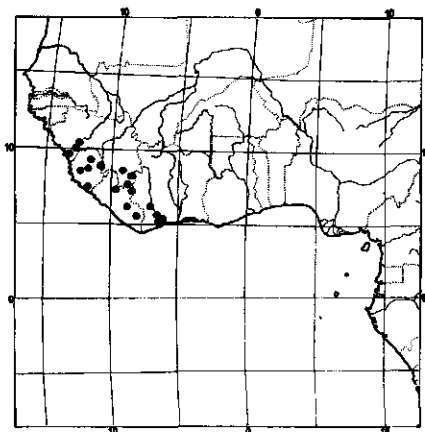
FIG. 10. *D. albidum*: 1. flowering branch, $\frac{5}{6} \times$; 2. part of inflorescence, $8 \times$; 3. pistil, $13 \times$; 4. fruit, $1\frac{2}{3} \times$; 5. pyrene, $3\frac{1}{3} \times$; 6. pyrene transversely cut, showing seed and loose hairs, $3\frac{1}{3} \times$. (1. Chevalier 19159; 2-3. Oldeman 18; 4-6. Leeuwenberg & Voorhoeve 4638).

Type: Ivory Coast, between Soubré and Grabia, *Chevalier 19159* (lectotype: P; isotypes: K, WAG).

Diagnostic characters. Leaves with a close-felted whitish or sometimes brownish indumentum beneath, glabrous above. Pedicel thin (3)6–11 mm long, the articulation always above the middle, the upper part 2–4 mm long. Sepals reflexed. Ovary with stiff, erect, acicular, barbed hairs. Fruits subglobose or 2–3-lobed, 10–15(20) mm in diameter, with a dense indumentum of pale brown, erect, acicular, easily caducous, irritating, minutely barbed hairs.

Description. Liana up to 20 m long and 5 cm in diameter or more, shrub, or lianescent shrub. *Branches* shallowly grooved or slightly angular, often with 5 rows of lenticels, the latter usually located within the grooves, glabrous or glabrescent. *Branchlets* at first covered by a close-felted whitish or pale brownish indumentum, turning glabrous and then usually sparsely lenticellate. *Stipules* deciduous but not very early so, outside with a close-felted indumentum, inside glabrous or nearly so; upper ones triangular to narrowly oblong, often slightly falcate, top acute, (4)5–7(8) mm long, 1–1.5(2) mm wide; lower ones linear-subulate, (2)3–5 mm long, ca. 0.5(–1) mm wide, generally 2 mm shorter than the upper. *Leaves*: petiole (3)4–6(8) mm long, with a close-felted whitish indumentum; blade elliptic to obovate, seldom ovate, tapering to a rounded base, usually gradually long-acuminate, 2–3 times as long as wide, (5)8–11(15.5) × (2)3–4(5.5) cm, acumen (0.5)1–1.5(2) cm long; midrib and main lateral nerves (5)7–9 on each side, impressed above, prominent beneath; glabrous above (exceptionally with a trace of indumentum on the impressed midrib), beneath with a whitish or pale brownish close-felted indumentum. *Inflorescences* axillary, often paired, cymose, tomentose; peduncle (5)8–20(30) mm long; branches often short, usually shorter than the pedicels and much shorter than the peduncle; bracts small, triangular to narrowly triangular. *Pedicel* (of open flowers) thin (3)6–11 mm long, accrescent in fruit; articulation always above the middle; the upper part 2–4 mm long. *Calyx* obtuse to rounded at base. *Sepals* reflexed, unequal, obovate-elliptic to oblong-elliptic, 3–4 × 1–1.5 mm, free or nearly so, top rounded, acutish, or obtuse-emarginate, concave; tomentose outside, inside glabrous. *Petals* erect to slightly spreading, shortly adnate to the filaments at base, spatulate, (3)3.5–4.5 mm long, 1–2 mm split; lobes concave, top rounded; outside sometimes with a few stiff appressed hairs below the split, inside slightly keeled below the split and glabrous. *Stamens* erect to slightly spreading, 3.5–5 mm long, glabrous; filaments at base as wide as the petals; anthers ca. 0.5 mm long, connective prominent. *Staminodes* subquadrate, up to ca. 0.5 × 0.5 mm, top truncate-emarginate, sometimes lobulate, glabrous. Pistil 3–5.5 mm long. *Style* glabrous or with a few hairs in the basal part, 3-lobed at top; lobes at most 0.5 mm long. *Ovary* subglobose, 3-locular, covered by ca. 1 mm long, stiff, erect, barbed hairs, at base sometimes mixed with a few woolly hairs. *Fruits* subglobose or 2–3-lobed, 10–15(20) mm in diam., yellow to orange at maturity; exocarp dehiscent by 3 valves, covered by a dense indumen-

MAP 3. *D. albidum*



tum of pale brown, erect, acicular, easily caducous, irritating, minutely barbed hairs outside; mesocarp rather thin, mealy, red; pyrenes subobovoid, 9–12 mm long, 6–8 mm in diam.; endocarp rugose outside, consisting of 2 main layers, the outer bony and the inner fibrous; the latter partly deciduous, embedding the seed on loose, acicular, barbed, 1–1.5 mm long hairs. *Seeds* obovoid-ellipsoid, ca. 7 mm long and 5 mm in diam., slightly laterally compressed, glabrous. *Seed-coat* thin, brown.

Distribution: Guinea, Sierra Leone, Liberia, Ivory Coast.

Ecology: Rain forest, semi-deciduous forest.

Specimens examined. Guinea: Fouta, *Adam* 35 (P); Kindia, *Chevalier* 13204 (P, WAG); 13368 (P, WAG); near Kouria, *Chevalier* 15086 (P, paratype); between Fassakoidou and Késsérédou, *Chevalier* 20826 (P); near Macenta, *Jacques-Felix* 881 (P); Kindia, *Maclaud* 163 (P).

Sierra Leone: Mabonto, *Deighton* 3269 (K); Pujehun, *Deighton* 5794 (K, P); Loma Mt., *Jaeger* 213 (P); 1480 (P); Marampa, *Morton & Cole* 3805 (K, WAG); Mayoso, *Thomas* 1431 (K); Mabum, *Thomas* 1604 (K); Bumbuna, *Thomas* 3159 (K); 3173 (K); 3443 (K); 3476 (K); 3733 (K).

Liberia: Nimba Mt., *Adam* 21111 (K, P); 21376 (K); 21609 (K); 25522 (K); 25621 (K); 25710 (K); Vonjama, *Baldwin* 9961 (K); 10075 (K); near Tappita, *Jansen* 871 (WAG); km 24 Vonjama – Zorzor, *Jansen* 2058 (WAG); Nimba Mt., *Leeuwenberg & Voorhoeve* 4638 (B, BR, EA, FHI, HBG, K, L, MO, P, PRE, SL, WAG); Chien (Zwedru), *Versteegh & Jansen* 820 (WAG).

Ivory Coast: km 56 Sassandra – Gagnoa, *Breteler* 5842 (WAG); between Soubré and Grabia, *Chevalier* 19159 (K, P, WAG, type); 5 km W. of Niapidou, *W. de Wilde* 217 (BR, K, P, UC, WAG, Z); near Sassandra, *Oldeman* 18 (B, BR, FHI, K, MO, P, WAG).

Notes. PELLEGRIN's publication, in which he validated CHEVALIER's herbarium name, has been overlooked by all the authors dealing with West African *Dichapetalaceae* (Index Kewensis 1911–1915 quoted this species as 'nomen'). PELLEGRIN based *D. albidum* on 3 specimens collected by CHEVALIER, clearly

indicating the differences with *D. liberiae*. Two of these specimens (15086, 19159) bear flowers, the third (17690) is sterile. This one is, because of its large leaves, better placed in *D. pallidum*, as was done by HUTCHINSON & DALZIEL (1928-a). CHEVALIER (1920) cited 19159 under *D. albidum* and 15086 under *D. liberiae*. KEAY united *D. liberiae* with *D. pallidum* and consequently he cited all specimens under the latter name.

D. albidum is indeed very closely related to *D. pallidum* and specimens of the former may easily be mistaken for the latter, because both species have the close-felted whitish indumentum on the leaves beneath and no striking distinguishing characters. However, the indumentum of the ovary is hispid in *D. albidum* and densely lanate in *D. pallidum*. Moreover, specimens of the latter usually have shorter pedicels and generally much larger fruits.

***D. altescandens* Engl.**

Fig. 11 Map 4

D. altescandens Engler, 1902: 80; 1912-a: 570; De Wildeman, 1919: B17.

Type: Cameroun, Bipindi, *Zenker 1743* (holotype: B†; lectotype: P; isotypes: BM, BR, COI, L, W).

Diagnostic characters. Inflorescences pedunculate, distinctly branched. Pedicel 3–8 mm long, jointed above the middle, upper part up to 1.5 mm long. Calyx reflexed. Ovary with dense lanate indumentum. Exocarp of fruit reticulately fissured, leaving ca. conical islets, which are covered by a dense short-hairy indumentum mixed with ca. 1 mm long, acicular, minutely barbed, readily caducous, irritating hairs.

Description. Liana, often large, or scandent shrub. *Stems* usually dark brown-black, without prominent lenticels. *Branches* usually dark brown-black, sparsely lenticellate or not at all, glabrous or nearly so. *Branchlets* dark brown-black, similarly lenticellate, puberulous, often sparsely so, sometimes white long hispid hairs intermixed also present, glabrescent. *Stipules* soon deciduous, narrowly triangular to linear-subulate, 1.5–4 mm long, the lower shorter and narrower, appressed-puberulous. *Leaves*: petiole 2–4(6) mm long, subterete to slightly canaliculate, above appressed-puberulous sometimes with some long white hairs as well, beneath glabrous or nearly so; blade elliptic to obovate, often narrowly so, ca. 2.5–3 times as long as wide, (6)8–12(16) × (2)3–4(6) cm obtuse, rounded or cuneate at base, often decurrent into petiole, gradually to abruptly acuminate at top, the acumen obtuse to acutish, (7)10–15(20) mm long; with a few hairs on the midrib on both sides and on the lateral nerves beneath, otherwise glabrous, soon glabrescent; glands few, on lower surface only, inconspicuous and scattered; midrib mostly raised above, at least in upper half; lateral nerves (4)5–6(8) on each side of midrib, often more prominent beneath. *Inflorescences* pedunculate, distinctly branched with up to ca. 40 flowers but usually less than 25 flowers, appressed-puberulous, sometimes a

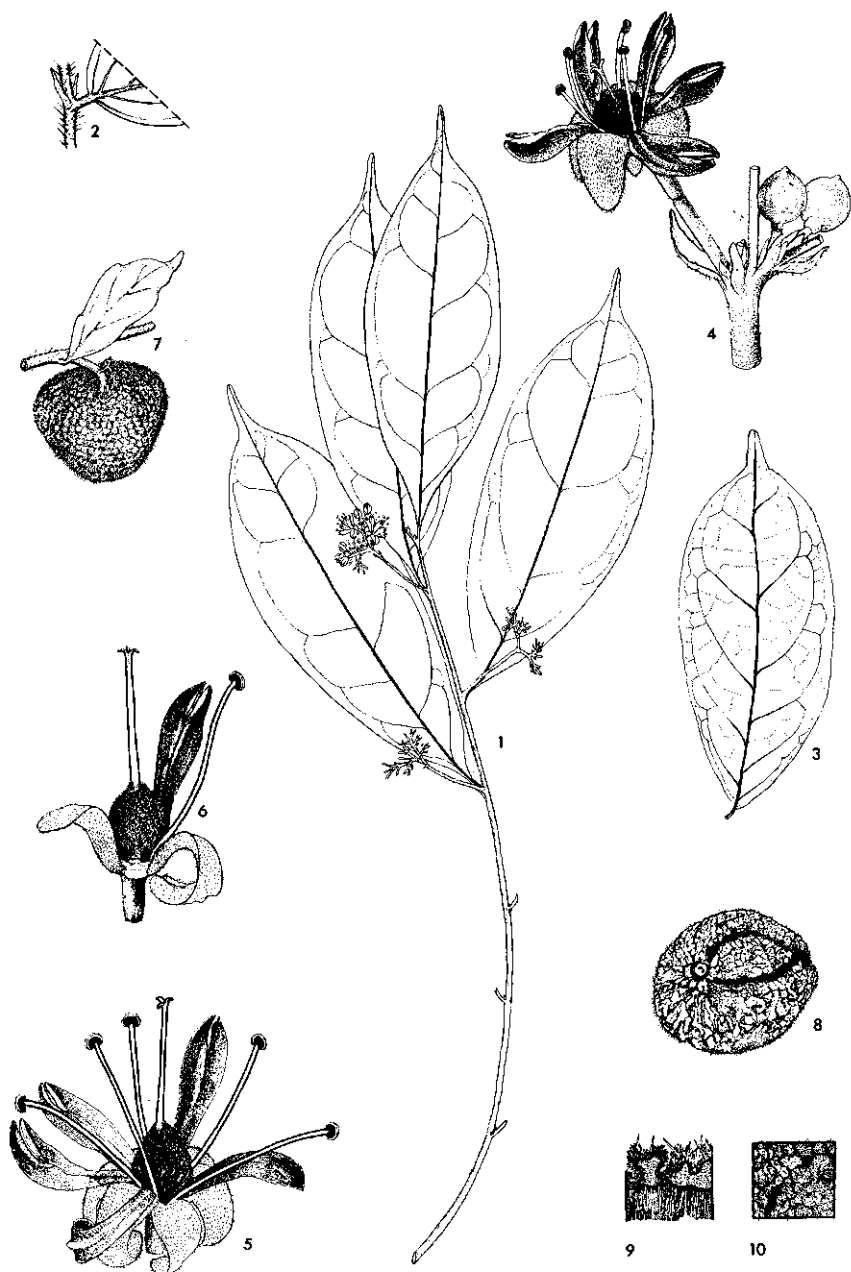


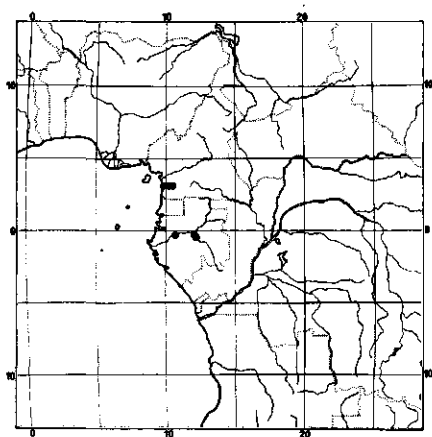
FIG. 11. *D. altescandens*: 1. flowering branch, $\frac{1}{2} \times$; 2. axil with stipules, $\frac{1}{2} \times$; 3. leaf beneath, $\frac{1}{2} \times$; 4. part of inflorescence, $4 \times$; 5. flower, $4 \times$; 6. pistil with staminodes, $4 \times$; 7. fruit, $\frac{1}{2} \times$; 8. fruit with sutures, $\frac{1}{2} \times$; 9. detail of fruit wall in cross section, $2\frac{1}{2} \times$; 10. detail fruit surface, $1\frac{1}{2} \times$. (1, 5-6. N. Hallé 1959; 2, 4. Bos 6660; 3, 8. Bos 5042; 7, 10. Bos 3631; 9. Bos 4834).

few long white hispid hairs also present; peduncle 4–20 mm long. *Bracts* and bracteoles triangular to narrowly triangular, 1–4 × 0.5–1.5 mm. *Pedicel* (3)4–8 mm long, always jointed far above the middle, appressed-puberulous; upper part up to 1.5 mm long. *Calyx* rounded to obtuse at base. *Sepals* reflexed, free at base or very shortly united, narrowly oblong to oblong-elliptic, (3)3.5–4 × 1–1.5 mm, top acutish, rounded or obtuse, outside appressed-puberulous, inside sparsely puberulous. *Petals* mostly spreading often slightly geniculate below the lobes, narrowly-obovate in outline, 3.5–5 mm long, 1.5–2.5 mm split, very shortly united with filaments at base, inside keeled below the lobes and glabrous, outside with a few hairs below the lobes; lobes concave, rounded at top. *Stamens* (3)5–7 mm long, spreading to erect, glabrous; connective prominent. *Stamino-des* subquadrate, less than 0.5 × 0.5 mm, top obtuse or truncate to emarginate, glabrous or with a few hairs. *Pistil* (2.5)5–7 mm long; style glabrous, shortly 3-lobed at the top; ovary subglobose, 3-locular, densely lanate; ovules with an obturator. *Fruits* subglobose to obscurely 2–3-lobed, 1.5–4 cm in diam., 1–3-seeded; exocarp 1–2 mm thick, reticulately fissured leaving subconical islets covered by a dense short-hairy indumentum, mixed with wider-spaced, ca. 1 mm long, acicular, minutely barbed, readily caducous, irritating hairs; together with mesocarp dehiscent by 3 valves, or at least partly so; mesocarp consisting of a 1–2.5 mm high fibrous palisade, the fibres at their top often bent against the exocarp; pyrenes subellipsoid, up to 20 mm long and 17 mm in diam.; endocarp slightly rugose-muricate, at most 0.5 mm thick, with a bony outer layer and a fibrous lining, smooth or minutely striate and mostly glossy inside. *Seeds* ellipsoid; seedcoat brown, fibrous, papery to thinly leathery, with a minute aril.

Distribution: Southern Cameroun, Gabon.

Ecology: Rain forest at low elevations.

Specimens examined. Cameroun: km 12 Kribi – Lolodorf, *Bos* 3631 (WAG, YA);



MAP 4. *D. altescandens*

km 18 Kribi – Lolodorf, *Bos* 4834 (WAG, YA); 5042 (WAG); 6660 (WAG, YA); Bipindi, *Zenker* 1743 (BM, BR, COI, L, P, W, type).

Gabon: 10 km S.W. of Ndjolé, *N. Hallé* 1959 (P, WAG); Lastoursville, *Le Testu* 7183 (BM, P, WAG); 7215 (P, WAG); 7863 (P).

Notes. Specimens from the N.W. part of the area (*Bos* 5042, 6660) have next to the normal indumentum long white hispid hairs on the young parts. These hairs are not or very rarely seen on the type material from Bipindi and on specimens from Gabon. More or less similar hairs have been observed in specimens of the allied *D. acuminatum* (see notes under the latter).

D. angolense Chod.

Fig. 12 Map 5

D. angolense Chodat, 1895: 672; Hiern, 1896: 137; Engler, 1912-a: 567; Pellegrin, 1913: 642; De Wildeman, 1919: B17; Pellegrin, 1924: 55; Exell, 1927: 65; Moss, 1928: 119; Hutchinson & Dalziel, 1928-a: 325; Exell & Mendonça, 1951-b: 326; Hauman, 1955: 340; 1958-a: 335; Keay, 1958: 436.

Type: Angola, Golungo Alto, *Welwitsch* 4664 (lectotype: G; isotypes: BM, COI, K, LISU, P).

D. angolense Chodat var. *leucanthum* Pellegrin, 1913: 643 (p.p.). Type: Cameroun, Bipindi, *Zenker* 3265 (lectotype: P; isotypes: B, BM, BR, COI, E, EA, GOET, K, L, M, PRE, W, WU, Z).

D. angolense Chodat var. *glabriusculum* Hauman, 1955: 347; 1958-a: 336. Type: Zaïre, Yangambi, *Louis* 255 (holotype: BR; isotypes: K, LISU, P).

D. ferrugineo-tomentosum Engler, 1896-b: 139; 1896-a: 349 (as *D. rufotomentosum* Engl.); 1912-a: 571; De Wildeman, 1919: B30 & B63 (the last as *D. rufotomentosum*); Engler & Krause, 1931: 9. Type: Cameroun, Yaoundé, *Zenker & Staudt* 46 (holotype: B†; lectotype: WAG; isotypes: BM, G, K, LE, P, Z).

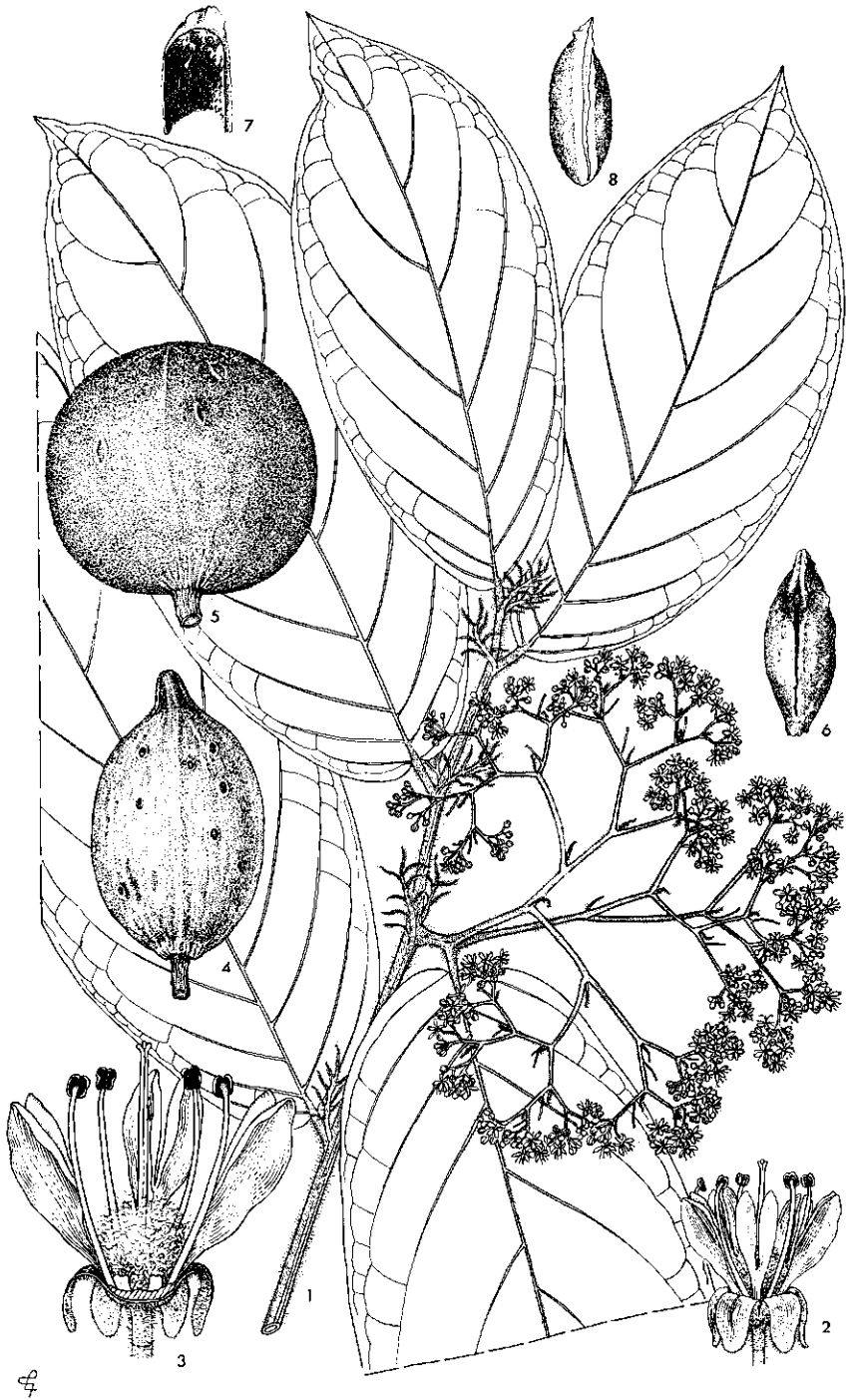
D. petersianum Dinklage & Engler in Engler, 1912-a: 572; De Wildeman, 1919: B58; Hutchinson & Dalziel 1928-a: 324; Keay, 1958: 436. Type: Liberia, Fishtown, *Dinklage* 1970 (lectotype: B; isotype: K).

D. reygerti De Wildeman, 1919: B61; Exell, 1927: 66; Engler & Krause, 1931: 7. Type: Zaïre, Mobwasa, *Reygert* 1045 (holotype: BR; isotype: BM).

D. mayumbense Exell, 1927: 65; Exell & Mendonça, 1951-b: 327. Type: Angola, Cabinda, Maiombe, Caio Village, *Gossweiler* 7677 (holotype: BM; isotypes: COI, K, LISU).

Homotypic synonym: *Chailletia angolensis* Chodat ex Barth, 1896: 498–500. Type: see under *D. angolense*.

Diagnostic characters. Liana. Branches and branchlets hollow, densely velutinous or tomentose; similar indumentum present on stipules, petioles, and inflorescences. Stipules mostly pinnatisect or dentate, seldom entire. Leaves obovate-elliptic, (7)12–25(53) × (2.5)5–11(21) cm, mostly with a cordate, subcordate or obtuse base, often unequal-sided, with (6)8–11(15) pairs of lateral nerves. Inflorescences up to 15 cm in diam., (5)6–9(10) times forked; the pe-



duncle (0)0.5–1.5(3) cm long, mostly adnate to the petiole. Pedicel articulated above the middle, the upper part ca. 1–2 mm long. Sepals reflexed. Ovary densely lanate, 3-locular. Fruits subglobose to obovoid-ellipsoid, tomentose or velvety. The seed keeled by a long aril.

Description. Large liana reaching the crown of tall trees, lianescent shrub, or shrub. *Stems* and branches hollow, with 5 rows of prominent lenticels. Bark of stems turning fissured and peeling off in irregularly shaped thin flakes. Cross section of the xylair cylinder not deeply divided by intruding bark, but subentire, circular or nearly so. *Branches* glabrous or glabrescent. *Branchlets* hollow, often longitudinally grooved, densely brown or blackish velutinous, or densely brown- or greyish-tomentose (often mixed with hispid hairs); similar indumentum present on stipules, petioles, and inflorescences, and often on the midrib and main lateral nerves as well. *Stipules* early caducous, (5)9–15(30) mm long, deeply pinnatisect or at least dentate, very rarely entire, with up to ca. 10 mm long, filiform, usually spreading lobes. *Leaves*: petiole subterete or canaliculate above, (3)4–10(15) mm long, but when united with peduncle (6)12–20(30) mm long; blade papery to thinly coriaceous, obovate-elliptic, (1.75)2–2.5(4.5) times as long as wide, (7)12–25(53) × (2.5)5–11(21) cm, base mostly cordate, subcordate, or obtuse, sometimes rounded, usually unequal-sided, top acute or shortly and acutely acuminate (seldom obtuse or retuse), the acumen up to ca. 2 cm long; midrib and the (6)8–11(15) pairs of lateral nerves often conspicuous above by being glabrous and impressed (at least when dry) or prominently clothed by a tomentose or velutinous, brown indumentum, usually sparsely so and earlier glabrescent on the remaining surface; beneath reticulately veined and velutinous-tomentose or sparsely pubescent, the midrib sometimes brown-strigose as well, and early glabrescent or not; glands mostly few and inconspicuous, usually absent above (sometimes with numerous small glands beneath in early glabrescent leaves). *Inflorescences* up to 15 cm in diam., (5)6–9(10) times dichotomously branched, of which (3)4–8 forks good visible; peduncle (0)0.5–1.5(3) cm long, usually adnate to the petiole, often completely so, sometimes absent and branched at once in the axil; lowermost branches up to 5.5 cm long, the upper gradually shorter towards the top; lower forks usually without a terminal flower; bracts and bracteoles linear-subulate to triangular, up to 10 mm long, the lower sometimes pinnatisect or dentate like the stipules, recaulescent with the branches up to the next bifurcation. *Pedicel* articulated above the middle, up to 11 mm long, the upper part (0.5)1–2(2.5) mm long, tomentose, sometimes with a few long hairs as well. *Calyx* rounded to obtuse at base. *Sepals* reflexed, free or very shortly united at base, slightly unequal, ovate-elliptic to oblong, 2–3(4) × 1–1.5(2) mm, rounded to obtuse or more or

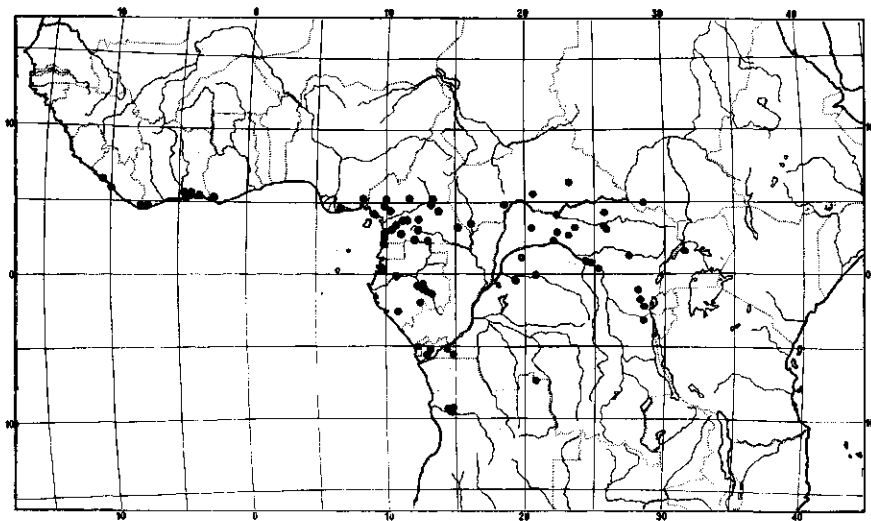
FIG. 12. *D. angolense*: 1. flowering branch, $\frac{1}{2} \times$; 2. flower, $5 \times$; 3. flower showing pistil and staminodes, $10 \times$; 4. 1-seeded fruit, $1 \times$; 5. 2-seeded fruit, $1 \times$; 6. pyrene, $1 \times$; 7. detail of endocarp inside, $1 \times$; 8. seed with aril, $1 \times$. (1–3. *Bos & Breteler 3058*; 4, 6–8. *Bos 3683*; 5. *Bos 4240*).

less acute at top, tomentose outside, inside glabrous or puberulous in upper part. *Petals* erect to spreading, more rarely reflexed, very shortly united with the filaments at base, ca. obovate-spathulate in outline, (2)2.5–3(4) mm long, ca. 1.5 mm split, outside usually with a few hairs below split, inside glabrous; lobes concave, top rounded. *Stamens* usually erect or nearly so, 2.5–3.5(5) mm long, glabrous; anthers less than 0.5 mm long; connective prominent. *Staminodes* mostly oblong, often narrowly so, tapering towards base, top obtuse, truncate, or bilobed, ca. 0.5–1 mm long, glabrous or with a few hairs inside. *Pistil* 2.5–3(4) mm long; ovary subglobose, 3-locular, with a dense cover of long lanate hairs; style glabrous, sometimes with a few lanate hairs in the lower part, 3-lobed at top; lobes less than 0.5 mm long; obturator often present. *Fruits* subglobose to obovoid-ellipsoid, rounded or obtuse at base, obtuse, rounded, or shortly apiculate at top, ca. 2–3.5 cm long, 1.5–2.5 cm in diam., 1–3-seeded, yellow (or orange?) at maturity; exocarp firm, 1–3 mm thick, with a brownish densely tomentose or velvety indumentum (or with a mixture of both) outside, rather smooth; mesocarp firm, mealy, 1–3 mm thick; pyrenes ovoid-ellipsoid, usually laterally compressed, up to ca. 2.5 cm long and 1.5 cm in diam.; endocarp bony, cross-grained, outside reticulate, inside minutely striate, glossy and sometimes densely or sparsely appressed-pubescent. *Seeds* subellipsoid, up to 22 mm long and ca. 13 mm in diam., keeled by an oblong, ca. 4 mm wide aril; testa brown, rather thick (ca. 0.5 mm).

Distribution: West and Central Africa, Uganda, Southern Sudan.

Ecology: Rain forest or gallery forest; alt. 0–1600 m.

Specimens examined. Liberia: Webo distr., Baldwin 6392 (K); 6456 (K); Grand Bassa, Dinklage 1694 (E, paratype of *D. petersianum*); Fishtown, Dinklage 1970 (B, K, type of *D.*



MAP 5. *D. angolense*

petersianum); Monrovia, *Dinklage* 2231 (B, paratype of *D. petersianum*); 2832 (P, Z); Paynesville, *Voorhoeve* 355 (BR, WAG).

Ivory Coast: Forêt de l'Anguedéou, *Aké Assi* 2911 (WAG); Bécédi, *Aké Assi* 6097 (WAG); near Aboisso, *Breteler* 5962 (WAG); Bingerville, *Chevalier* 15560 (P); Adiopodoumé, *W. de Wilde* 363 (K, P, WAG); *Geerling & Bokdam* 301 (WAG); Grand Béréby, *Oldeman* 654 (B, BR, K, P, WAG).

Ghana: Ankasa F.R., *Hall & Enti* GC 36259 (K).

Nigeria: Eket distr., near Etebi, *Daramola* FHI 55302 (K); eastern Oban, *Ujor* FHI 31795 (FHI, K).

Cameroun: Bitye, *Bates* 658 (BM); 1089 (BM, BR, Z); 1500 (BM, Z); Kribi, *Bos & Breteler* 3058 (WAG, YA); *Bos* 3154 (WAG, YA); 9 km S. of Kribi, *Bos* 3683 (WAG, YA); 4240 (WAG); km 10 Kribi – Lolodorf, *Bos* 4642 (WAG); km 31 Kribi – Lolodorf, *Bos* 4885 (WAG, YA); 11 km S. of Kribi, *Bos* 6493 (WAG); Campo, *Bos* 7036 (WAG); Kribi, *Bos & Breteler* 7187 (WAG); km 45 Kribi – Campo, *Bos & Breteler* 7311 (WAG); near Yokadouma, *Breteler* 1532 (BR, K, LISC, P, WAG, YA); Bertoua, *Breteler* 1869 (BR, K, P, WAG, YA); km 27 Yaoundé – Ayos, *Breteler* c.s. 2470 (P, WAG); 40 km N.W. of Bertoua, *Breteler* 2939 (P, WAG, YA); 40 km S.S.W. of Eséka, *W. de Wilde* c.s. 3832 (WAG); Ayos, *de Wit* 8208 (WAG); Grand Batanga, *Dinklage* 678 (HBG); 1053 (HBG, P); Buea, *Dunlap* 157 (K); Deng Deng, *Jacques-Felix* 4647 (P); 16 km S. of Nkongssamba, *Leeuwenberg & Breteler* 8766 (WAG); 7 km E. of Yingui *Leeuwenberg* 9094 (WAG); Nkam R., Ekom Falls, *Leeuwenberg* 9894 (WAG, YA); 22 km N.N.E. of Linté, *Letouzey* 8045 (BR, P); 33 km S. of Djoum, *Letouzey* 8406 (P); Mangale, *Lotz* 215 (B); Cameroun Mt., *Maitland* 1173 (K); km 50 Djoum – Oveng, *Mezeli* 49 (P); 22 km E. of Ebolowa, *Mildbraed* 5587 (HBG); near Deng Deng, *Nana* 332 (P, WAG); Bipindi, *Zenker* 2617 (B, BM, BR, COI, E, GOET, K, L, M, P, W, WU, Z, paratype of *D. angolense* var. *leucanthum*); 3265 (B, BM, BR, COI, E, EA, GOET, K, L, M, P, PRE, W, WU, Z, type of *D. angolense* var. *leucanthum*); 3371 (BM, E, K, WU); Yaoundé, *Zenker & Staudt* 46 (BM, G, K, LE, P, WAG, Z, type of *D. ferrugineo-tomentosum*).

Equatorial Guinea: near Campo, *Tessmann* 620 (K).

Gabon: Ndjolé region, *Aubrèville* 66 (P); km 7 Moanda – Franceville, *Breteler* 6378 (WAG); km 48 Lastoursville – Moanda, *Breteler* 6447 (WAG); 4 km W. of Lastoursville, *Breteler* 6522 (WAG); 70 km S.S.W. of Moanda, *Breteler* 6927 (WAG); near Libreville, *Klaine* 305 (P, WAG); 338 (LE, P, WAG); 2519 (BM, K, LE, P, WAG); 2659 (K, LE, P, WAG); 3186 (BM, P, WAG); 3439 (BR, K, P); Tchibanga, *Le Testu* 2136 (BM, K, P, WAG); Lastoursville, *Le Testu* 7652 (K, P, WAG); 7745 (P, WAG); 7961 (BM, P, WAG); Franceville, *Le Testu* 8083 (BM, P, WAG).

Zaïre: Avakubi, *Bequaert* 2139 (BR, WAG); near Kisangani, *Bokdam* 3468 (WAG); Kimvusa, *Compère* 507 (BR); Sanga, *Compère* 1720 (BR, K); Mvuazi, *Devred* 442 (BR, K); 1259 (BR, LISU, SRGH); Bas – Uele, *De Wulf* 486 (BR); 921 (BR, WAG); Luki, *Donis* 2015 (BR, K); Tshuapa, *Dubois* 210 (BR); Inéac Bongabo, *Evrard* 1168 (BR); Befale area, *Evrard* 5133 (BR); Batite – Zobia, *Gerard* 1772 (BR); Bambesa, *Gerard* 1838 (BR, K); 2462 (BR); 3199 (BR); Tukpwo, *Gerard* 3409 (BR); Bambesa, *Gerard* 5349 (BR); Yangambi, *Germain* 8518 (BR, LISC, PRE); Ivulu, *Goossens* 2768 (BR, WAG); Byungu, *A. Léonard* 2079 (BR, K); Bunyakiri, *A. Léonard* 2940 (BR, K, WAG); 3248 (BR); Bushababa, *A. Léonard* 4968 (BR); Yangambi, *Louis* 255 (BR, K, LISU, P, type of *D. angolense* var. *glabriusculum*); 364 (BR); 1145 (BR); 2707 (BR, COI, EA, LISU, M, SRGH, WAG); 3094 (BR, WAG); 6886 (BM, BR, EA, L, LD, LISC, WAG); 11570 (BR); 12503 (BR, WAG); between Ngazi and Yambuya, *Louis* 13285 (BR, WAG, Z); Yangambi, *Louis* 13297 (BM, BR, K, LISU, M, P); 15040 (BR, WAG); Weko – Bengamisa, *Louis* 16028 (BR, U, W, WAG); Yangambi, *Menantanza* 34 (BR); Yambata, *Montchal* 156 (BR, WAG); Dundusana, *Mortehan* 430 (BR); Mobwasa, *Reygaert* 1045 (BM, BR, type of *D. reygaerti*); Irangi, *Troupin* 3429 (BR, COI, K); 10286 (BR, K); La Kulu, *Van den Brande* 272 (BR).

Angola: Camondai – Dalatando, *Gossweiler* 4783 (BM, COI, K); Granja de S. Luiz, *Gossweiler* 4870 (BM, COI, K); 4875 (BM, COI, K); Dalatando – Cazengo, *Gossweiler* 5654 (BM, COI, LISU); near Cayo, *Gossweiler* 7677 (BM, COI, K, LISU, type of *D. mayumbense*);

Dundo, *Gossweiler* 13877 A (K); 13977 (B, P); Quilombo – Dalatando, *Gossweiler s.n.* (PRE); near Cacula and Cabondo, *Welwitsch* 4663 (BM, COI, G, K, LISU, P, paratype of *D. angolense*); Golungo Alto, *Welwitsch* 4664 (BM, COI, G, K, LISU, P, type of *D. angolense*).

Central African Republic: Yalinga, *Le Testu* 4161 (BM, P, WAG); 4302 (P, WAG); Nola, *Tessmann* 2016 (K); 20 km N.W. of Bambari, *Tisserant* 2027 (BM, P); Boukoko, *Equine Tisserant* 2594 (P, WAG).

Sudan: Zande country, *Wyd* 353 (BM).

Uganda: Busingiro area, *Harris* 1130 (K, WAG).

Notes. The synonymy of this species has, at least partly, already been established by PELLEGRIN (1913), MOSS (1928), and HAUMAN (1955). Within its large area of distribution some variability can be observed in the indumentum of the leaves, more specifically at the rate in which the indumentum is shed. On this last character PELLEGRIN based his var. *leucanthum*, later duplicated by HAUMAN in his var. *glabriusculum*. Part of the syntypes cited by PELLEGRIN (*Zenker* 2617 and 3265) were also cited by HAUMAN when publishing his variety. Another syntype of the var. *leucanthum* (*Mann s.n.* from Principe Island) belongs to *D. bocageanum*. The variation in glabrescence of the leaves is very considerable indeed, but does not justify the distinction of separate infraspecific taxa.

The name *D. rufotomentosum* appeared only once (1896-a) in ENGLER's publications about this genus and has never been validated by a description. All species published by ENGLER in september 1896 (1896-b) were classified in his treatment for *Die natürlichen Pflanzenfamilien* (1896-a) except for *D. ferrugineo-tomentosum*. At the place where in ENGLER's classification this species could be expected, appears the name *D. rufotomentosum*. In his later classification (1912-a) *D. ferrugineo-tomentosum* does indeed appear in this same place and the name *D. rufotomentosum* is no longer mentioned. Both names are well applicable to *D. angolense*. When ENGLER described *D. ferrugineo-tomentosum*, however, the manuscript for *Die nat. Pflanzenf.* had already been completed. Most probably he originally named the species *D. rufotomentosum*, but in describing it changed the name into *D. ferrugineo-tomentosum*. I consider the former as an earlier variant of the latter, validly published name.

Whether peduncle and petiole are fused or not at all, appears to be the only distinguishing character between *D. angolense* and *D. petersianum* respectively. A duplicate (*Dinklage* 1670 (E)) of one of the syntypes of *D. petersianum*, however, has the peduncle clearly adnate to the petiole, and quite a few specimens show a variation in this character from completely free to completely adnate (e.g. *Breteler* 1869, *Gossweiler* 8470, *Letouzey* 8406, *Mildbraed* 5587, *Tessmann* 620, *Zenker* 3265). *D. petersianum* can therefore not be maintained as a distinct taxon.

D. angolense is closely allied to *D. bocageanum*. The main difference is found in the pistil, which is trilocular with a trilobed style in the former and bilocular with a bilobed style in the latter. Besides this no other useful character has been found to support *D. angolense* as a distinct species. It might suffice, but more material from the isolated area of distribution of *D. bocageanum* is needed to decide definitively whether both species can be kept separate.

D. angustisquamulosum Engl. & Ruhl. = *D. heudelotii* (Planch. ex Oliv.) Baill.

D. angustisquamulosum Engler & Ruhland, 1902: 86; Engler, 1912-a: 584; De Wildeman, 1919: B17. Type: Cameroun, Grand Batanga, *Dinklage n.?* (holotype: B†; lectotype: BM, photograph WAG).

Notes. No collector's number was mentioned when the authors designated the type. A fragment of the holotype found in BM has been designated lectotype. The original set of DINKLAGE's Cameroun collection remained in Hamburg. The only specimen of this collection there which fits very well the description of *D. angustisquamulosum* is *Dinklage 828* from Grand Batanga. It is impossible to prove, however, that a duplicate of this particular specimen was indeed the holotype lost at Berlin.

The material of *D. angustisquamulosum* shows some differences with material of *D. heudelotii*. These, however, are restricted to indumentum of vegetative parts and leaf shape, and thus concern very variable characters. This variation will be discussed in extenso when the complex species *D. heudelotii* is treated.

***D. arachnoideum* Bret., sp. nov.**

Fig. 13 Map 6

Liana, frutex scandens vel frutex. Ramulorum indumentum ferrugineo-brunneum, pilis brevibus subappressis. Folia elliptica, basi cordata, subcordata vel obtusa, apice apiculata vel abrupte breviter acuminata, costa ut plerumque nervis lateralibus utrinque 4–7 supra impressis, supra prope apicem et acumine glandulosa, subtus arachnoideo-pubescentia, pilis albis. Inflorescentia laxa, ferrugineo-brunnea, pedunculo a petiolo libero. Sepala reflexa. Petala usque medium bilobata, glabra vel subglabra. Ovarium triloculare, lanatum. Fructus pilosus, pilis ferrugineis.

Type: Zaïre, Kinshasa-Maluku, *Carrington 109* (holotype: WAG).

Diagnostic characters. Liana, lianescent shrub, or shrub. Branchlets with a rusty-brown indumentum of short subappressed hairs. Leaves elliptic, ca. 2–2.5 times as long as wide, (5)9–12(15) × (2.5)4–6(7) cm, cordate, subcordate, or obtuse at base, top apiculate or abruptly (sometimes gradually) short-acuminate; midrib and usually the 4–7 pairs of lateral nerves impressed above; glandular above near the top and on the acumen, beneath with a web of white hairs. Inflorescences loose, up to 6 times branched, rusty-brown-short-hairy; peduncle (3)7–11(30) mm long. Sepals reflexed. Petals 2.5–3.5 mm long, 0.5–2 mm split, glabrous or nearly so. Ovary 3-locular, lanate, Fruits up to ca. 13 mm long, shortly rusty-brown-hairy.

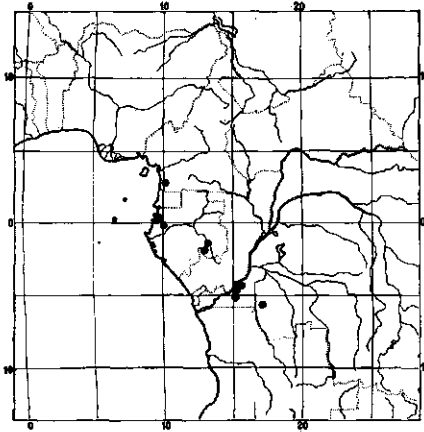
Description. Liana reaching top of tall trees, lianescent shrub, or shrub. Stems somewhat angular, main trunk usually 5-lobed; bark shallowly longi-



FIG. 13. *D. arachnoideum*: 1. flowering branch, $\frac{1}{2} \times$; 2. leaf, $\frac{1}{2} \times$; 3. leaf, $\frac{1}{2} \times$; 4. detail of arachnoid indumentum on leaf, $1\frac{1}{2} \times$; 5. cross section of midrib, $3 \times$; 6. leaf top upper side, $1\frac{1}{2} \times$; 7. inflorescence, $1 \times$; 8. flower just opened, $6 \times$; 9. fully expanded flower, $6 \times$; 10. pistil with staminodes, $6 \times$; 11-13. 1-3-lobed fruits, $1\frac{1}{2} \times$. (1, 7. Carrington 109; 2, 8-10. Klaine 1310; 3, 5. Carrington 141; 4. Pobéguin 91; 6. Breteler 6251; 11-13. Carlier 141-bis).

tudinally fissured. Branches mostly shallowly grooved, with 5 rows of rather prominent lenticels, one row in each groove, short brown-hairy, glabrescent. *Branchlets* with a rusty-brown, usually dense indumentum of short, subappressed, usually curved hairs, glabrescent or not. *Stipules* early caducous, narrowly triangular, 5–7 mm long, at most 1 mm wide at base; appressedly short brown-hairy. *Leaves*: petiole subterete, 2–5(7) mm long, densely appressed-brown-hairy; blade elliptic, sometimes oblong (1.75)2–2.5(3) times as long as wide, (5)9–12(15) × (2.5)4–6(7) cm, cordate, subcordate, truncate, or obtuse and often unequal sided at base; apiculate or abruptly short-acuminate (sometimes gradually so) at top; midrib and usually also the 4–7 pairs of main lateral nerves impressed above and prominent beneath; usually brownish-short-hairy on the midrib and often more sparsely so on the lateral nerves above; beneath entirely covered by a web of white hairs (often forming a close felt on young, not yet fully expanded leaves), and sparsely, shortly appressed-brown-hairy on the midrib and often on the lateral nerves; both sides glabrescent; the (1)2–4(12) mm long acumen (apiculum) often densely brown-hairy on both sides; glands on both sides, above rather prominent, mainly concentrated towards and on the acumen, beneath usually along-side and rather close to midrib. *Inflorescences* loose, up to 6 times branched, usually several together on rather long, leafless (or with strongly reduced leaves) axillary branches, rusty-brown-hairy like the branchlets; peduncle (3)7–11(30) mm long, the first branches often as long as or longer than the peduncle; bracts and bracteoles narrowly triangular, the lower up to 3 mm long, the upper 0.5–1 mm long, mostly more than halfway recalcrescent towards the next bifurcation. *Pedicel* ca. 1–4 mm long, the upper part usually short, but distinct, less than 1 mm long. *Calyx* rounded to obtuse at base. *Sepals* reflexed equal or not, free or very slightly united at base, narrowly oblong-elliptic or narrowly ovate, 2–3 × 0.5–1 mm, top obtuse, rounded or acute, outside, and inside in the upper part, shortly rusty-brown-appressed-pubescent. *Petals* slender, erect or loosely spreading, sometimes reflexed, top often recurved, very shortly adnate to filaments at base, 2.5–3.5 mm long, 0.5–2 mm split, both sides glabrous or with a few, short, appressed hairs outside; lobes narrow, often spreading, top subacute, flat or nearly so. *Stamens* usually erect, 3.5–4.5 mm long, glabrous; anthers ca. 0.5 mm long, connective not very prominent. *Staminodes* subquadrate, less than 0.5 × 0.5 mm, top truncate or emarginate, glabrous or with a few hairs. *Pistil* slender, erect 3.5–4.5 mm long, lanate except for the upper part of the 3(–4)-lobed style; lobes short, less than 0.5 mm long; ovary 3(–4)-locular; ovules usually with an obturator. *Fruits* 1–3-lobed, 1–3-seeded, when 1-lobed remarkably unilaterally developed, beaked; mericarps subglobose, slightly laterally compressed, 8–13 mm long, 6–11 × 5–10 mm across; exocarp densely to sparsely short-rusty-brown-hairy, together with the mesocarp most probably not over 2 mm thick in fresh fruits; endocarp pergamentaceous, rather smooth outside, inside glossy or shining and finely striate. *Seed* subellipsoid, ca. 6–10 mm long, 4–8 mm in diam; testa thin, brown, prominently veined.

MAP 6. *D. arachnoideum*



Distribution: South-West Cameroun, Gabon, western Zaïre (not yet collected in Congo).

Ecology: Rain forest, gallery forest.

Specimens examined. Cameroun: 20 km S.E. of Kribi, *Bos* 6675 (WAG).

Gabon: km 23 Moanda – Franceville, *Breteler* 6251 (WAG); 6772 (WAG); 60 km S.S.W. of Moanda, *Breteler* 6906 (WAG); near Mandji, *Fleury* 26725 (P); near Libreville, *Klaine* 213 (P, WAG); 1310 (BM, K, LE, P); near Ngegoni Lake, *Pobéguin* 91 (P).

Zaïre: Kimuenza, *Carlter* 141 (BR, WAG); 141-bis (BR, WAG); Kinshasa – Maluku, *Carrington* 109 (WAG, type); Kinshasa – Lovanium, *Carrington* 141 (WAG); Kisantu, *Pauwels* 1540 (BR); 1795 (BR); 3353 (BR); 3393 (BR, WAG); 3791 (BR); 4092 (BR); between Kingundji and Popokabaka, *Vanderyst* 15244 (BR, WAG).

Notes. *D. arachnoideum* might easily be confused with *D. librevillense* by the shape of leaves and inflorescences, but may be distinguished from the latter as follows:

Young parts (branchlets and inflorescences) rusty-brown-hairy; midrib and usually the main lateral nerves impressed above; leaves beneath with a web of white hairs. ***D. arachnoideum***

Young parts (branchlets and inflorescences) brownish- to dark red-hairy; midrib and usually the main lateral nerves raised above; web of white hairs absent beneath ***D. librevillense***

D. arenarium Bret., sp. nov.

Fig. 14 Map 7

D. deflexum (Klotzsch) Engler, 1895: 235, p.p. (concerning habitats in Tanzania).

D. deflexum Auct. non (Klotzsch) Engler, Moss, 1928: 128, p.p. (concerning Tanzania material); Brenan & Greenway, 1949: 130 (as *D. deflexum* Klotzsch);

Torre, 1963: 323, p.p. (as regards 'also in Tanganyika'); Verdcourt & Trump, 1970: 64.

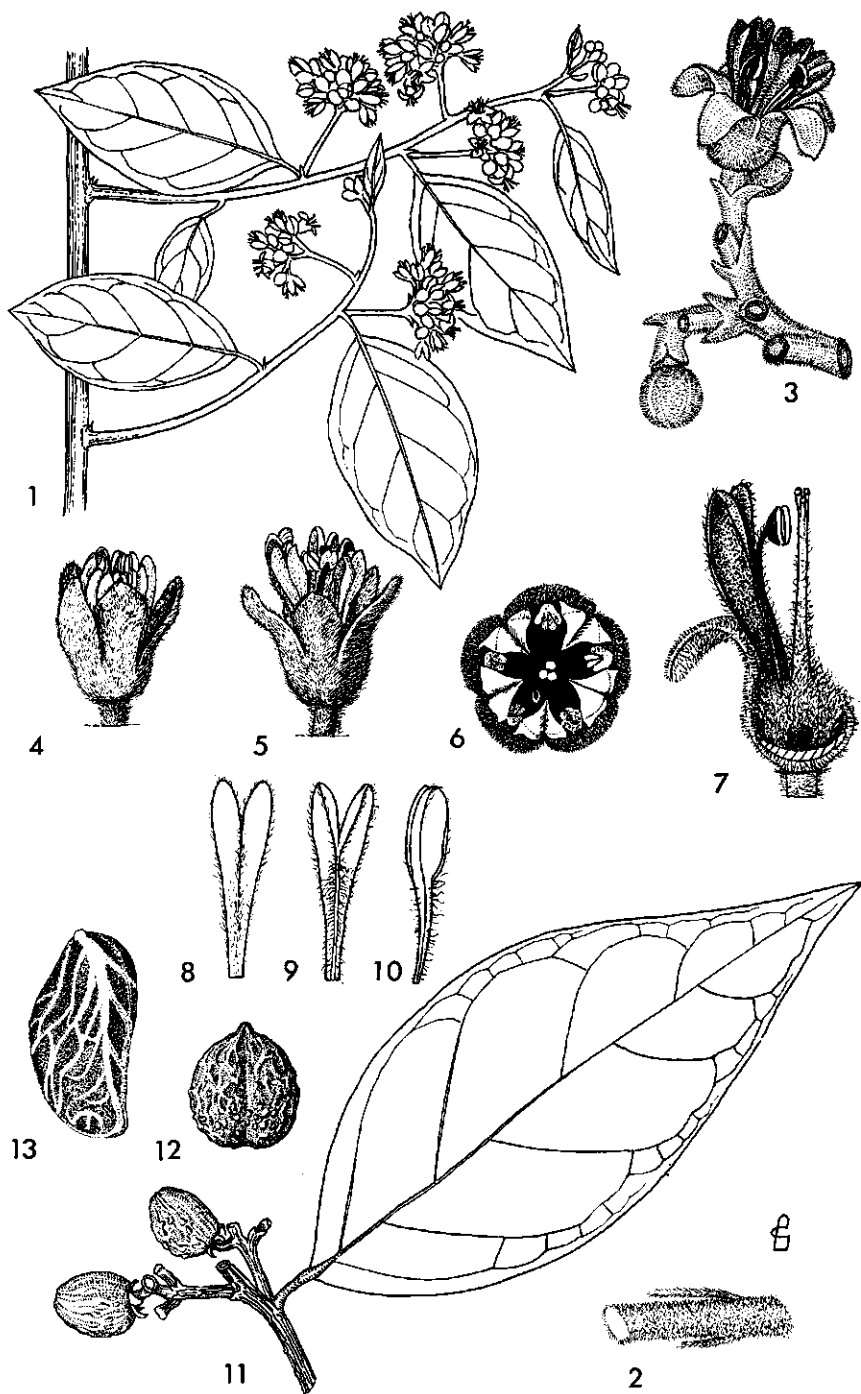
Chailletia deflexa Auct. non Klotzsch, Barth, 1896: 498.

Liana, frutex scandens vel frutex. Ramuli dense tomentosi, glabrescentes, demum lenticellati. Folia coriacea, elliptica usque ovata, saepe margine revoluta, nervis lateralibus utrinque (4)5–7(8); juvenilia utraque pagina breviter pubescentia, supra glabrescentia. Inflorescentia breviter pedunculata, tomentosa, pedunculo a petiolo libero. Sepala erecta, patentia vel reflexa. Petala breviter biloba, intus longe pilosa. Ovarium triloculare, lanatum. Fructus tomentellus, tuberculatus.

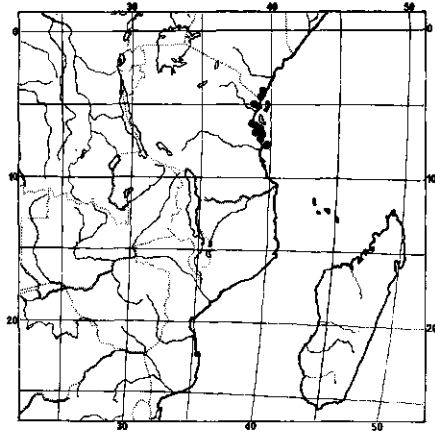
Type: Tanzania, Dar es Salaam – Kiliwa Rd., Vikindu For. Res., *O. J. Hansen 486* (holotype: WAG).

Diagnostic characters. Liana, lianescent shrub, or shrub. Branches glabrous or glabrescent, with minute, dispersed lenticels. Branchlets densely tomentose, becoming glabrescent and lenticellate with age. Leaves coriaceous, often with strongly revolute margins, with (4)5–7(8) pairs of lateral nerves; shortly pubescent on both sides when young, glabrescent above, beneath never completely glabrous; glands rare or absent, if present inconspicuous. Inflorescences tomentose; peduncle (4)6–11(13) mm long. Sepals tomentose, 2.5–3(3.5) × 1–1.5 mm. Petals 2.5–3.5 mm long, long-pilose inside below the short (less than 1 mm) split. Stamens as long as the petals. Ovary 3-locular, lanate. Fruits tomentellous, tuberculate; endocarp inside with more or less appressed, dirty-white hairs.

Description. Liana, lianescent shrub, or shrub. *Branches* glabrous or glabrescent, with minute, dispersed lenticels. *Branchlets* densely tomentose, usually glabrescent and lenticellate with age. *Stipules* early caducous, narrowly triangular, 1–4 mm long, the lower usually 1 mm shorter than the upper, tomentose. *Leaves*: petiole semiterete or slightly canaliculate above, (3)4–6(10) mm long, tomentose; blade coriaceous, dark green above when fresh, elliptic, ovate-elliptic, or ovate, (1.5)2–2.25(2.75) times as long as wide, (3)6–11(15) × (2)3–5(8) cm, base equal or slightly unequal, rarely strongly unequal, cuneate, rounded, or sometimes obtuse, gradually tapering into a rounded, subacute, or acuminate top, the acumen up to ca. 1 cm long; midrib and the (4)5–7(8) pairs of lateral nerves inconspicuous above, prominent beneath, tertiary venation reticulate, often prominent on both sides; shortly pubescent on both sides, often densely so when young, glabrescent above, beneath never completely glabrous; margin often strongly revolute; glands rare or absent, if present few and inconspicuous (only beneath and mainly along the midrib). *Inflorescences* rather congested, 3–5 times branched, tomentose; peduncle (4)6–11(13) mm long; bracts and bracteoles minute, triangular, up to ca. 1 mm long. *Pedicel* up to 2.5 mm long or flowers sessile to subsessile; upper part of pedicel usually 0, rarely up to



MAP 7. *D. arenarium*



0.5 mm long. *Calyx* rounded to obtuse at base. *Sepals* erect, spreading, or reflexed, free or very shortly united at base, subequal, obovate-oblong, 2.5–3(3.5) × 1–1.5 mm, top obtuse to rounded, tomentose both sides, more densely so outside. *Petals* erect, narrowly oblong-obovate or spatulate in outline, at base at most 1 mm adnate to filaments, 2.5–3.5 mm long, up to 1 mm split, ca. appressed-pilose-tomentose outside below split, inside more loosely and often more densely pilose below split; lobes concave, top rounded. *Stamens* 2.5–3.5 mm long, often very slightly shorter than the petals; filaments hairy like the petals, more sparsely so or subglabrous; anthers less than 1 mm long; connective prominent, glabrous. *Staminodes* separate, subquadrate to transversely oblong, up to 0.5 × 0.5 mm, top truncate or slightly bilobed, glabrous or with a few lanate hairs inside. *Pistil* 2.5–3.5(4) mm long, lanate, the ovary densely so; top with 3 less than 1 mm long lobes; ovary subglobose, 3-locular; ovules with an obturator. *Fruits* subellipsoid, often slightly curved and laterally slightly compressed, 14–20 mm long, ca. 9–15 mm in diam., top obtuse, rounded, or slightly apiculate 1–3-seeded; exocarp tuberculate, densely tomentellous, together with mesocarp most probably not over 1–1.5 mm thick when fresh; mesocarp exuding a red slime, turning dark-red or brown-black when dry; endocarp pergamentaceous to somewhat bony, slightly rugulose outside, inside with a dense indumentum of up to 2.5 mm long, often somewhat curly, rather weak hairs, subappressed towards the top of the fruit. *Seed* subellipsoid, 8–14 mm long, up to 7 mm in diam.; testa thin, brown, conspicuously veined, glabrous; cotyledons plano-convex, firm, somewhat rugose outside.

FIG. 14. *D. arenarium*: 1. flowering branch, $\frac{5}{6} \times$; 2. part of branchlet with stipules, $5 \times$; 3. part of inflorescence, $5 \times$; 4. flower just opened, $5 \times$; 5. fully expanded flower, $5 \times$; 6. flower just opened from above, $10 \times$; 7. pistil with staminodes, $10 \times$; 8–10. petal outside, inside and lateral view, $10 \times$; 11. fruiting branchlet, $\frac{5}{6} \times$; 12. fruit, $\frac{5}{6} \times$; 13. seed, $2\frac{1}{2} \times$. (1–3, 7–10. Faulkner 2202; 4–6. Hansen 486; 11. Raymond 44; 12. Semsei 1349; 13. Hansen 420).

Distribution: S.E. Kenya, Tanzania.

Ecology: closed forest or dense bush, and, as far as reported, on sandy soils.

Specimens examined. Kenya: Kwale District, ca. 13 km W.S.W. of Gazi, *Drummond & Hemsley 3950* (B, BR, K); near Kwale, *Moomaw 1087* (EA); *Verdcourt 3923* (BR, EA, K).

Tanzania: s.l., *Busse 423* (EA, K, P); Amboni, *Faulkner 1618* (BR, K); *1674* (B, BR, K, LISU); Tanga Distr., *Faulkner 2202* (BR, EA, K, LISC); Kisarawe Distr., Nyeburu, *Fundi 6* (EA, K); Mafia Is., Chungarumo, *Greenway 5358* (EA, K); Pugu Hills F.R., *Hansen 420* (WAG, paratype); *448* (WAG); Dar es Salaam – Kiliwa, Vikindu F.R., *Hansen 486* (WAG, type); Amboni, *Holst 2700* (G, K, M); s.l., *Holtz, Inst. Amani 6918* (EA); Zanzibar, *Kirk s.n.* (K); Bagamoyo, *Kirk s.n.* (K); Dar es Salaam, *Kirk 125* (?) (K, LE); Amboni, *Peter 52223* (B); Dar es Salaam, *Raymond 44* (EA); Mafia Is., *Schlieben 2651* (B, BR, G, HBG, LISC, M, P, Z); Kisiju, *Semsei 1349* (EA, K); Bagamoyo Distr., Bana F.R., *Shabani 130* (EA, K); Pugu Hills, *Vaughan 2477* (BM, EA); Mafia Is., *Wallace 764* (K).

Notes. This species has been confused by several authors with *D. deflexum*, and as a result it remained undescribed. ENGLER's misidentification (1895: 235) was followed, partly for lack of evidence against it, as material of *D. deflexum* was and is still very scarce in the principal herbaria. *D. arenarium* is in fact quite different from *D. deflexum* and may be distinguished as follows:

Inflorescence appressed-pubescent; peduncle adnate to the petiole, rarely not so; petals 3–4.5 mm long, 1.5–2.5 mm split, glabrous inside; fruit velutinous. Moçambique. **D. deflexum**

Inflorescence tomentose; peduncle free from the petiole; petals 2.5–3.5 mm long, less than 1 mm split, pilose inside; fruit tomentellous. Kenya, Tanzania **D. arenarium**

D. arenarium is most closely related to *D. barbosa*, from which it is geographically separated. The most useful differential characters are:

Leaves never completely glabrous beneath, usually shortly pubescent all over the lower surface, margins usually strongly revolute; peduncle (4)6–11(13) mm long; petals 2.5–3.5 mm long, less than 1 mm split **D. arenarium**

Leaves glabrous beneath, or sparsely, shortly appressed-hairy on midrib and main lateral nerves, margins not or only slightly revolute; peduncle 2–5 mm long; petals (4)4.5–5.5(6) mm long, 1–1.5 mm split **D. barbosa**

D. argenteum Engl. = **D. bangii** (F. Didr.) Engl.

Note. For details see under *D. bangii*.

D. aruwimense Engl. = **D. madagascariense** Poir.

D. aruwimense Engler, 1912-a: 585, nomen; 1912-b: 444, t. 53 D–F; De

Wildeman, 1919: B17; Hauman, 1958-a: 332. Type: Zaire, Aruwimi, *Mildbraed 3301* (holotype: B†; lectotype: B).

Note. Not being aware of the presence of an isotype at the Berlin herbarium, HAUMAN (l.c.) treated this species on the base of ENGLER's description only and maintained it as a distinct taxon. The characters of the isotype, however, show that *D. aruwimense* falls completely within the variation of *D. madagascariense* (see also under *D. abrupti-acuminatum*).

D. aurantiacum Engl. = **D. longitubulosum** Engl.

D. aurantiacum Engler, 1912-a: 593; De Wildeman, 1919: B17; Engler & Krause, 1931: 9. Type: Cameroun, Bipindi, *Zenker 2591* (holotype: B†; lectotype: GOET; isotypes: BM, BR, E, K, P, W, WU, Z).

Note. ENGLER (l.c.) placed *D. aurantiacum* close to *D. longitubulosum*, small differences in the shape and size of the leaves being the only characters to separate the type material of the two species. Recent material from Cameroun, however, shows that these small differences do not justify specific segregation (see also under *D. batesii*).

D. aureonitens Engl. = **D. mossambicense** (Kl.) Engl.

D. aureonitens Engler, 1911: 248; 1912-a: 573; 1915: 845; Moss, 1928: 119; Torre, 1963: 322; Verdcourt & Trump, 1970: 66. Type: Tanzania, Mizozue (Misoswe), *Holst 2218* (lectotype: K; isotypes: COI, M).

Note. *D. aureonitens* was based by ENGLER on several syntypes all lost at Berlin. Of the duplicate material *Holst 2218* at K has been designated lectotype.

The characters used to distinguish between this species and *D. mossambicense* are restricted to the indumentum, which however, is very variable. VERDCOURT and TRUMP's conclusion (l.c.) that there is a continuous range of variation between the two extreme types could be confirmed.

D. bakerianum Exell = **D. madagascariense** Poir.

D. bakerianum Exell, 1927: 68; Exell & Mendonça, 1951-b: 323 (as *D. bakerianum*). Type: Angola, Cabinda, Pangua Mungo, *Gossweiler 6279* (holotype: BM; isotypes: COI, K, LISU).

Note. The type-material of *D. bakerianum* fits completely within the variable *D. madagascariense* (see also under *D. abrupti-acuminatum*).

D. bangii (F. Didrichsen) Engler, 1896-a: 349; De Wildeman 1919: B18; Hauman, 1958-a: 346, p.p.

Basionym: *Chailletia bangii* F. Didrichsen, 1854: 195; Barth, 1896: 498.

Type: Zaïre, sin.loc., *Smith s.n.* (holotype: C, isotype: BM; the KW-sheet cited below may be an isotype as well).

D. rufipile (Turczaninoff) Engler, 1896-a: 349; Durand & Schinz, 1896: 90; Th. & H. Durand, 1909: 95, p.p.; Engler, 1912-a: 571; Pellegrin, 1913: 643; De Wildeman, 1919: B62, p.p.; Exell, 1927: 67, p.p.; Exell & Mendonça, 1951-b: 328, p.p. Basionym: *Chailletia rufipilis* Turczaninoff, 1863: 611; Oliver, 1868: 342. Type: ? duplicate of the type of *Ch. bangii* (lectotype: KW).

D. argenteum Engler, 1902: 82; 1912-a: 571; Pellegrin, 1913: 643; De Wildeman, 1919: B17; Exell, 1927: 67; Hutchinson & Dalziel, 1928-a: 324; Exell & Mendonça, 1951-b: 326; Hauman, 1958-a: 342; Keay, 1958: 436; White, 1962: 185. Type: Cameroun, Lolodorf, *Zenker 1384* (holotype: B†; lectotype: GOET; isotypes: BM, E, G, K, LE, P, W, WU, Z).

D. patenti-hirsutum Ruhland, 1902: 86; Th. & H. Durand, 1909: 95; Engler, 1912-1: 583; De Wildeman, 1919: B57; Hauman, 1958-a: 341. Type: Zaïre, sin. loc. *Dewèvre 841* (holotype: BR; isotype: BM).

D. patenti-hirsutum Ruhland var. *longibracteolatum* Hauman, 1955: 351; 1958-a: 342. Type: Zaïre, Kibambi, *Callens 3759* (holotype: BR).

D. thonneri De Wildeman, 1911: 224, t.ix; Engler 1912-a: 571; De Wildeman, 1919: B69; Exell & Mendonça, 1951-b: 326, p.p.; Hauman, 1958-a: 338. Type: Zaïre, Mombonga, *Thonner 148* (holotype: BR; isotype: K).

D. thonneri De Wildeman var. *longistipulatum* Hauman, 1955: 351; 1958-a: 341. Type: Zaïre, Walikale, *Bequaert 6514* (holotype: BR).

D. thonneri De Wildeman var. *polyneuron* Hauman, 1955: 351; 1958-a: 340. Type: Zaïre, Boende, *Gorbatoff 253* (holotype: BR).

D. thonneri De Wildeman var. *ellipticum* (R. E. Fries) Hauman, 1958-a: 340; Torre, 1963: 47. Basionym: *D. ellipticum* R. E. Fries, 1916: 114, t. 12, f. 10-12; Moss, 1928: 122 (in synonymy to *D. rhodesicum* Sprague & Hutch.); Exell & Mendonça, 1951-b: 325. Type: N.E. Zambia, Kawendimusi, *R. E. Fries 727a* (lectotype: UPS; isotype: Z).

D. holosericeum Engler, 1912-a: 587; Pellegrin, 1913: 643; Guinea Lopez, 1946: 305; Hauman, 1958-a: 342. Type: Equatorial Guinea, near Nkolentangan, *Tessmann 161* (holotype: B†; lectotype: K; isotype: BM).

Diagnostic characters. Liana, lianescent shrub, or shrub. Branchlets densely hirsute. Stipules divided into 2(-3) separate, subulate segments, at least on the upper side of the branchlets. Leaves elliptic or nearly so, cordate, subcordate, or rounded at base, top acute to shortly acuminate, (2.5)6-14(19) × (1.5)3-6(8) cm, with 6-10(13) main lateral nerves on each side of midrib, usually impressed above; beneath with a closely appressed, often long persistent, web-like indumentum of white hairs. Inflorescences congested, (5)10-30(70)-

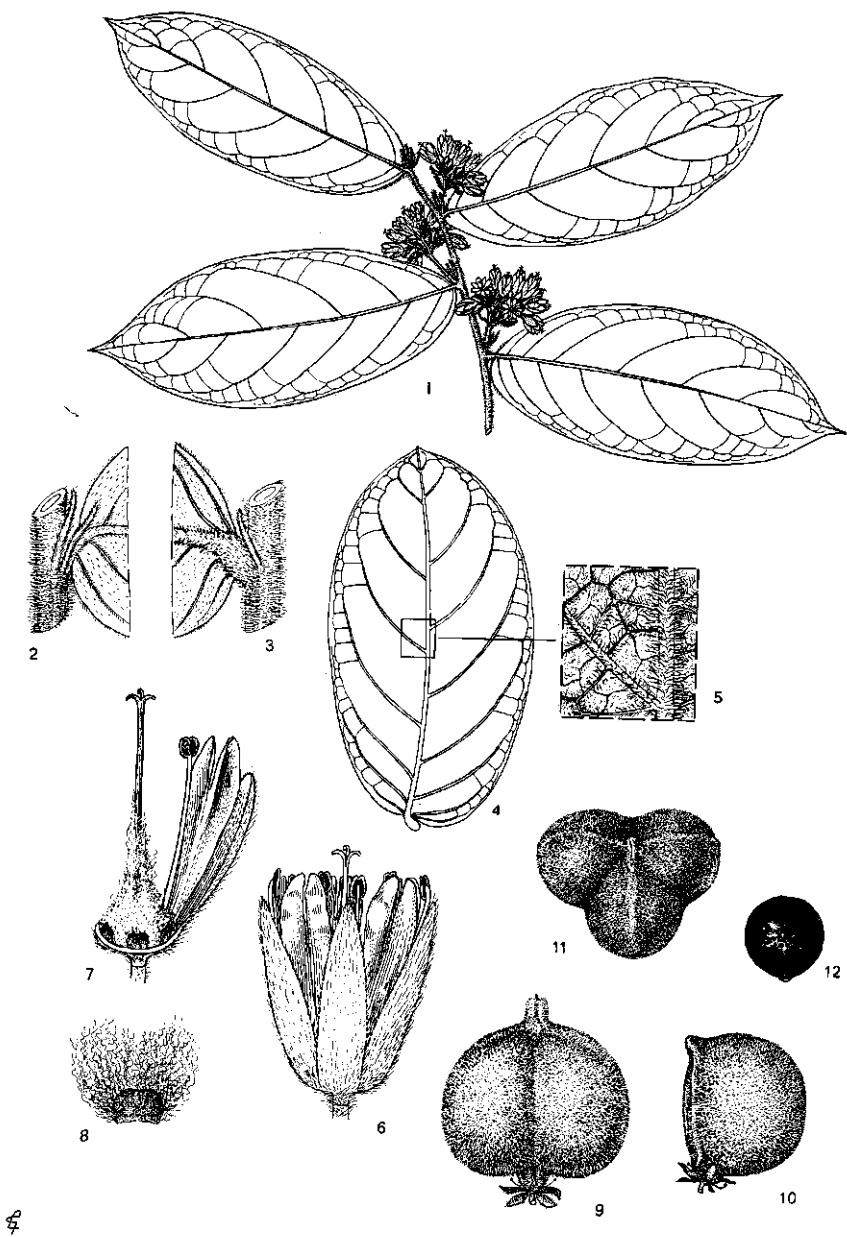


FIG.15. *D. bangii*: 1. flowering branch, $\frac{1}{2} \times$; 2. upper stipule, $2 \times$; 3. lower stipule, $2 \times$; 4. lower surface of leaf, $\frac{1}{2} \times$; 5. detail of indumentum, $2 \times$; 6. flower, $5 \times$; 7. pistil with staminodes, $5 \times$; 8. staminode, $10 \times$; 9. 2-seeded fruit, $1 \times$; 10. 1-seeded fruit, $1 \times$; 11. 3-seeded fruit from above, $1 \times$; 12. seed, $1 \times$. (1, 6-8. Zenker 1384; 2-5. Le Testu 9099; 9. W. de Wilde 2856; 10. Bos 5365; 11-12. N. Hallé 1945).

flowered; peduncle (1)2–10(17) mm long. Sepals erect, (3.5)4–5(6) mm long. Petals (4)4.5–6.5(7.5) mm long, (0.5)1–1.5(2.5) mm split. Stamens mostly slightly shorter than petals, never longer. Pistil (4.5)5–7(7.5) mm long; ovary densely lanate. Fruits velutinous.

Description. Liana reaching top of tall trees, lianescent shrub, or shrub. *Trunk* up to at least 6 cm in diam., with a grey, rather smooth bark. *Wood* cylinder almost divided into several segments by radiately intruding bark. *Branches* glabrescent with age, often with 5, rather prominent rows of lenticels, often grooved. *Branchlets* often hollow, with a somewhat tomentose, densely hirsute or even hispid, rather long persistent, usually brown indumentum. *Stipules* (1)3–8(12) mm long, simple or divided to the base into 2(–3), subulate, unequal segments, (1)2(–3) on the upper side, mostly undivided or with 2 segments on the lower side of the branchlets, the lower stipules shorter than the upper, with similar indumentum as the branchlets. *Leaves:* petiole subterete, (1)2–6(12) mm long, hairy like the branchlets; blade papery, elliptic, obovate-elliptic, or obovate, often oblique and cordate, subcordate, obtuse, or rounded at base, acute to shortly acuminate (seldom rounded and mucronate) at top, (1.5)2–2.5(3.5) × as long as wide, (2.5)6–14(19) × (1.5)3–6(8) cm, with 6–10(13) main lateral nerves on each side of midrib, these rather inconspicuous and usually impressed above, prominent beneath; above with a subappressed or erect, hirsute or subtomentose, mostly brownish indumentum, usually very early caducous except on the midrib and main lateral nerves, similar indumentum beneath but usually longer persistent and mixed with a closely appressed, loose or dense, caducous or persistent, web-like indumentum of white hairs, often giving the lower surface a grey or even white appearance; glands absent or inconspicuous. *Inflorescence* a (0.5)1–2(3.5) cm long, ca. (5)10–30(70)-flowered, congested cyme, with similar indumentum as the branchlets; peduncle (1)2–10(17) mm long; bracts and bracteoles subulate, variable in length, 1–9 mm long, often curved. *Pedicel* 1–3(5) mm long, the upper part 0–1 mm long. *Sepals* erect, sometimes slightly spreading, nearly free or slightly united at base, ovate-triangular to oblong-elliptic, ovate-elliptic or oblong-triangular, (3.5)4–5(6) × (1)1.5–2.5 mm, usually concave, top acute, acutish, rounded or obtuse, outside appressed-pubescent to strigose, the parts covered in bud usually woolly-tomentose, sometimes completely woolly-tomentose and then often intermixed with some strigose hairs, inside silky appressed-puberulous, mainly in the upper part. *Petals* erect, slightly longer than sepals, oblong to narrowly obovate-elliptic, gradually tapering towards base, (4)4.5–6.5(7.5) × (1)1.5–2.5 mm, (0.5)1–1.5(2.5) mm split, glabrous on both sides, exceptionally with a few hairs outside below split, inside firmly keeled, base shortly united with filaments, rarely not; lobes concave, top rounded. *Stamens* erect, usually slightly shorter than the petals, at most equal in length, 4–6(7) mm long, glabrous, exceptionally with a few hairs near base inside; anthers ca. 1 mm long, connective prominent. *Staminodes* subquadrate, variable in shape and size, obtuse or bilobed at top, less than 1 × 1 mm, lanate inside, rarely glabrous or nearly so. *Pistil* erect, (4.5)5–

7(7.5) mm long; ovary subglobose, densely lanate 3(–4)-locular; style glabrous to completely lanate, top shortly 3(–4)-lobed; obturator often present. *Fruits* yellow to orange at maturity, up to ca. 3 cm in diam., consisting of 1–3(4) mericarps, usually with a thick, short stipe at base, not or up to 5 mm apiculate; mericarp subglobose to ovoid, obovoid, or ellipsoid, usually slightly laterally compressed, 13–20(35) mm long, 9–15 mm in diam., dorsally often slightly keeled in the upper part; exocarp rather smooth, at least when fresh, rusty-brown to pale brown velutinous, the hairs often caducous and irritating; mesocarp pulpy, fibrous, together with exocarp up to ca. 4 mm thick, yellow–orange at maturity; endocarp bony, at most 0.5 mm thick, muricate outside, inside smooth, glossy, very finely striate. *Seed* subglobose to ellipsoid, 8–17 mm long, 7–11 mm in diam.; testa rather firm, dark brown-black, smooth or slightly reticulate, usually glossy, up to ca. 0.5 mm thick; cotyledons sub-plano-convex.

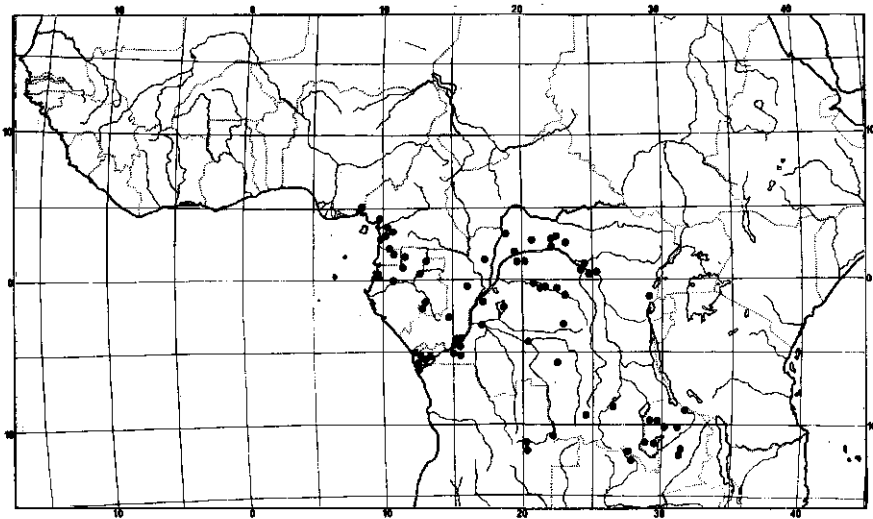
Distribution: Central Africa, Angola, Zambia.

Ecology: Rain forest, gallery forest, evergreen thickets. Alt. up to ca. 1500 m.

Specimens examined. Cameroun: 8 km S. of Kribi, *Bos* 4808 (WAG); km 16 Kribi – Lolodorf, *Bos* 5365 (WAG, YA); 11 km S. of Kribi, *Bos* 6492 (WAG, YA); 30 km S. of Kribi, *Bos* 7025 (WAG); ca. 70 km S.W. of Eséka, *W. de Wilde* 2856 (WAG, YA); km 17 Douala – Edea, *Leeuwenberg* 9507 (WAG, YA); Cameroun R., *Mann* 747 (K, P); Lolodorf, *Zenker* 1384 (BM, E, G, GOET, K, LE, P, W, WU, Z, type of *D. argenteum*).

Equatorial Guinea: Nkolentangan, *Tessmann* 161 (BM, K, type of *D. holosericeum*); Bebai, near Campo, *Tessmann* 618a (K); sin. loc., *Tessmann* 847 (K.)

Gabon: km 23 Moanda – Bakoumba, *Breteler* 6512 (WAG); 70 km S.S.W. of Moanda, *Breteler* 6870 (WAG); 60 km S.S.W. of Moanda, *Breteler* 6910 (WAG); 6968 (WAG); Makokou, *N. Hallé* 1104 (P); 10 km S.W. of Ndjolé, *N. Hallé* 1945 (P, WAG); Bélinga, *N. Hallé*



MAP 8. *D. bangii*

3415 (P); Hallé & Le Thomas 472 (P, WAG); near Libreville, Klaine 1768 (K, P); 2062 (P); 2988 (K, P); 3175 (P); 3191 (K, P); Médoumou, Le Testu 9099 (BM, P, WAG); Malène, Le Testu 9390 (BM, P).

Congo: near Brazzaville, Chevalier 11188 (P); 27696 (P); Epéna, de Néré 981 (P); Fort Rousset region, Descouings 7793 (MPU); 7799 (MPU, WAG); near Brazzaville, Farron 4037 (P); plateaux Batékés, Farron 5133 (P); near Brazzaville, Koechlin 875 (P); km 9 Kibossi – Koubola, Sitha 981 (MPU); Brazzaville Rd., Thollon 4037 (P, WAG).

Zaïre: Yambuya, Bequaert 1334 (BR, WAG); Walikale, Bequaert 6514 (BR, type of *D. thonneri* var. *longistipulatum*); Maniema Distr., Berger s.n. (BR); 5 km W. of Kisangani, Bokdam 3084 (WAG); Yangambi, Bolema 3 (BR, K, WAG); 17 (BR); Boutique 23 (BR); Maluku – Kingakati, Breyne 813 (BR); Kibambi, Callens 3759 (BR, type of *D. patenti-hirsutum* var. *longibracteolatum*); Kimuenza, Carlier 188 (BR); Milambo, Claessens 239 (BR); Donda II, Compère 1061 (BR, C, K, WAG); Matadi, Dacremont 214 (BR, K, LISU, WAG); Mobeka, De Giorgi 53 (BR); Likimi, De Giorgi 60 (BR, WAG); Musangoi, Desenfans 1469 (BR); Bokondji, De Wanckel 183 (BR); Lukolela, Dewèvre 841 (BM, BR, type of *D. patenti-hirsutum*); Luki, Donis 1936 (BR); 2173 (BR, PRE); Boende, Dubois 27B (BR, WAG); Ikela, Dubois 868 (BR, LISC, WAG); Ikela Distr., Evrard 5165 (BR, K); Yangambi, Germain 8495 (BR); 8570 (BR); 8571 (BR, SRGH); Likimi, Gilbert 1637 (BR, K, LISU, WAG); Kimuenza, Gillet s.n. (BR, WAG); near Kinshasa, Gillet s.n. (BR); Basankusu, Goossens 4928 (BM, BR); Boende, Goossens 4932 (BR); Bekili, Boende, Gorbatoff 253 (BR, type of *D. thonneri* var. *polyneuron*); Urega, Maniema, Lebrun 5834 (BR, P); Kole, Lebrun 6356 (BR, M, WAG); Yangambi, A. Léonard 944 (BR); 1211 (BR, K, P, WAG); Yalemke, Linder 1890 (K); Yangambi, Louis 480 (BR); 1865 (BR, K, WAG); 2652 (BR, C, WAG); 2989 (BR, P, PRE); 6297 (BR, K, WAG); 6712 (BR); 7063 (BR); 9689 (BR, WAG); 25 km N.W. of Yangambi, Louis 10041 (BR, WAG); Yangambi, Louis 13016 (BR, WAG); 14467 (BR); 16254 (BM, BR, WAG); Likimi, Malchair 412 (BR); Yangambi, Menavanza 49 (BR); near Yambata, Montchal 51 (BR); Mole, near Dundusana, Morteahan 424 (BR, WAG); Bokala, Nelis s.n. (BR); Kisantu, Pauwels 1657 (BR); 3879 (BR); near Mobwasa, Reygaert 1221 (BR, WAG); 1233 (BR); Sankuru, Sapin s.n. (BR); Ekuta, Sapin s.n. (BR); 50 km S. Lubumbashi, Schmitz 3207 (BR); sin. loc., Smith s.n. (BM, C, K, type of *D. bangii*); near Luluabourg, Sparano 121 (BR); Mombongo, Thonner 148 (BR, K, type of *D. thonneri*); Gimbi, Toussaint 721 (BR); Vallée de la Luki, Toussaint I.N.E.A.C. Luki no 2223 (BR); Matadi, Vanderyst 7845 (BR); Port Franquii, Vanderyst 24384 (BR); Kangu, Vanderyst 26280 (BR); Kibambi, Vanderyst 34369 (BR, paratype of *D. patenti-hirsutum* var. *longibracteolatum*); Nat. Park Upemba, Verheyen in De Witte 3784 (BR, WAG).

Angola: Luisavo R., Barros Machado 359 (LISC); Congo R., Dawe 12 (K); Dala, Exell & Mendonça 1049 (BM, COI, LISC, M); 1111 (BM, BR, COI, LISC, M, PRE); Panga Mungo, Gossweiler 6004 (BM, COI, K, LISU); 6285 (BM, COI, LISU); Sumba Peco, Gossweiler 8794 (B); 8798 (BM, K); Dala, Gossweiler 11585 (BM, COI, M); Teixeira de Sousa, Gossweiler 12224 (BM, LISC); Cabinda, Chiaca, Teixeira & Gerez 7510 (COI); Teixeira de Sousa, Young 290 (BM, COI).

Zambia: Chibote, Astle 756 (K, SRGH); Chilwi Is., Brenan & Greenway 8093 (K); km 37 Abercorn – Tunduma, Brenan & Greenway 8187 (K); Samfya, Fanshawe 314 (K); Mpika, Fanshawe 1911 (BR, K); Chingola, Fanshawe 2538 (BR, K); Kawambwa, Fanshawe 3528 (K); Samfya, Fanshawe 4155 (K); Bangweolo, Fries 727 (UPS, paratype of *D. ellipticum*); Kawendimusi, Fries 727a (UPS, Z, type of *D. ellipticum*); Mpika, Greenway & Trapnell 5547 (EA, K); Muteshi, Holmes 709 (FHO, K, SRGH); Fort Rosebery, Lawton 270 (FHO); Kasama, Lawton 728 (FHO); Chilongwelo Distr., Richards 2340 (K); Kawambwa, Richards 9314 (K); Kasama, Richards 12671 (K, LISC, SRGH); Mungwi – Kasama, Richards 16422 (K); near Kalambo, Sanane 873 (K); near Ndoba, Symoens 9993 (BR, K, WAG); Fort Rosebery, White 3093 (FHO, K); 3124 (FHO, K).

Cult.: Zambia, Kitwe, Fanshawe 2730 (K, seedling); 2889 (K, seedling).

Notes. The above proposed synonymy has already been initiated by several authors. RUHLAND (1902: 87) noted the close affinities between *D. argenteum* and *D. patenti-hirsutum*, PELLEGRIN (1913: 643) the extremely close affinities

between *D. argenteum*, *D. rufipile*, and *D. holosericeum*, and HAUMAN (1958-a: 342) considered *D. argenteum* and *D. holosericeum* to be conspecific. WHITE (1962: 185) placed *D. ellipticum* into synonymy of *D. argenteum*.

However, the oldest name *D. bangii* has been overlooked until HAUMAN's flora treatment (1958-a), likely because the type material originates from Zaïre. The latter author, however, did not make the correct interpretation of the type from Copenhagen, of which duplicate material is kept at the British Museum. The BM-material (3 sheets) consists of a mixture of two species: partly (one sheet) identical with the homogeneous Copenhagen material, to which the name *D. bangii* is attached, and partly (2 sheets) conspecific with *D. lujaei*. *D. bangii* in HAUMAN's sense, i.e. as found in his flora treatment, is, except for the reference to the type material, conspecific with *D. lujaei*. The type of *D. bangii* has rather poor flowered inflorescences and small leaves and thus resembles *D. lujaei*. The former however lacks the arachnoid indumentum on the upper side of the leaves.

The type of *D. rufipile* has been received on loan from the Kiew herbarium. The single sheet with only one branchlet could easily be identified as *D. bangii*. To all appearances this branchlet was once part of the material on one of the 3 Copenhagen sheets. *D. rufipile*, therefore, most probably is a homotypic synonym of *D. bangii*. It is not known whether or not TURCZANINOFF's type material originally consisted of a mixture as was the case with the BM material. The author's description is not sufficiently detailed to exclude either one of both species. In the event that the type material proves not to be homogeneous, I designate the specimen received on loan as the lectotype of *D. rufipile*.

The type of *D. patenti-hirsutum* var. *longibracteolatum* has indeed longer bracts and bracteoles than usually seen in *D. bangii*. Several intermediates (e.g. *W. de Wilde* 2856, *De Néré* 981, *Gossweiler* 6004, *Louis* 480) can be found, however, which makes it impossible to maintain it as a distinct taxon.

The material identified by HAUMAN (1958-a) as belonging to *D. thonneri* has earlier glabrescent leaves and often larger inflorescences than is usual. These differences are of a quantitative nature with many intermediates. The same holds for the acumen or apiculum of the fruit. Therefore no justification is found to maintain *D. thonneri* as a distinct taxon.

Gorbatoff 253, the type of *D. thonneri* var. *polyneuron*, has leaves with many lateral nerves, slightly more than is average in *D. bangii*. Also the indumentum is somewhat different. For both characters *Barros Machado* 359 is a good intermediate. Although *Gorbatoff* 253 remains somewhat aberrant, it is not sufficiently justified to maintain a distinct variety based on a single, but slightly aberrant specimen.

The same can be said from *Bequaert* 6514, the type of *D. thonneri* var. *longistipulatum*. In this case there are no flower differences either, but only somewhat longer stipules and it is once more based on a single specimen. Stipule length is very variable: 4–11 mm long in *Vanderyst* 34369, 4–9 mm in *Thollon* 4037, 3–10 mm in *Callens* 3759, against ca. 7–12 mm in *Bequaert* 6514.

The closely related *D. bangii* and *D. lujaei* may be distinguished as follows:

- Young leaves above, and often also the branchlets, with an arachnoid, dehiscent, white indumentum; petals much longer than the sepals, i.e. about twice as long as the outer sepals **D. lujaei**
 Young leaves above and branchlets lacking an arachnoid indumentum; petals only slightly longer than the sepals **D. bangii**

D. barbatum Bret., sp. nov.

Fig. 16 Map 9

Liana, frutex scandens vel arbusculus, cortice albida. Ramuli, stipulae, petioli, costa et foliorum margines plerumque juventute barbati indumento furfuraceo vel hirsuto. Folia obovato-oblonga, saepe angusta, dimensionibus variabilissimos, basi cordata, apice acuminata, costa et nervis lateralibus principalibus supra prominentibus. Inflorescentia glomerata, pauciflora; bracteae bracteolisque pedicellos robustos subaequantibus. Petala breviter biloba, glabra vel subglabra. Ovarium triloculare, velutinum; stylus trilobus.

Type: Cameroun, km 28 Kribi – Lolodorf, *Bos 4318* (holotype: WAG; isotypes: BR, K, P, PRE).

Diagnostic characters. Treelet, shrub or liana with whitish bark. Young vegetative parts barbate by a furry or hirsute indumentum. Leaves very variable in size, obovate-oblong, often narrowly so, usually cordate at base; midrib and main lateral nerves raised above. Flowers glomerate; the bracts and bracteoles as long or nearly as long as the stout pedicel. Sepals spreading to reflexed. Petals erect, very shortly bilobed. Ovary 3-locular, velutinous.

Description. Liana, lianescent shrub, shrub, or treelet. *Bark* of main trunk and older branches usually whitish, lenticellate but not distinctly so. *Branches* glabrous or glabrescent, the bark peeling off rather soon. *Branchlets*, stipules, petioles, midrib, and margins of leaves (sometimes entire blade of unexpanded leaves) usually barbate by a furry or hirsute indumentum when young, rather soon deciduous, the hirsute indumentum often intermixed with a tomentose cover and remaining longer on branchlets, petioles, and on the basal part of the midrib beneath. *Stipules* narrowly triangular to subulate, 2–20 mm long, caducous. *Leaves:* petiole subterete, 1–7(11) mm long; blade obovate-oblong, often narrowly so, rarely elliptic, 2.5–4 times as long as wide, very variable in size even in a single specimen, 6–42 × 2–12 cm, usually cordate (often deeply so) at base, acuminate at apex, the acumen up to 2.5 cm long; with 8–13(20) main lateral nerves on each side of the midrib; midrib and lateral nerves raised above; glands small, inconspicuous, on the lower surface only. *Inflorescences* glomerate, few-flowered, sericeous-hirsute; bracts and bracteoles narrowly triangular, usually curved, about as long as, or longer than the pedicel, 3–5(6) mm long; pedicel stout, (2)3–6(7) mm long, the upper part very short or absent. *Sepals* spreading to reflexed, more or less shortly united at base, triangu-

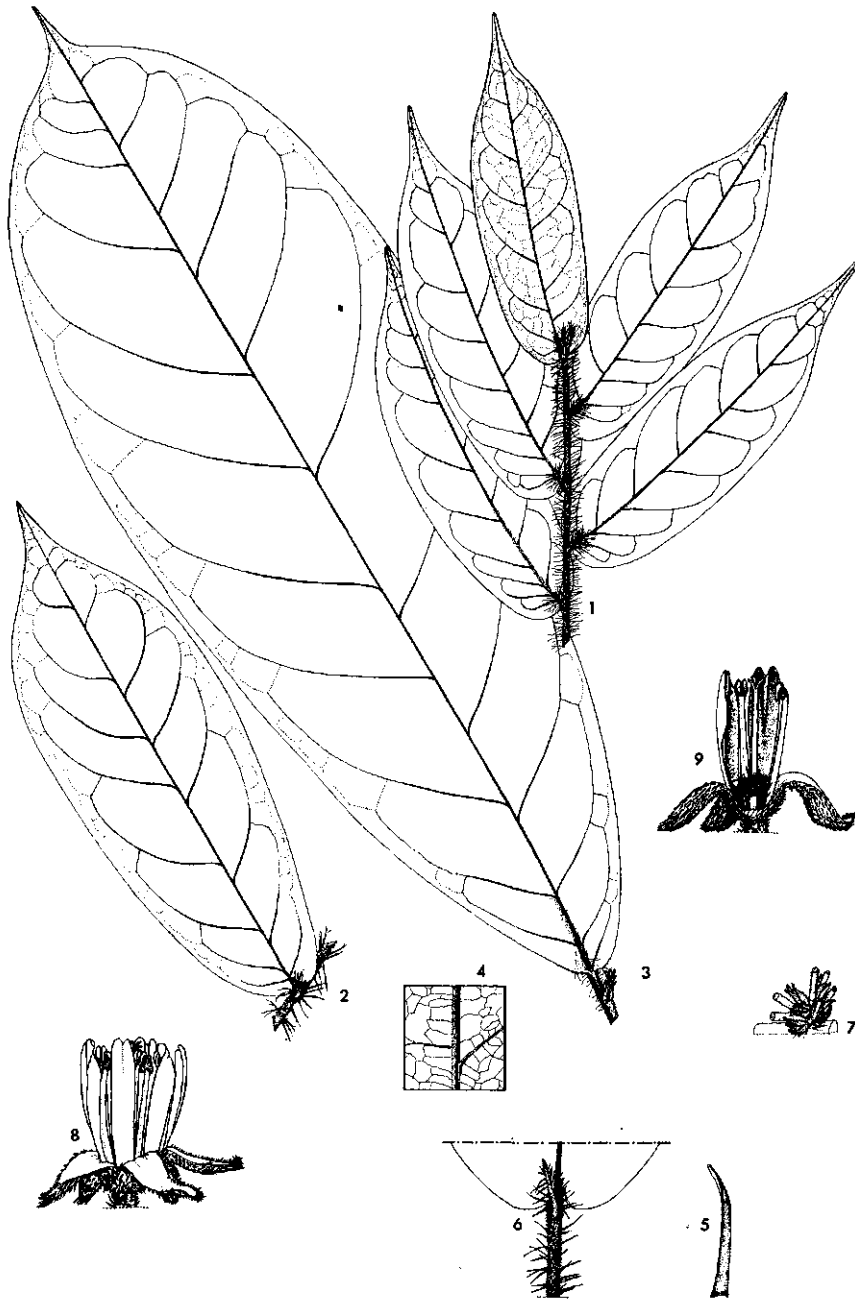
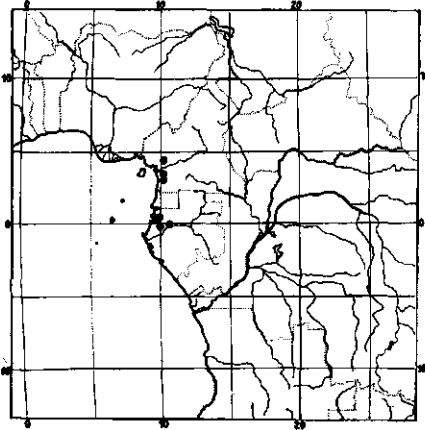


FIG. 16. *D. barbatum*: 1. leafy branch from below, $\frac{1}{2} \times$; 2-3. upper side of leaf, $\frac{1}{2} \times$; 4. detail of raised midrib above, $\frac{1}{2} \times$; 5. stipule, $1 \times$; 6. detail of leafbase with upper stipule, $1 \times$; 7. inflorescence without flowers, $1 \times$; 8. flower, $6 \times$; 9. flower showing pistil and staminodes, $6 \times$. (1. *Bos* 7087; 2, 4, 6, 8-9. *Bos* 4318; 3, 7. *N. Hallé* 2394; 5. *Leeuwenberg* 9187).



MAP 9. *D. barbatum*

lar to oblong, concave, 2.5–3 mm long, ca. 1–1.5 mm wide, rounded at top; outside sericeous especially at the top, inside puberulous in the upper part. *Petals* erect, spathulate in outline, 3–3.5 mm long, less than 0.5 mm split, shortly adnate to the filaments at base, glabrous; lobes concave, with a rounded top. *Stamens* erect, 3–4 mm long, glabrous or nearly so; anthers less than 0.5 mm long; connective prominent. *Satminodes* oblong, flat, ca. 0.5 mm long, glabrous. *Pistil* ca. 3 mm long; style glabrous, 3-lobed at top; ovary 3-locular, velutinous. *Fruits* unknown.

Distribution: Cameroun, Gabon.

Ecology: Rain forest.

Specimens examined. Cameroun: km 28 Kribi – Lolodorf, *Bos* 4318 (BR, K, P, PRE, WAG, type); 60 km N. of Kribi, E. of Edea Rd., *Bos* 7087 (P, PRE, WAG); *Bos & Breteler* 7184 (WAG); 3 km E. of Yingui, *Leeuwenberg* 9126 (WAG); km 25 Yingui – Yabassi, *Leeuwenberg* 9187 (WAG).

Gabon: Akondjé, *Chevalier* 27.022 (P); Abanga R. (chantier C.E.F.A.), *N. Hallé* 2394 (P, WAG); N.W. Gabon, *Trilles* 24 (P).

Note. The species, most closely related, to *D. barbatum* is *D. dewevrei*, which occurs in the same area. These two species may be distinguished as follows:

Bracts and bracteoles ca. as long as or longer than the rather stout pedicels; petals erect, very shortly split (less than 0.5 mm)	D. barbatum
Bracts and bracteoles less than half as long as the usually filiform pedicels; petals slightly spreading (the lobes curved inwards), (1)1.5–2.5 mm split	D. dewevrei

D. barbosa Torre

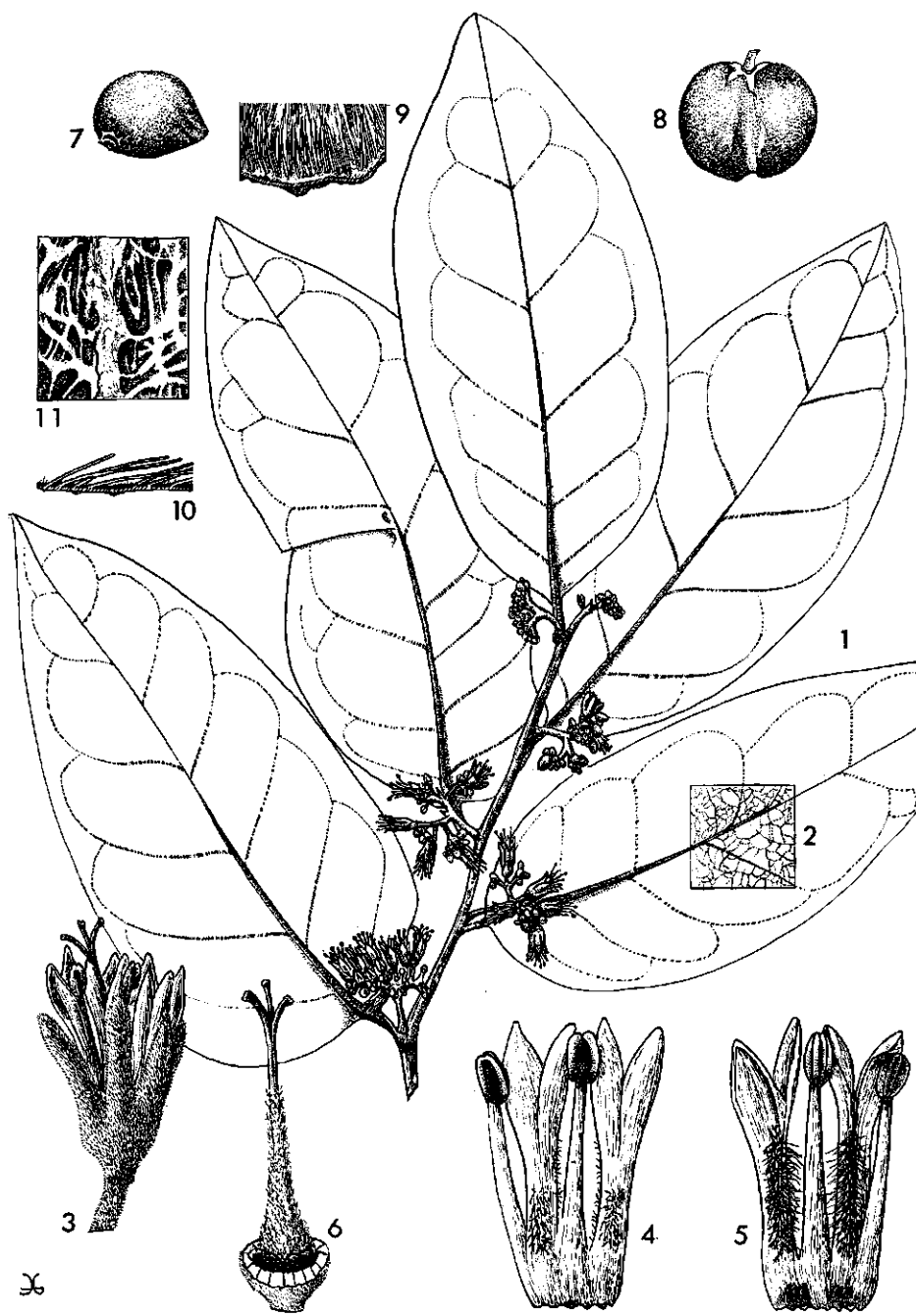
Fig. 17 Map 10

D. barbosa Torre, 1962: 68, tab. ii; 1963: 323. Type: Mozambique, Cabo Delgado, *Barbosa* 2085 (holotype: LISC; isotypes: COI, K).

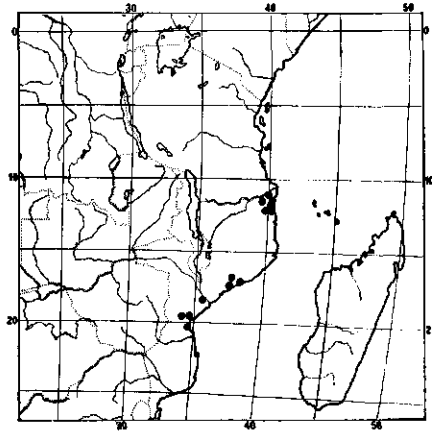
D. zambesianum Torre, 1962: 69, tab. iii; 1963: 324. Type: Mozambique, Zambezia, *Barbosa & Carvalho* 4272 (holotype: LISC; isotypes: G, PRE).

Diagnostic characters. Liana, lianescent shrub, or shrub. Branches and older branchlets with minute, dispersed lenticels, glabrous or glabrescent. Leaves coriaceous, glabrous, or on one or both sides sparsely, shortly, appressed-pubescent on the midrib and the (6)7–9(12) pairs of lateral nerves, soon glabrescent. Glands, if present, usually distinct, at some distance alongside the margins. Inflorescences tomentose; peduncle 2–5 mm long. Sepals tomentose (3)3.5–4.5(5) × 1–2 mm. Petals (4)4.5–5.5(6) mm long, long-pilose inside below the 1–1.5 mm deep split. Stamens as long as the petals. Ovary 3-locular, lanate. Fruits tomentellous, up to 2 cm in diam. Endocarp inside with firmly appressed, golden-brown, up to 3 mm long, acicular hairs.

Description. Liana, lianescent shrub, shrub (or tree?). *Branches* glabrous or nearly so, usually with rather small, dispersed lenticels. *Branchlets* shortly appressed-pubescent, often densely so when young, glabrescent, usually lenticellate when older. *Stipules* usually early caducous, narrowly triangular-subulate, (1)2–3 mm long, shortly appressed-pubescent. *Leaves*: petiole usually canaliculate above, (2)4–7(11) mm long, shortly appressed-pubescent, glabrescent; blade coriaceous, elliptic, oblong-elliptic, ovate-elliptic or ovate, rounded to obtuse or truncate-cordate and subequal at base, gradually tapering into an obtuse or truncate or sometimes acute top, (1.75)2–2.5(3) × as long as wide, (5)8–15(18) × (2)3–6(9) cm, glabrous or on one or both sides sparsely shortly appressed-pubescent on midrib and on the (6)7–9(12) pairs of main lateral nerves, soon glabrescent, when young sometimes sparsely pubescent on the entire upper surface, margins usually not or only slightly revolute, nervation rather obscure above, prominent beneath, glands, when present, usually prominent and often on both sides, never alongside the midrib but at some distance along the margin. *Inflorescences* rather congested, 3–5 times branched, tomentose; peduncle 2–5 mm long; bracts and bracteoles minute, triangular, ca. 0.5–1.5 mm long. *Pedicel* 1–2.5 mm long; the upper part 0–0.5 mm long. *Calyx* rounded at base. *Sepals* erect or slightly spreading, occasionally some sepals reflexed, subequal or slightly unequal, free or very shortly united at base, oblong, (3)3.5–4.5(5) × 1–2 mm, often concave, top obtuse, rounded or acutish, both sides tomentose, more densely so outside. *Petals* narrowly obovate-oblong in outline, for up to 1 mm united with the filaments at base, (4)4.5–5.5(6) mm long, 1–1.5 mm split, inside loosely long-pilose below split, outside more appressed-pilose below split, often sparsely so; lobes concave, rounded at top. *Stamens* as long as or slightly shorter than the petals, erect; filaments hairy like the petals but usually less densely so to subglabrous; anthers up to 1 mm long, connective prominent, glabrous. *Staminodes* separate or forming a ring, transversely oblong, at most 0.5 mm long, ca. 0.5 mm wide, top truncate-emarginate, glabrous or sparsely villous inside. *Pistil* 4.5–5.5(6.5) mm long, lanate, only the ca. 0.5–1.5 mm long lobes and sometimes also the upper part of style glabrous;



MAP 10. *D. barbosa*



ovary subglobose, 3-locular; ovules mostly with an obturator. *Fruits* obovoid-ellipsoid or subglobose, usually lobed when more than one-seeded, slightly laterally compressed, base obtuse, top obtuse, very shortly beaked, or apiculate, 13–20 mm long, 9–14(20) mm in diam., 1–2(3)-seeded; exocarp densely tomentellous, in dried fruits slightly wrinkled and often obscurely muricate, together with the mesocarp most probably not more than 1–2 mm thick when fresh; mesocarp dark brown-black-mottled, probably containing a red slime which turns dark-brown to black when dry; endocarp thin, pergamentaceous, rather smooth outside, inside with up to ca. 3 mm long, golden-brown, acicular, minutely barbed hairs, firmly appressed towards the top of the fruit. *Seeds* ellipsoid, ca. 6–12 mm long, 4–8 mm in diam.; testa thin, firmly, irregularly, reticulately veined, glabrous, outside glossy and finely striate by the impression of the acicular hairs of the endocarp; cotyledons plano-convex, firm, wrinkled outside.

Distribution: Mozambique.

Ecology: Gallery forest, deciduous and secondary woodland.

Specimens examined. Mozambique: Palma, Nangade Rd., *Andrada 1359* (COI, K, LISC, paratype of *D. zambesianum*); Macomia, *Barbosa 2085* (COI, K, LISC, type of *D. barbosa*); Macomia – Chai, *Barbosa 2280* (K, LISC); Bajone, between Murroa and Namuera, *Barbosa & Carvalho 4272* (G, LISC, PRE, type of *D. zambesianum*); Mocimboa da Praia, *Barbosa s.n.* (BR, COI, K, LISC, paratype of *D. zambesianum*, cited from Quissanga by TORRE, 1962); Manica e Sofala, sin. loc., *Johnson 92* (K); Chupanga, *Kirk s.n.* (K); Cheringoma, *Men-*

FIG. 17. *D. barbosa*: 1. flowering branch, $\frac{5}{6} \times$; 2. detail of nervation, $\frac{5}{6} \times$; 3. flower, $5 \times$; 4. petals and stamens outside, $7\frac{1}{2} \times$; 5. petals and stamens inside, showing staminodes, $7\frac{1}{2} \times$; 6. pistil with staminodes, $7\frac{1}{2} \times$; 7–8. fruits, 1- and 2-seeded, $\frac{5}{6} \times$; 9. detail of endocarp showing indumentum inside, $5 \times$; 10. cross section of part of endocarp, $10 \times$; 11. detail of seedcoat, $5 \times$. (1, 2, 6. *Barbosa & Carvalho 4272*; 3–5. *Torre & Correia 13359*; 7–8. *Barbosa s.n.*; 9–11. *Torre 5907*).

donça 4346 (LISC); between Panguia and Macomia, *Pedro & Pedrogao 5118* (EA); Niassa, between Mueda and Mocimboa do Rovuma, *Pedro & Pedrogao 5314* (EA); Maganja da Costa, *Sim 5705* (PRE); Madanda Forests, *Swynnerton 1188* (BM); *1386* (BM, K); Cheringoma, *Torre 5907* (LISC); km 68 Nangade – Palma, *Torre & Paiva 12077* (LISC); Sofala, *Torre & Pereira 12365* (BR, K, LISC, SRGH, WAG); km 40 Beira – Vila Pery, *Torre & Correia 13359* (K, LISC); Maganja da Costa, *Torre & Correia, 14639* (BR, K, LISC, SRGH); *16208* (LISC).

Notes. TORRE published *D. barbosa* and *D. zambesianum* simultaneously, the latter being distinct from the former by: 'foliis majoribus cum nervis laterali-bus 7–9 jugis'. Judging from TORRE's description of both species alone, these differences do not fully justify segregation as *D. barbosa* has leaves of 5–12 × 2–5 cm with 5–6 pairs of lateral nerves, while *D. zambesianum* has leaves of 7–13 × 3.5–6 cm and 7–9 pairs of lateral nerves. TORRE classified the smaller-leaved specimens under *D. barbosa* and the larger-leaved ones under *D. zambesianum*. A further analysis of all the available material confirmed that there is really only one species, for which the name *D. barbosa* has been chosen.

D. barbosa is closely allied to *D. arenarium*. For details see under the latter species.

D. barens Engl. = *D. tomentosum* Engl.

D. barens Engler, 1912-a: 579; De Wildeman, 1919: B18. Type: Cameroun, N.E. of Nkongsamba, between Boeda and Bare, *Ledermann 6105* (holotype: B†; lectotype: BM, photograph WAG).

Note. The original diagnosis of *D. barens* does not show any important difference by which to separate this species from *D. tomentosum*. The isotype at BM, although very poor and here designated lectotype, supports this conclusion.

D. barteri Engl.

Fig. 18 Map 11

D. barteri Engler, 1896-b: 134; 1896-a: 348, nomen; 1912: 566; Pellegrin, 1913: 640 (p.p.); De Wildeman, 1919: B18 (p.p.); Hutchinson & Dalziel, 1928-a: 324; Engler & Krause, 1931: 6; Keay, 1958: 436; Keay et al., 1960: 323.

Type: Nigeria, Onitsha, *Barter 1781* (holotype: B†; lectotype: K; photograph WAG; isotype: P).

Icacinospis annonoides Roberty, 1953: 1420, f. 6; 1954: 89. Type: Ghana, Cape Coast Castle, *Roberty 12829* (holotype: G, photograph K).

Diagnostic characters. Shrub or small tree up to ca. 12 (17) m tall, often with a densely bushy crown. Branches usually and often the branchlets densely minutely lenticellate, densely short-hairy when young. Leaves usually coriaceous, elliptic to obovate-elliptic, 7–13(17) × 3–6(8) cm, glabrous or nearly so, beneath usually with two basal glands. Inflorescences pedunculate, distinctly

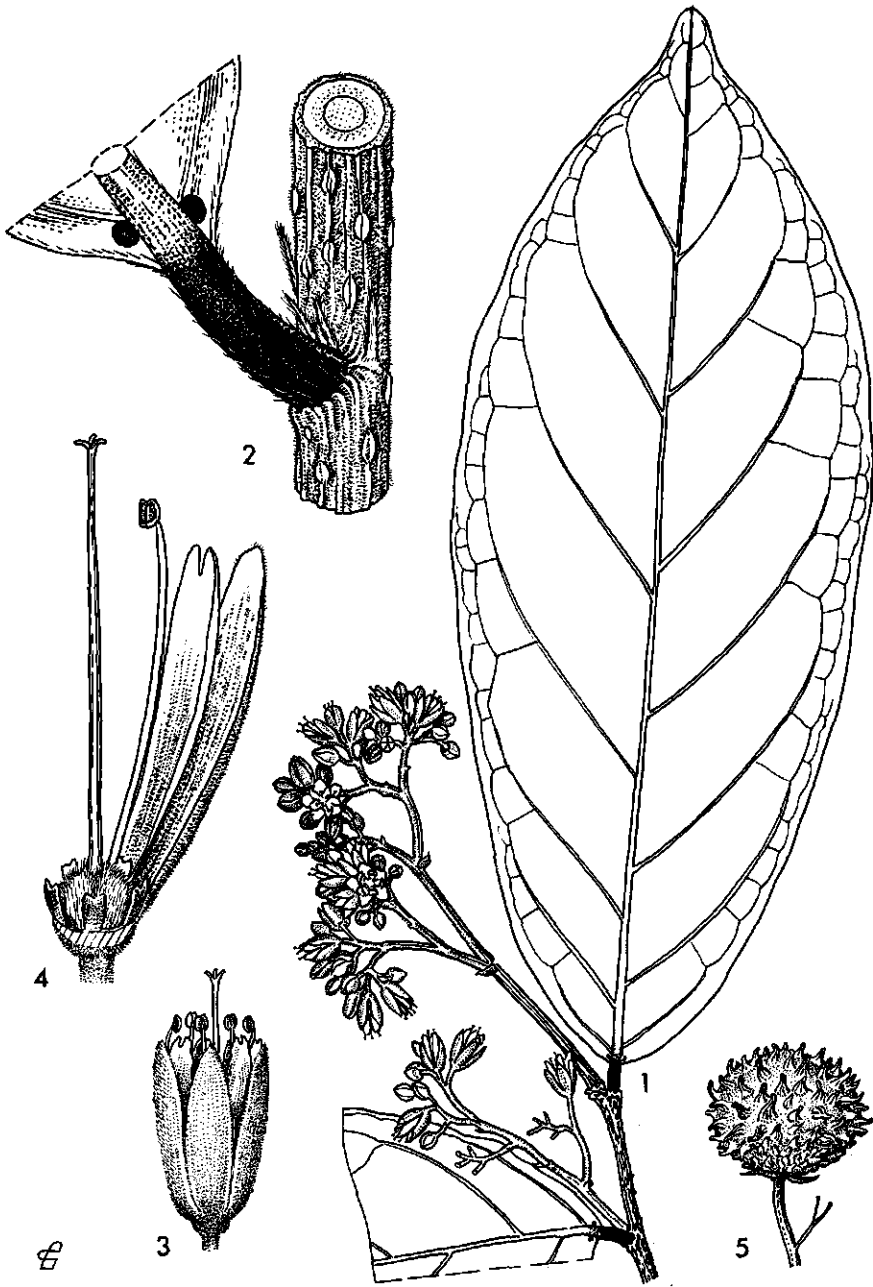
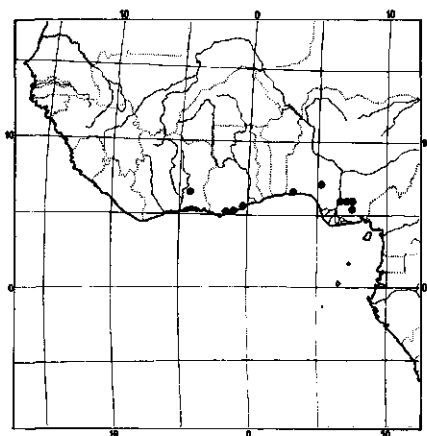


FIG. 18. *D. barteri*: 1. flowering branch, $\frac{5}{6} \times$; 2. detail of branch showing lenticels, stipules, and leafbase beneath, $5 \times$; 3. flower, $5 \times$; 4. pistil with staminodes, $10 \times$; 5. fruit, $\frac{5}{6} \times$. (1. Smith 46; 2. Breteler 6173; 3-4. Ujor FHI 15292; 5. Andoh 5597).

branched, short hairy. Flowers ca. 4–6 mm long; sepals equal to or slightly shorter than petals and stamens; petals retuse to very shortly bilobed at apex; ovary velutinous, style glabrous. Fruits subglobose to ovoid-ellipsoid, ca. 2–3.5 cm in diam., densely shortly velutinous – tomentose, strongly tuberculate.

Description. Shrub or tree up to 12(17) m tall, often with a dense bushy crown. *Branches* glabrous or glabrescent, usually densely minutely lenticellate. *Branchlets* mostly densely brownish puberulous to shortly velutinous, at least when young, rather soon lenticellate. *Stipules* early caducous or not, subulate, (1)2–4(5) mm long, appressed-puberulous-strigillose. *Leaves*: petiole semiterete to slightly canaliculate above, (1)3–6(7) mm long, appressed-puberulous to strigillose; blade elliptic to obovate-elliptic, ca. 2 times as long as wide, 7–13(17) × 3–6(8) cm, rounded or obtuse-truncate (rarely cuneate) and more or less equal-sided at base, usually shortly, obtusely, or subacutely acuminate (sometimes obtuse or subacute) at top, the acumen up to ca. 1.5 cm long; main lateral nerves 4–6(7) on each side of midrib, rather obscure above, prominent beneath, the midrib usually impressed above, at least in the basal part; above usually with a few, small, scattered glands, beneath usually with 2 large glands at the base, on either side of the midrib, and often with some small scattered glands as well; glabrous or with a few, short, scattered hairs on midrib, mainly beneath, when young sometimes sparsely appressed-puberulous both sides, glabrescent. *Inflorescences* up to ca. 6 times branched, puberulous to shortly velutinous; peduncle (4)10–15(20) mm long; bracts and bracteoles ovate-triangular, minute, up to 1 mm long; pedicel 1–4(6) mm long, the upper part up to 0.5 mm long. *Sepals* erect or nearly so, more or less free at base, flat or slightly concave, usually narrowly oblong, sometimes narrowly elliptic or lanceolate, 4–6(7) × (1)1.5–2 mm, top obtuse, rounded or acutish, tomentellous outside, inside appressedly puberulous-tomentellous or sericeous-puberulous. *Petals* erect or nearly so, shortly adnate to filaments at base, narrowly obovate-oblong in outline, 5–6.5 mm long, retuse or up to 1 mm split at apex, flat or nearly so, thin, inside glabrous, outside puberulous-tomentellous to quite glabrous, lobes glabrous, often inrolled or folded one over the other. *Stamens* erect, (4.5)6–6.5(7) mm long; filaments glabrous, pubescent, or with a few hairs only; anthers less than 1 mm long, glabrous. *Staminodes* free and separate or connivent and often united at base while adnate to petals and filaments, thin, subquadrate, 0.5–1 mm long and wide, glabrous. *Pistil* erect, 6–7.5 mm long; style glabrous, with 3, less than 1 mm long lobes at top; ovary 3-locular, depressed-globose, densely shortly velutinous. *Fruits* subglobose to ovoid-ellipsoid, densely shortly velutinous – tomentose, strongly tuberculate, ca. 2–3.5 cm in diam. (tubercles included); tubercles mainly irregular in size and shape, often curved, up to ca. 7 mm long; endocarp pergamentaceous to coriaceous, fibrous, rather smooth outside, inside smooth, glossy, finely striate. *Seeds* subellipsoid, up to ca. 1.5 cm long and 1 cm in diam.; testa brown, glossy, rather thin.

MAP 11. *D. barteri*



Distribution. Ivory Coast, Ghana, Nigeria.

Ecology. In coastal scrub (Ghana); in forest undergrowth in gallery forest or in drier parts of the rain forest (Ivory Coast, Ghana, Nigeria).

Specimens examined. Ivory Coast: N.W. of Kotobi, *Breteler* 6173 (WAG).

Ghana: Pokoase, ca. 6 km N. of Achimota, *Akpabla* 1199 (K); Komenda F.R., *Andoh* 5551 (K, LISC); 5597 (BR, FHO, K, P); Cape Coast, *Brass s.n.* (BM); Asuansi, *Darko* 1036 (K); Cape Coast, *J.B. Hall* 249 (K); Esuekyir, *J.B. Hall* 607 (K); Cape Coast Castle, *Roberty* 12829 (G, type of *Icacinospis annonoides*).

Nigeria: Onitsha, *Barter* 1781 (K, P, type); *Chesters* 140 (FHO); Enugu F.R., *Chesters* 210 (FHO); Akpaka F.R., Onitsha Distr., *Duruh* FHI 15468 (K); *Jones* 1141 (FHO); Orlu, *Jones* FHI 6202 (K, P); Udi, *Jones* FHI 7431 (K); *Keay* FHI 22280 (K); Onitsha Prov., Agulu, *Keay* FHI 25593 (BR, K); Mamu R., *Kenedy* 2541 (FHO); S. Nigeria, *Kennedy* 3110 (FHO); *Okafor c.s.* FHI 57605 (FHI, WAG); Ikeja, *Onochie* FHI 26696 (K); Egba Distr., Abeokuta Prov., *Onochie* FHI 26688 (K); Onitsha, Akpaka F.R., *Onochie c.s.* FHI 21644 (FHO); Enugu F.R., *Smith* 46 (FHO); Awka, Onitsha Distr., *Ujor* FHI 15292 (K); Onitsha, *Unwin* 63 (K).

Notes. Contrary to the statements in the Flora of West Tropical Africa ed. I & II and by ENGLER & KRAUSE (l.c.), *D. barteri* has never been collected in Cameroun. *Zenker* 1682, on which this information was most likely based, has been identified and distributed as *D. barteri*, and PELLEGRIN (l.c.) and DE WILDEMAN (l.c.) have cited it as belonging to this species. However, it belongs in reality to *D. crassifolium*, and, although not at first view, is markedly different from *D. barteri*.

KEAY (1958) reduced *Icacinospis annonoides* to a synonym of *D. barteri*. His decision is fully supported.

There is only one collector who reports *D. barteri* as being poisonous to stock (*D. Chesters* 140). The Ibo name 'ngbu ewu' given by this collector means goat killer. It is most likely that this species is indeed toxic like some of its close relatives, e.g. *D. braunii*, *D. cymosum*, *D. stuhlmannii*. *D. barteri*, however, seems

to be rather rare as only a few collections exist, which may explain why its toxic nature has hardly ever been reported.

D. barteri has no closely related species in the same area and can easily be recognized (see diagnostic characters).

There are a few specimens (e.g. *Hombert 27*, *Kuasa 20*, *Toussaint 2097*, *Verwoesen 1486*) collected in Mayumbe (Zaire) which may represent this species or belong to a very closely related taxon. As these specimens show some morphological differences with *D. barteri* s.s. (e.g. a smaller calyx, a more loose inflorescence) and no records exist from the area in between, i.e. from Cameroun, Gabon and Congo, they have been kept separate awaiting more material.

D. batanganum Engl. & Ruhl. = *D. madagascariense* Poir.

D. batanganum Engler & Ruhland, 1902: 79; Engler, 1912-a: 570; De Wildeman, 1919: B18. Type: Cameroun, Grand Batanga, *Dinklage 1094* (lectotype: HBG; isotypes: BM, WAG).

Note. The original syntypes, *Dinklage 1094* & *1410*, have been lost at Berlin. From duplicates of this material the HBG-specimen of *Dinklage 1094* has been chosen as lectotype.

D. batanganum certainly belongs in *D. madagascariense*. It represents material with rather large, widely cordate or subcordate leaves. Such specimens have recently often been collected in the Kribi-area of Cameroun (see also under *D. abrupti-acuminatum*).

D. batesii Engl. = *D. longitubulosum* Engl.

D. batesii Engler, 1912-a: 595, f. 3; 1915: 848, f. 400; De Wildeman, 1919: B18; Engler & Krause, 1931: 9. Type: Cameroun, Batanga, *Bates 332* (lectotype: BM; isotype: Z).

Notes. ENGLER (1912-a) separates *D. batesii* from *D. longitubulosum* (and *D. aurantiacum*) mainly on the ovary being semi-inferior in the former and superior in the latter species. The flowers of the type material of both species, however, have a more or less semi-inferior ovary and no other character could be found by which these two species might be separated.

ENGLER's drawing of a flower of *D. batesii* (f. 3-B) shows the filaments free from the petals. This must be an error, because the flowering material analysed by this author corresponds with ENGLER's description: 'petala cum staminibus ad medium usque in tubum longum connata'. The drawing of the pistil differs from the description as well: not nearly as long as but much shorter than the petals with a 2-lobed style instead of a 3-lobed one.

D. batesii was based by ENGLER on two specimens: *Bates 332* and *Dinklage*

1307, both from Cameroun. This material has been lost at Berlin. Of the duplicates, *Bates 332* at the British Museum, has been designated lectotype.

D. baturense Krause = *D. glomeratum* Engl.

D. baturense Krause, 1912: 510 (August 27); De Wildeman, 1919: B19. Type: Cameroun, near Yokadouma, *Mildbraed 4794* (lectotype: HBG).

Notes. Most probably by following ENGLER's almost completely artificial division of the genus (1912-a: 562), KRAUSE did not compare his species with the then recently published *D. glomeratum* (1912-a: 584, March 26). In both species the leaves are glabrescent. However, the type of *D. glomeratum*, still having some indumentum on the midrib and the lateral nerves beneath, this species was placed in '*Ferruginea*' and the type of *D. baturense*, with already glabrous leaves, would place the latter in '*Flavovirentia*'. *D. baturense* cannot be separated from *D. glomeratum*.

Of the two syntypes on which *D. baturense* was based (*Mildbraed 4794* and *4898*) and which were lost at Berlin, only one duplicate could be traced. This specimen, from Hamburg, has been designated lectotype.

***D. bellschmiedioides* Bret., sp. nov.**

Fig. 19

Liana?, ramis glabris, cavis, ramulisque glabris vel glabrescentibus, cavis vel fere cavis. Petiolus canaliculatus, (5)7–10(12) mm longus. Folia elliptica vel obovato-elliptica, (10)15–21 × (3)5–8 cm, basi cuneata, glabra. Inflorescentia cymosa, ca. 7–18-flora, puberulo-tomentella. Sepala reflexa. Petala extus villosa. Ovarium triloculare, lanatum.

Type: Gabon, Lastoursville, *Le Testu 7595* (holotype: P; isotypes: BM, WAG).

Diagnostic characters. Branches hollow, glabrous. Branchlets glabrous or glabrescent, hollow or nearly so. Petiole canaliculate, (5)7–10(12) mm long. Leaf blade glabrous, (10)15–21 × (3)5–8 cm, base cuneate, margin gradually passing into the petiole. Upper part of pedicel 0.5–1 mm long. Sepals reflexed, 3–4 × 1.5–2.5 mm. Petals 3–4 mm long, villous outside below split. Ovary lanate.

Description. Liana (?). Branches hollow, glabrous, sparsely lenticellate. Branchlets sparsely puberulous when young, soon glabrescent, hollow or turning so, sparsely lenticellate or lenticels absent. Stipules lanceolate-subulate, early caducous, up to ca. 5 mm long. Leaves distichous or nearly so; petiole canaliculate, often deeply so, (5)7–10(12) mm long, glabrous or more often very



FIG. 19. *D. beilschmiedioides*: 1. flowering branch, $\frac{1}{2} \times$; 2. leafbase with petiole from above, $3 \times$; 3. cross section of petiole, $20 \times$; 4. inflorescence, $3 \times$; 5. flower, $6 \times$; 6. pistil with staminode, $6 \times$. (1-6. *Le Testu* 7595).

sparsely puberulous when young; blade elliptic to obovate-elliptic, 2.5–3 times as long as wide, (10)15–21 × (3)5–8 cm; cuneate at base and the margin decurrent into the petiole, top obtusely caudate-acuminate, the acumen (5)10–15 mm long; glabrous (midrib beneath often very sparsely short-hairy when young); midrib and the 5–7 main lateral nerves on each side more prominent beneath; glands not very prominent, on lower surface only, mainly alongside the midrib, often more numerous near the base and the top. *Inflorescences* axillary, cymose, sometimes several together on a leafless, short, axillary branch, ca. 7–18-flowered, puberulous-tomentellous, generally with short but distinct branching; peduncle (3)5–13 mm long; bracts and bracteoles concave, ovate, elliptic, or deltate, 1.5–4 × 0.5–1.5 mm. *Pedice*l up to 9 mm long, always jointed far above the middle; upper part 0.5–1 mm long, appressed-puberulous. *Calyx* rounded to obtuse at base. *Sepals* reflexed and often partly inrolled, almost free at base, obovate-oblong, 3–4 × 1.5–2.5 mm, broadly rounded to obtuse-emarginate at top, outside appressed-puberulous, inside finely puberulous. *Petals* spreading, rather thick and stiff, sometimes slightly geniculate, very shortly united with the filaments at base, narrowly obovate-spathulate in outline, 3–4 mm long, up to 1.5 mm split, inside strongly keeled below split and glabrous, outside villous below split and sometimes on lobes also; lobes more or less concave, top rounded. *Stamens* 3–4.5 mm long, glabrous; filaments at base as wide as petals; anthers reniform, less than 0.5 mm long; connective prominent. *Staminodes* subquadrate, 0.5 × 0.5 mm, glabrous or with a few hairs, top bilobed-emarginate. *Pistil* 2.5–4 mm long; style glabrous or lanate in lower part, top 3-lobed; ovary subglobose, lanate, 3-locular. *Fruits* unknown.

Distribution: Collected three times in Gabon, near Lastoursville.
Ecology: Rain forest at low elevations.

Specimens examined. Gabon: near Lastoursville, *Le Testu* 7244 (BM, P); 7595 (BM, P, WAG, type); 8500 (BM, P, WAG).

Note. *D. beilschmiedioides* is most closely allied to *D. altescandens*, from which it can be distinguished as follows:

Branches hollow; petiole (5)7–10(12) mm long; leafblade (10)15–21 × (3)5–8 cm	D. beilschmiedioides
Branches not hollow; petiole 2–4(6) mm long; leafblade (6)8–12(16) × (2)3–4(6) cm	D. altescandens

D. bellum Bret., sp. nov.

Fig. 20 Map 12

Liana gracilis omnino fere glabra. Folia oblongo-elliptica usque obovata, 7–13 × 2.5–5.5 cm, apice caudata, glabra vel subglabra, nervis lateralibus utrinque (7)8–11(14) tenuibus. Sepala reflexa, margine sparse pilosa tantum. Stami-

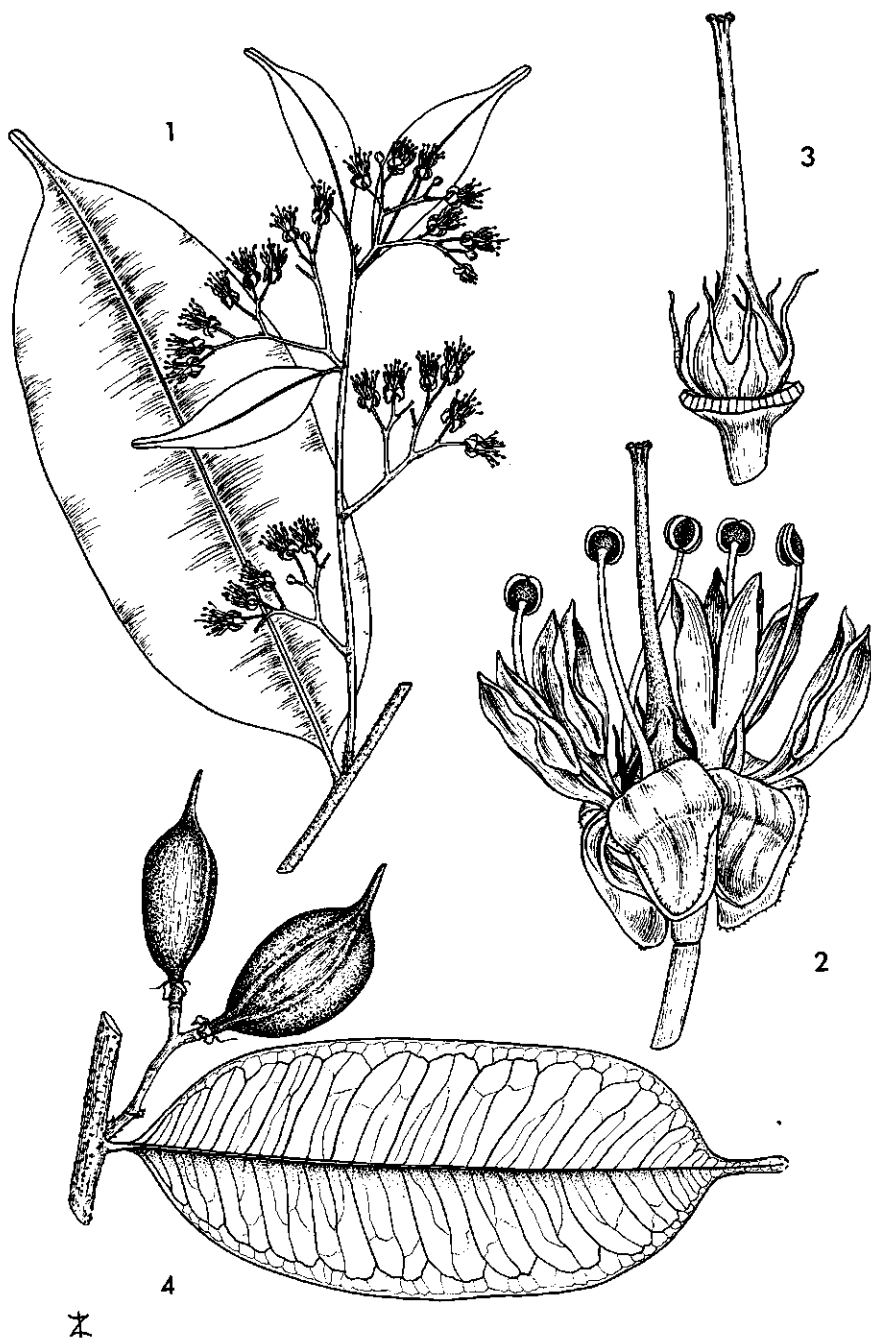


FIG. 20. *D. bellum*: 1. flowering branch, $\frac{5}{6} \times$; 2. flower, $10 \times$; 3. pistil with staminodes, $10 \times$; 4. fruiting branch, $\frac{5}{6} \times$. (1-3. Le Testu 7073; 4. N. Hallé 2972).

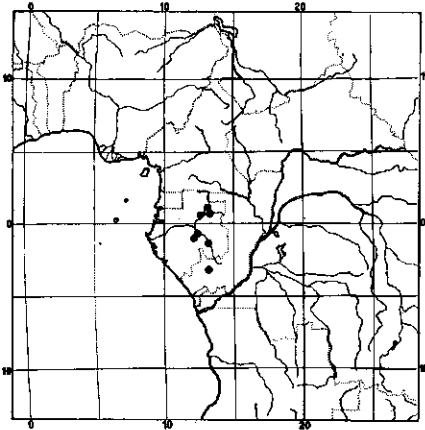
nodia alte bifurcata. Pistillum glabrum. Ovarium triloculare. Fructus rostratus, plerumque basi breviter stipitatus, laevis, glaber.

Type: Gabon Koulamoutou, *Le Testu 8002* (holotype: WAG; isotypes: BM, P).

Diagnostic characters. Slender liana, almost glabrous in all its parts. Leaves oblong-elliptic to obovate, 2–3 times as long as wide, 7–13 × 2.5–5.5 cm, caudate at top, glabrous or nearly so, with (7)8–11(14) delicate, main lateral nerves on each side of midrib, the latter raised above, Sepals reflexed, with a few hairs on the margin only. Staminodes deeply bifurcate. Pistil glabrous; ovary 3-locular. Fruits beaked, mostly shortly stipitate at base, smooth, glabrous.

Description. Slender liana. *Branches* glabrous, mostly lenticellate; lenticels inconspicuous, scattered. *Branchlets* glabrous or very sparsely appressed-short-hairy, soon glabrescent, often becoming lenticellate; young parts sometimes minutely scabrid. *Stipules* early caducous, subulate, 1–3 mm long, glabrous or nearly so. *Leaves*: petiole canaliculate above or semi-terete, 2–4(7) mm long, glabrous or nearly so; blade papery, glossy or shiny when fresh, oblong-elliptic to obovate, ca. 2–3 times as long as wide, 7–13 × 2.5–5.5 cm; cuneate, obtuse or sometimes truncate at base, obtusely caudate at top, the acumen (0.5)1–1.5 cm long; glabrous or with a few scattered hairs on midrib, soon glabrous; midrib usually raised above, main lateral nerves delicate, (7)8–11(14) on each side of the midrib, on both surfaces often rather indistinct from the more or less parallel tertiary veins; glands minute, scattered, on the lower surface only. *Inflorescences* often a few together on short, leafless, axillary shoots, loosely branched, up to ca. 10(15)-flowered, glabrous; peduncle 2–10 mm long; bracts and bracteoles minute, triangular, up to 0.5 mm long, usually with a few hairs. *Pedicel* rather slender, usually articulate above the middle, glabrous, lower part (1)2–3(4) mm long, upper part 1–1.5(2) mm long. *Sepals* reflexed, free or very shortly united at base, obovate-elliptic to ovate-elliptic, 2–2.5 × 1.5–2 mm, margin finely puberulous or almost completely glabrous. *Petals* spreading or subreflexed, sometimes erect, obovate-oblongate in outline, 3–4 mm long, 2–2.5 mm split, very shortly adnate to filaments at base, glabrous; lobes concave top rounded to subacute. *Stamens* 3–5.5 mm long, glabrous; anthers small, up to 0.5 mm long. *Staminodes* as long as or longer than the ovary, deeply bifurcate with slender branches, ca. 1–1.5 mm long, glabrous. *Pistil* 3–5 mm long, glabrous; style 3-lobed at top; ovary 3-locular. *Fruits* obovoid-ellipsoid, 2.5–4 cm long, up to ca. 1.5 cm in diam., usually shortly stipitate at base, at top with an often sharp and curved, up to ca. 8 mm long beak, orange and smooth at maturity, glabrous; mesocarp sweet, juicy; endocarp pergamentaceous, fibrous, shining and minutely striate inside. *Seeds* ovoid-ellipsoid, up to ca. 2 cm long and 1 cm in diam.; testa thin, brown, distinctly veined.

MAP 12. *D. bellum*



Distribution: Gabon, Congo.
 Ecology: Tropical rain forest, gallery forest.

Specimens examined. Gabon: km 23 Moanda – Franceville, *Breteler 6259* (WAG); S.E. of Makokou, Zoolende, *N. Hallé 1140* (P); Bélinga, *N. Hallé 2972* (P, WAG); 3472 (P, WAG); Lastoursville, *Le Testu 7073* (BM, P, WAG); 7171 (BM, P, WAG); Koulamoutou, *Le Testu 8002* (BM, P, WAG, type); Lastoursville, *Le Testu 8510* (BM, P, WAG); Kemboma, *Le Testu 8920* (BM, P, WAG).

Congo: Komono, Mossendjo Rd., *Bouquet & Sitha 2417* (IRSC, P).

Notes. *D. bellum* is most closely related to *D. mundense* from which it may be distinguished by its floral characters as follows:

Pistil entirely glabrous; petals 3–4 mm long, 2–2.5 mm split; staminodes deeply bifurcate, with 2 filiform branches. ***D. bellum***

Pistil hairy in the upper part of the ovary and the lower part of the style; petals 2–3 mm long, 1–1.5 mm split; staminodes variously shaped, never with 2 long filiform branches. ***D. mundense***

D. beniense Engl. = ***D. madagascariense*** Poir. var. ***beniense*** (Engl.) Bret., stat. nov.

D. beniense Engler, 1912-b: 440, t. 51 E–H; 1912-a: 581, nomen; De Wilde-man, 1919: B19; Robyns, 1948: 433; Hauman, 1958-a: 322. Type: Zaïre (Congo), N.W. Beni, *Mildbraed 2200* (holotype: B†; lectotype: BM).

Notes. The differences between *D. beniense* and the very variable *D. madagascariense* proved to be so little that it is not justified to maintain the former as a distinct species. This will be discussed in detail under *D. madagascariense*.

ENGLER, in his original publication (1912-b), stated that only part E & F of plate 51 pertain to *D. beniense*, but part G & H belong to this taxon as well.

D. benthamianum (F. Didr.) Engl. (not *D. benthamianum* (Turcz.) Engl.): see under *D. benthamii*.

D. benthamii (F. Didr.) Engl. = **D. madagascariense** Poir.

D. benthamii (F. Didrichsen) Engler, 1896-a: 349 (as *D. benthamianum* (F. Didr.) Engl., not *D. benthamianum* (Turcz.) Engl., which is conspecific with *D. timoriense* (DC.) Boerlage); De Wildeman, 1919: B19; Basionym: *Chailletia benthamii* F. Didrichsen, 1854: 196; Barth, 1896: 498; Keay, 1955: 137 (in synonymy to *D. guineense* (DC.) Keay). Type: Guinea (Ghana), *Thonning s.n.* (*Hb. Hornemann*) (lectotype: C).

Notes. DIDRICHSEN's name is a superfluous one for the names cited by him in synonymy: *Ceanothus? guineensis* DC. (1825: 30), and its homotypic synonym *Rhamnus paniculatus* Thonn. ex Schum. (1827: 151). He cited two specimens of the HORNEMANN herbarium, one collected by ISERT, the other by THONNING. He did not cite the THONNING specimen from the SCHUMACHER herbarium, now present in C. This latter specimen is the holotype of *Rhamnus paniculatus* and an isotype of *Ceanothus? guineensis*.

DE WILDEMAN (l.c.), probably not aware of ENGLER's misuse of the existing orthographic variant 'benthamianum', again combined *Ch. benthamii* in *Dichapetalum*.

D. bocageanum (Henr.) Engl.

Fig. 21

D. bocageanum (Henriques) Engler, 1896: 349; 1912-a: 570; Pellegrin, 1913: 648; De Wildeman, 1919: B19; Exell, 1944: 137.

Basionym: *Chailletia bocageana* Henriques, 1893: 107.

Type: S. Tomé, *Quintas 1077* (holotype: COI; isotypes: BM, BR, K(?), LISU, Z).

D. angolense Chodat var. *leucanthum* Pellegrin, 1913: 643 (p.p., see note under *D. angolense*).

Chailletia floribunda Planchon ? var. γ , Oliver, 1868: 341. Type: Principe Is., *Mann s.n.* (holotype: K; isotype: P).

Diagnostic characters. Branches and branchlets hollow, velutinous – tomentose, glabrescent. Stipules pinnatisect or dentate, early caducous. Petiole 6–15 mm long. Leaves elliptic to obovate-elliptic, (11)15–22 \times 5–10 cm, with 6–9(10) pairs of lateral nerves, sparsely strigose on both sides, glabrescent. Inflorescences up to ca. 10 cm in diam., tomentose, ca. 6 times branched, often umbellately so. Peduncle free or very shortly adnate to the petiole, very short or absent. Pedicel 3–6(8) mm long, upper part 1–2 mm long. Sepals reflexed. Ovary bilocular, densely lanate. Style 2-lobed at top. Fruits stipitate (?), subglobose to subovoid, tomentose.

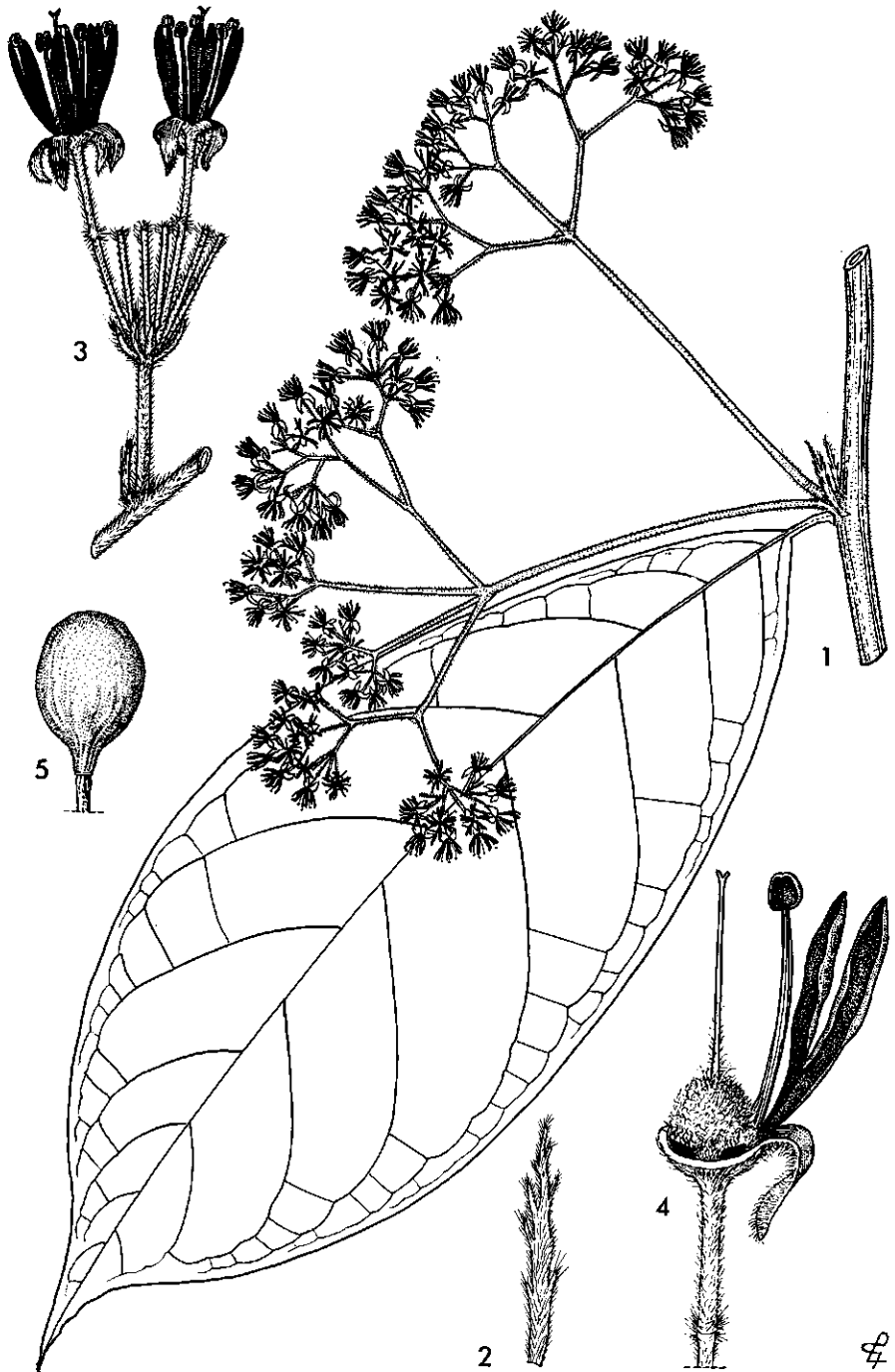


FIG. 21. *D. bocageanum*: 1. flowering branch, $\frac{5}{6} \times$; 2. stipule, $2\frac{1}{2} \times$; 3. detail of inflorescence, $2\frac{1}{2} \times$; 4. pistil with staminodes, $5 \times$; 5. fruit, $\frac{5}{6} \times$. (1, 3-5. Quintas 1077; 2. Mann s.n.).

Description. Tree (?) up to 15 m tall. *Branches* hollow, lenticellate, velutinous-tomentose, glabrescent. *Branchlets* hollow, velutinous-tomentose, sparsely lenticellate or not. *Stipules* early caducous, linear-subulate, pinnatisect to dentate, up to ca. 15 mm long, strigose-tomentose. *Leaves*: petiole subterete to slightly canaliculate above, 6–15 mm long, velutinous-tomentose; blade elliptic to obovate-elliptic, slightly over two times as long as wide, (11)15–22 × 5–10 cm, subcordate, obtuse, or rounded and often slightly unequal-sided at base, acutely acuminate at top, the acumen up to ca. 2 cm long; midrib and the 6–9(10) pairs of lateral nerves usually inconspicuous above, prominent beneath; both sides sparsely strigose (-tomentose), more densely so on the midrib, glabrescent; glands small, inconspicuous, scattered over the lower surface, sometimes a few on the upper side near the base as well. *Inflorescences* up to ca. 10 cm in diam., up to ca. 6 times branched, tomentose, branching often not dichotomous but more umbellate, even in the very axil; peduncle very short or absent, free or very shortly adnate to the petiole; bracts and bracteoles narrowly triangular-subulate, up to ca. 5 mm long, the lower early caducous and usually recaulescent with the branches up to the next fork or branching. *Pedice*l 3–6(8) mm long, always articulate above the middle, the upper part 1–2 mm long, pubescent. *Sepals* reflexed, free or very shortly united at base, oblong or oblong-elliptic, 2.5–3 mm long, top obtuse, rounded or acute, tomentose outside and on the upper part inside. *Petals* erect or slightly spreading, at base shortly adnate to the filaments, ca. obovate in outline, 2.5–3.5 mm long, 1.5–2 mm split, glabrous inside, outside with a few, stiff, appressed hairs just below the split; lobes concave, top rounded. *Stamens* 3–3.5 mm long, erect or nearly so, glabrous; anthers ca. 0.5 mm long, connective very prominent. *Staminodes* oblong, ca. 0.5–1 mm long, less than 0.5 mm wide, glabrous, top bilobed or obtuse, often oblique. *Pistil* 3–3.5 mm long; ovary subglobose, somewhat cuneate at base, 2-locular, densely lanate; style glabrous or sparsely villous, 2-lobed at top. *Fruits* (only 2 immature fruits seen!) subglobose to subovoid, shortly stipitate (?), ca 2–3 cm in diam., brown-tomentose.

Distribution: Only twice collected, once on S. Tomé, once on Principe.

Ecology: rain forest.

Specimens examined. São Tomé, *Quintas 1077* (BM, BR, COI, K(?), LISU, Z, type); Principe, *Mann s.n.* (K, P).

Notes. HENRIQUES did not cite the number of the QUINTAS-collection on which he based his species. The only material, however, present in the Coimbra herbarium which fits the author's description and fieldnotes is *Quintas 1077*. The Kew-specimen, marked *Quintas 61*, is most likely a duplicate of *Quintas 1077*, as some sheets in the Coimbra herbarium bear also the number *61* written after the number *1077*. The label on the Kew-sheet has apparently been incompletely copied from a Coimbra-label.

According to his fieldnotes, QUINTAS found *D. bacogeanum* as a tree of 15 m

high. The only other specimen collected does not bear any notes as regards the habit of the species. Although trees occur in the genus *Dichapetalum*, they are rather rare and hardly exceed a height of 6–8 m. Some doubt regarding the habit of this species remains until other collectors confirm QUINTAS' findings.

D. bocageanum is very closely allied to *D. angolense*. For details see under the latter species.

D. bodyi De Wild.

Fig. 22 Map 13

D. bodyi De Wildeman, 1919: B19; Hauman, 1958-a: 322, p.p. (except *Louis 14298*).

Type: Zaïre, Lake Leopold II, *Body s.n.* (lectotype: BR, designated by Hauman).

Diagnostic characters. Liana or shrub. Branches glabrous or nearly so. Branchlets glabrous or glabrescent. The stipules at one node very unequal in size, the lower much shorter and inserted much above the upper one. Petiole 2–3(4) mm long. Lamina glabrous or nearly so, obovate-elliptic, (8)11–15(18) × 3.5–6(9) cm, rounded and usually unequal-sided at base, with 4–7(9) main lateral nerves on each side of the midrib. Inflorescences rather congested, sessile or nearly so or with an up to 5 mm long peduncle. Sepals erect or slightly spreading, not reflexed, narrowly oblong-elliptic, 2.5–3 × 0.5–1 mm. Petals, stamens, and pistil slightly longer. Ovary 3-locular, velutinous.

Description. Liana or shrub. *Branches* smooth, often glossy, glabrous or nearly so, sparsely lenticellate or not. *Branchlets* appressed-short-hairy when young, soon glabrescent. *Stipules* mostly early caducous, narrowly triangular, 0.5–3 mm long, appressed-short-hairy, the lower much shorter and inserted much above the upper ones. *Leaves*: petiole semi-terete to slightly canaliculate above, 2–3(4) mm long, appressed-short-hairy, glabrescent; blade obovate-elliptic, sometimes narrowly so, 2–3 times as long as wide, (8)11–15(18) × 3.5–6(9) cm, rounded and usually unequal-sided at base, obtusely or acutely acuminate at apex, the acumen 0.5–1.5 cm long, glabrous or nearly so, sparsely appressed-short-hairy on midrib and main lateral nerves when young, soon glabrescent; main lateral nerves 4–7(9) on each side of midrib, usually more prominent beneath; midrib above flat or slightly impressed in lower half, but often slightly raised in upper half; glands usually present on both sides, above mainly near the base, usually along the midrib. *Inflorescences* rather congested, 3–5 times branched, sessile or nearly so, peduncle up to 0.5 cm long, appressed-short-hairy; bracts and bracteoles minute, deltoid, up to 1 mm long. *Pedicel* up to 4 mm long, appressed-puberulous, the upper part at most 1 mm long. *Sepals* erect or slightly spreading, never reflexed, free or slightly united at base, usually concave, narrowly oblong-elliptic, 2.5–3 × 0.5–1 mm, top truncate, obtuse, rounded, or acute, both sides appressed-puberulous to tomentellous. *Petals*

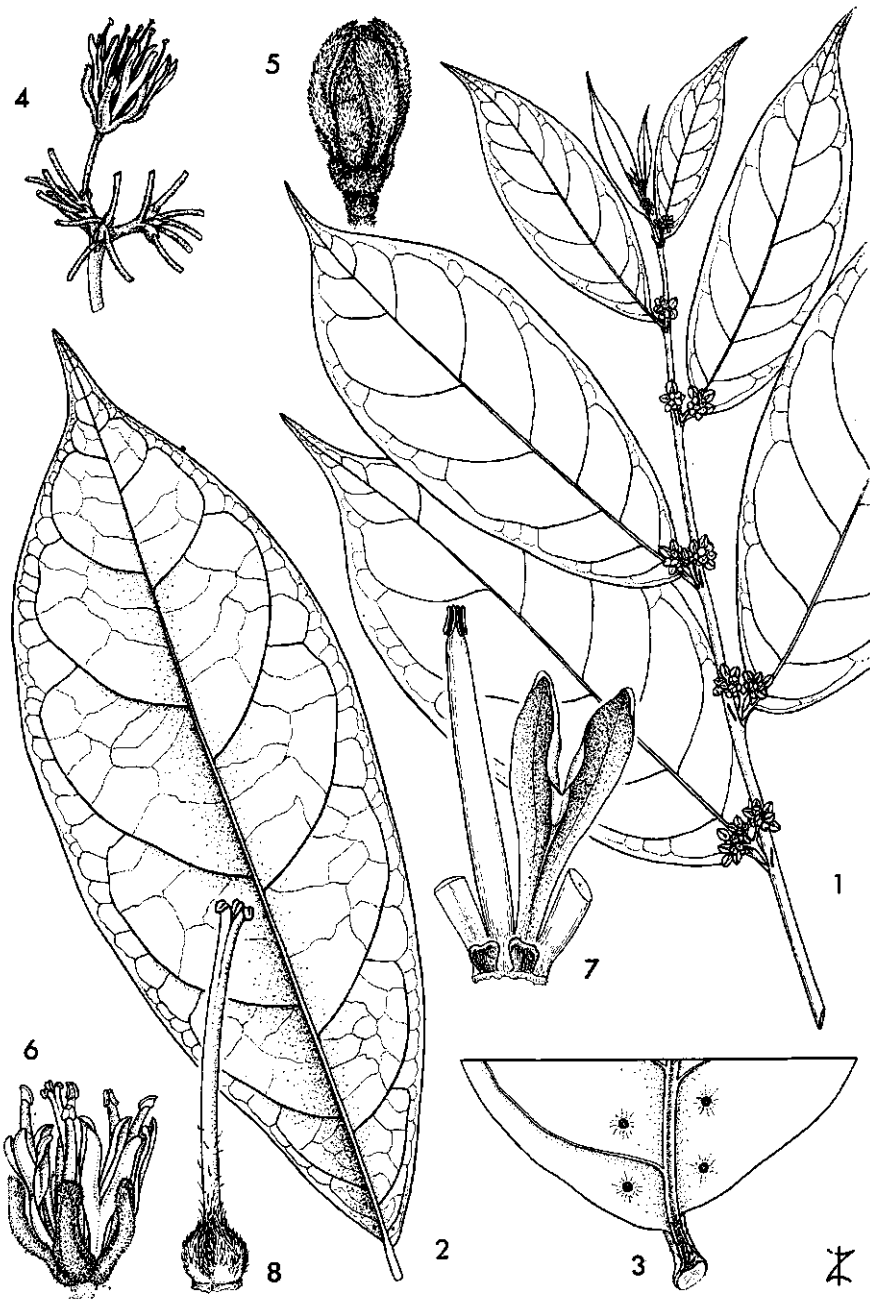
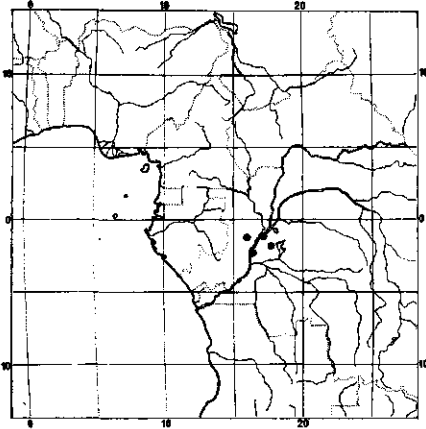


FIG. 22. *D. bodyi*: 1. flowering branch, $\frac{5}{6} \times$; 2. leaf beneath, $\frac{5}{6} \times$; 3. leafbase from above, $2\frac{1}{2} \times$; 4. inflorescence, $2\frac{1}{2} \times$; 5. flowerbud, $10 \times$; 6. flower, $5 \times$; 7. petal, stamen and staminodes, $10 \times$; 8. pistil, $10 \times$. (1, 3. *Body s.n.*; 2, 4-8. *Lebrun 6637*).

MAP 13. *D. bodyi*



erect a nearly so, rather narrow, base shortly adnate to the filaments, 3.5–4.5 mm long, 1–2 mm split, glabrous or with a few appressed hairs outside near base of split; lobes concave, rather narrow, often spreading, top rounded. *Stamens* erect or nearly so, glabrous, 4–5 mm long; anthers up to ca. 0.5 mm long, connective not prominent. *Staminodes* quadrate to slightly oblong, 0.5 mm long, up to 0.5 mm wide, top obtuse, emarginate or bilobed, glabrous. *Pistil* erect, 4–5.5 mm long; ovary subglobose, 3-locular, velutinous; style glabrous or with a few hairs on the lower part, top 3-lobed, lobes up to 0.5 mm long. *Fruits* unknown.

Distribution: Congo, Zaïre.
Ecology: Forest or forest edge.

Specimens examined. Congo: Gamboma Region, *Descoings* 7067 (MPU, P, WAG).
 Zaïre: Lake Leopold II, *Body s.n.* (BR, type); between Kutu and Lukolela, *Lebrun* 6637 (BR, LISC); Bolobo, *Lebrun* 6759 (BR, K, SRGH); Lukolela, *Pynaert* 315 (BR, paratype).

Notes. *D. bodyi* is closely related to 3 species: *D. cymulosum*, *D. dictyospermum*, and *D. filicaule*. From the first two species it can easily be distinguished by the sepals which are reflexed in these species and erect, or nearly so, in *D. bodyi*. From *D. filicaule* it may be distinguished as follows:

Leaves oblong-elliptic to narrowly obovate, usually cordate or subcordate and equal-sided at base, (3)6–9(13) × (1)2–3(5) cm. Ivory Coast – W. Ghana	<i>D. filicaule</i>
Leaves obovate-elliptic, rounded and usually unequal-sided at base, (8)11–15(18) × 3.5–6(9) cm. Congo, Zaïre.	<i>D. bodyi</i>

D. bojeri (Tulasne) Engler, 1896-a: 348; Engler & Krause, 1931: 6; Descoings, 1960: 73; 1961: 25.

Basionym: *Chailletia bojeri* Tulasne, 1857: 85.

Type: Madagascar, near Mazangay, *Bojer s.n.* (holotype: P, photograph WAG).

D. lantzianum Baillon, 1892: pl. 206, p.p. Type: Madagascar, between Madanga and Antsahalanbé, *Grandidier s.n.* (lectotype: P).

D. hirtellum (Tulasne) Engler, 1896-a: 348; Engler & Krause, 1931: 6; Descoings, 1960: 80; 1961: 24. Basionym: *Chailletia hirtella* Tulasne, 1857: 88. Type: Madagascar, Nossi Bé, *Boivin 2256* (holotype: P; isotype: TAN, n.v.).

Diagnostic characters. Liana, shrub, or small tree. Branchlets tomentose. Stipules triangular-subulate, early caducous. Petiole (2)3–6(12) mm long. Leaves obovate-elliptic, (2)4–8(14) × (1)2.5–3.5(6) cm, both sides tomentose, sometimes more strigose, more rapidly glabrescent above. Inflorescences pedunculate, the peduncle (2)5–8(11) mm long, adnate to petiole or not. Flowers ca. 4 mm long. Sepals usually reflexed, but some may be spreading or erect. Petals emarginate or entire at top. Ovary densely lanate. Fruits densely velutinous–tomentose.

Description. Liana, shrub, or small tree. *Branches* usually with scattered lenticels, in rows on the grooved orthotropic branches of lianas. *Branchlets* densely tomentose, sometimes glabrescent, with scattered lenticels or without. *Stipules* early caducous, triangular to subulate, 1–3(5) mm long, tomentose-strigose. *Leaves*: petiole semi-terete, sometimes slightly canaliculate above, (2)3–6(12) mm long, often comparatively longer when united with peduncle of inflorescence, tomentose or tomentose-strigose; blade obovate-elliptic, sometimes narrowly so, sometimes oblong, (1.25)1.5–2(3) times as long as wide, (2)4–8(14) × (1)2.5–3.5(6) cm, cordate, subcordate, truncate, obtuse, or rounded and sometimes unequal-sided at base, top obtuse, rounded or acute, often mucronate or truncate-emarginate, sometimes acuminate, the acumen up to 1 cm long; with (4)5–8(9) main lateral nerves on each side of midrib, the latter more or less flat or slightly impressed above, the nervation much more prominent beneath; both sides tomentose to velutinous or tomentose to strigose, more densely so on midrib and main lateral nerves, beneath usually more dense and rather longer persistent; glands few, small, inconspicuous, usually on lower surface only. *Inflorescences* pedunculate, rather congested, up to ca. 15(30)-flowered, ca. 2–4(5) times branched, tomentose; peduncle slender, free or adnate to the petiole (even in a single specimen), (2)5–8(11) mm long; bracts and bracteoles minute, triangular, up to 1 mm long. *Pedicel* short, usually up to 2 mm long, but up to 4 mm in terminal flowers, the upper part 0.5–1 mm long, appressedly pubescent to tomentose. *Calyx* obtuse to truncate at base. *Sepals* erect or spreading, but usually reflexed in mature flowers, narrowly triangular to

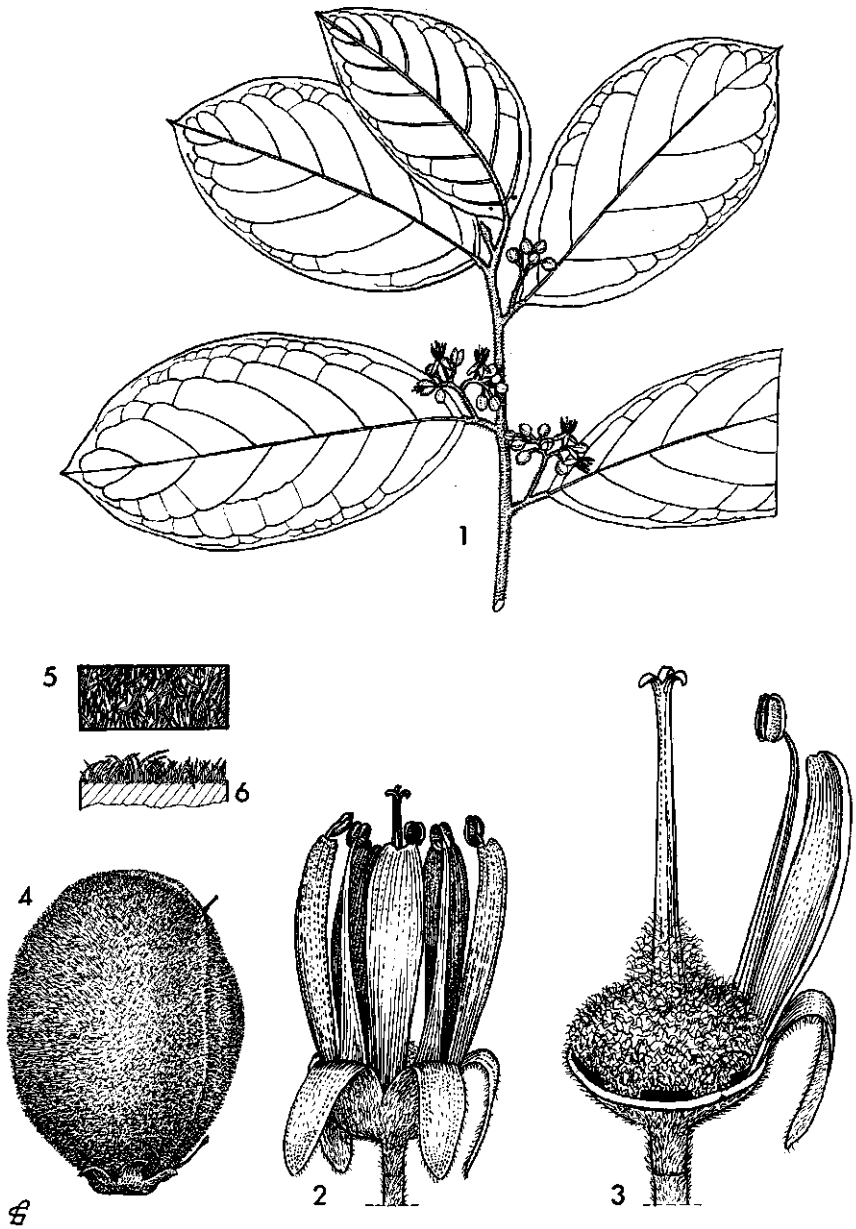


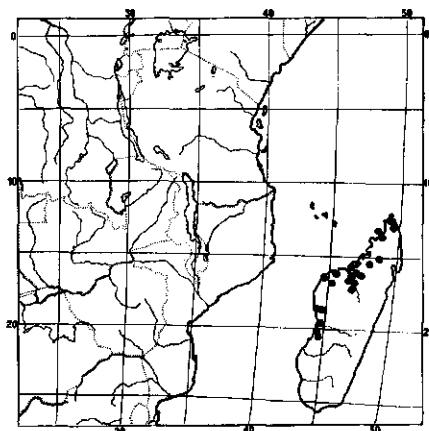
FIG. 23. *D. bojeri*: 1. flowering branch, $\frac{5}{6} \times$; 2. flower, $10 \times$; 3. pistil with staminodes, $15 \times$; 4. fruit, $2\frac{1}{2} \times$; 5-6. surface and sectional view of indumentum of fruit, $10 \times$. (1-3. *Humbert & Perrier de la Bâthie* 2358; 4-6. *Viguiet & Humbert* 14).

oblong, (2)2.5–3.5 × 0.5–1.5 mm, top usually more or less acute, appressed-pubescent to tomentose outside, inside sparsely appressedly puberulous-tomentellous, mainly in the upper part, or glabrous. *Petals* erect, base shortly adnate to filaments, narrowly obovate, (2)2.5–3.5 mm long, ca. 0.5–1 mm wide, top emarginate or entire, glabrous or with a few appressed hairs outside. *Stamens* erect, (2.5)3–3.5(4) mm long, glabrous, connective prominent. *Staminodes* subquadrate, up to 0.5 × 0.5 mm, glabrous. *Pistil* (2.5)3–4 mm long; ovary 3(4)-locular, densely lanate; style glabrous, sometimes lanate in the lower part, top 3(4)-lobed, lobes less than 0.5 mm long. *Fruits* consisting of 1–3 mericarps, 1–3-seeded; each mericarp subellipsoid, up to 16 mm long and 10 mm in diam., the aborted mericarps usually represented by a ridge-like appendage; exocarp densely velutinous – tomentose; endocarp with a bony, slightly rugose outer layer and a fibrous inner lining, glossy and minutely striate inside. *Seed* ellipsoid, up to ca. 12 mm long and 5 mm in diam.; testa brown, glossy, glabrous or sometimes hairy, especially near the hilum.

Distribution: Madagascar.

Ecology: Dry forest, savannah.

Specimens examined. Madagascar: sin.loc., *Baron* 5423 (K, P); 5426 (K, P); 5567 (K, P); Nossi Bé, *Boivin* 2256 (P, WAG, type of *D. hirtellum*); near Mazangay, *Bojer* s.n. (K, P, type of *D. bojeri*); Ankilizato, *Bosser* 4705 (P); Port-Bergé, *Bosser* 5741 (P); 5742 (P); Western Prov., km 48 Majunga Rd., *Bosser* 8325 (P); Ambolomoty (Marovoay), *Bosser* 8371 (P); Ankara-fantsika, *Bosser* 8374 (P); km 50 Antsohiby – Befandriana, *Bosser* 16667 (P); Bomalar Bay, *Boulon* s.n. (K); Tananarive – Majunga Rd., *Capuron* SF 130 (P); Ambato-Boéni, *Capuron* SF 205 (P); Bevazaha, near Tsaramandroso, *Cons. Rés. Nat.* 1679 (P); Nossi Bé, *Cons. Rés. Nat.* 3006 (P); Soalala, *Cons. Rés. Nat.* 7388 (P); Ambato-Boéni, *Cons. Rés. Nat.* 11415 (P); near Marovoay, *d'Alleizette* s.n. (L); Bokarafa, *Decary* 8126 (BM, K, P); Madirovalo, *Decary* 8190 (P, PRE); Besalampy, *Decary* 15.658 (P); Maevatanana, *Decary* 17087 (P); Nossi Bé, *Descoings* 1049 (P); between Madsanga and Antsahalanbé, *Grandidier* s.n. (P, type of *D. lantzia-num*); Sakaramy, *Homolle* 366 (P); Betsiboka Valley at Marovoay, *Humbert & Perrier de la*



MAP 14. *D. bojeri*

Bâthie 2358 (B, G, P); mouth of Tsiribihina R., *Humbert* 11439 (P); near Analamera, *Humbert* 19103 (P); 19236 (P); Ankobakobaka, near Befandriana, *Jard. Bot. Tan.* 5269 (P); S. Marie de Marovoay, *Kaudern s.n.* (G); near Morondava, *Keraudren & Aymonin* 25954 (P, WAG); near Sahoany, *Léandri* 300 (BM, K, P); 302 (P); 349 (P); 400 (P); Morondava Rd., near Mahabo, *Morat* 3700 (P); Tsarasaotra, *Perrier de la Bâthie* 359 (P); Ambongo et Boina, *Perrier de la Bâthie* 359-bis (P); sin.loc., *Perrier de la Bâthie* 6246 (P); Nossi Mitsio, *Perrier de la Bâthie* 18778 (P); Majunga, *Perry s.n.* (K); *Poisson* 107 (P); *Viguiet & Humbert* 14 (B, P).

Notes. Amongst the species from Madagascar with entire or nearly entire petals *D. bojeri* is, together with *D. vondrozanum*, well distinguished by its lanate indumentum on the ovary. *D. vondrozanum* has only been collected twice and fruits are unknown. It is therefore rather difficult to separate them clearly. However, *D. vondrozanum* may probably be separated by its larger flowers, the non-reflexed sepals, the shorter petiole, and the different indumentum on the leaves.

D. lantzianum was published by BAILLON without a description and based on a plate with analysis only. In the Paris herbarium 2 specimens could be traced bearing this name. These specimens, however, belong to different taxa: *D. bojeri* (*Grandidier s.n.*) and *D. leucosia* (*Lantz s.n.*). DESCOINGS (1960: 86) did not note this (although he correctly identified both specimens) and placed *D. lantzianum* into synonymy of *D. bojeri*. Both specimens have been used to compose the plate. The larger branch on the left is drawn from GRANDIDIER's specimen, the smaller branchlet on the right from a part of the LANTZ' specimen. The details of the plate may have been drawn from both specimens, at least they do not exclude one of both. I have therefore followed DESCOINGS (1960, 1961) and treat *D. lantzianum* as a synonym of *D. bojeri*. Consequently GRANDIDIER's specimen has been designated lectotype.

The distinguishing characters observed by DESCOINGS (1960: 82) of *D. bojeri* and *D. hirtellum* are mainly restricted to the vegetative parts. The oblong-obovate leaves with a cordate base and the hirsute indumentum should separate *D. hirtellum* from *D. bojeri*, at least according to the key given on page 5 (DESCOINGS, 1961). As to leaf shape in *D. bojeri*, a cordate leaf base is very often seen (holotype!) as well as an almost oblong leaf (holotype!). Moreover, *D. hirtellum* does not always have oblong leaves with a cordate base (see drawing DESCOINGS, 1960: 79).

The difference in indumentum is somewhat more obvious, as it shows a discontinuity between four specimens, identified as *D. hirtellum*, from the islands Nossi Bé and Nossi Mitsio on the one hand and the far more numerous specimens from the main island Madagascar belonging to *D. bojeri* on the other hand. A closer study of these two types of indumentum shows that the difference is restricted to a difference in length of the hairs. Collections from the coastal area opposite the islands Nossi Bé and Nossi Mitsio will most likely produce completely intermediary specimens, as is already partly the case with *Humbert* 19236 from the Diego-Suarez province.

Lastly, the difference in flower size mentioned (DESCOINGS, 1961: in key) is

rather small, and flowers of 3 mm length have been observed in specimens of *D. bojeri* (e.g. *J. Bosser 8371*) as well.

Upon these observations it must be concluded that *D. hirtellum* and *D. bojeri* are conspecific. The latter name has been adopted because the specimens previously identified as belonging to it are far more numerous than those assigned to *D. hirtellum*.

D. brachysepalum Engl. = *D. crassifolium* Chod.

D. brachysepalum Engler, 1912-b: 444, pl. 53 A–C (with subscription *D. brachystachyum*); 1912-a: 588, nomen; De Wildeman, 1919: B21; Engler & Krause, 1931: 8; Hauman, 1958-a: 297. Type: Zaire, Beni, near Muera, *Mildbraed 2203* (holotype: B†; lectotype: BM; isotype (?): B).

Notes. The main characters used by HAUMAN (1958-a) to separate his four species with entire petals (HAUMAN l.c.: 289, group I) are based on the fusion of petals with filaments. HAUMAN himself, however, considers this of little value (note under *D. brachysepalum*) and I share this view as in each of these species the petals are adnate to the filaments, although for a variable length. The other characters used, as shape and size of leaf acumen, the relative length of the petals, etc., are very variable throughout, even in a single specimen, and, as regards the petals, often linked to the state of maturity of the flower. These four species are conspecific with *D. crassifolium*, a species apparently not seen or not compared by HAUMAN.

The Berlin herbarium may have a duplicate of the original material of *D. brachysepalum*. The label, however, does not bear MILD BRAED's name nor his number 2203. Date and area of collection are correct and the material fits ENGLER's drawing. As some doubt remains I have preferred to choose the fragment in BM as lectotype.

D. braunii Engl. & Krause

Fig. 24

D. braunii Engler & Krause, 1914: 451; Engler, 1915: 844; Moss, 1928: 128; Engler & Krause, 1931: 6; Brenan & Greenway, 1949: 130, p.p. (except *Greenway 4990*); Verdcourt & Trimp, 1970: 67.

Type: Tanzania, Lindi District, near Mtua, *Braun in Herb. Amani no. 606* (holotype: B†; lectotype: BM, photograph WAG).

D. stuhlmannii Auct. non Engler, Braun, 1908: 246, t. I, a–c.

Diagnostic characters. Shrub or lianescent shrub. Leaves coriaceous, glossy on both sides, glabrous or nearly so, elliptic to obovate, (5.5)7–10(13) × (2.5)3–4.5(6) cm, shortly acuminate, without glands above, beneath usually with 2 large glands near the base. Inflorescences sparsely short-hairy, peduncle

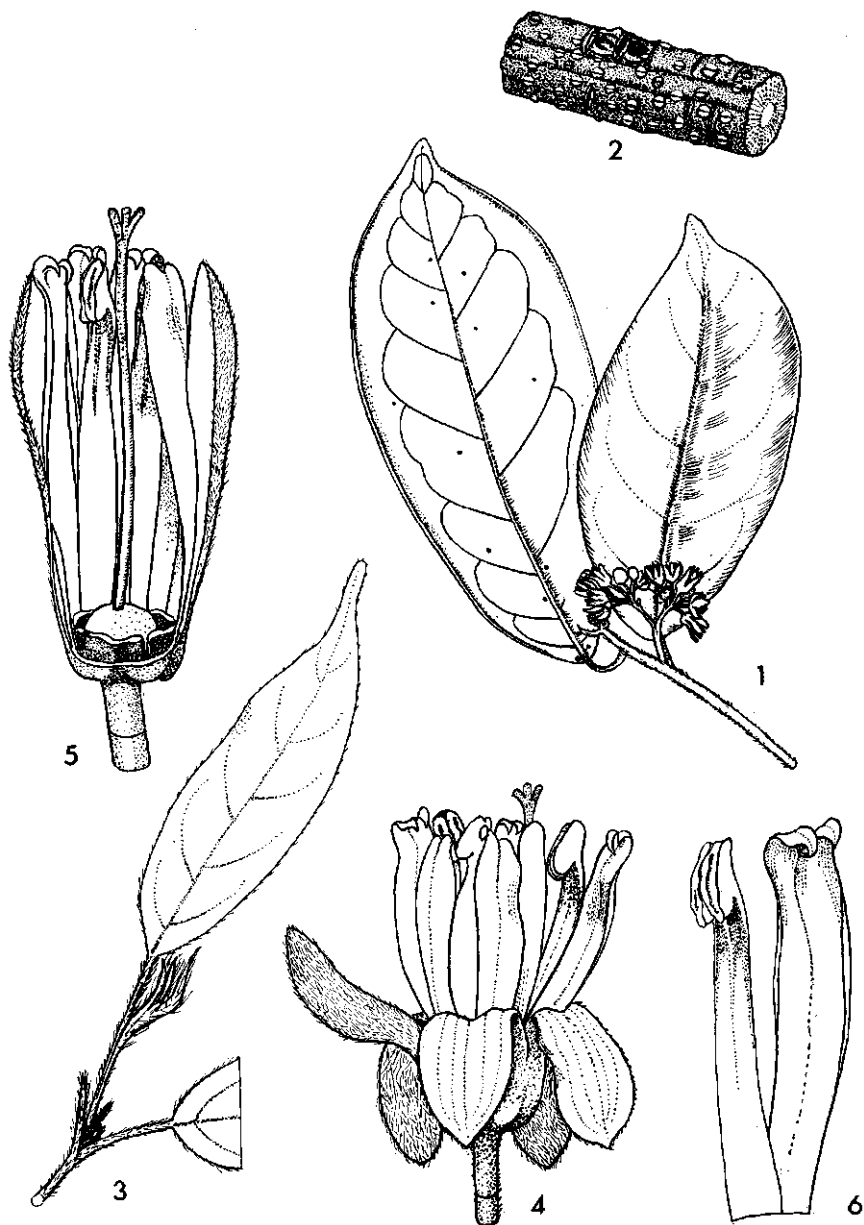


FIG. 24. *D. braunii*: 1. flowering branch, $\frac{5}{6} \times$; 2. part of branch with lenticels, $2\frac{1}{2} \times$; 3. top of young shoot with stipules, $2\frac{1}{2} \times$; 4. flower, $7\frac{1}{2} \times$; 5. flower showing inside with pistil and staminodes, $10 \times$; 6. petal and stamen, $10 \times$. (1-6. Schlieben 5196).

(3)5–7 mm long. Flowers 4.5–6 mm long. Sepals puberulous, mainly in the upper part. Petals retuse to very shortly split at apex. Pistil glabrous; ovary 3-locular; style shortly 3-lobed.

Description. Shrub, lianescent or not. *Branches* glabrous or nearly so, usually dark-brown, with numerous minute lenticels. *Branchlets* shortly golden-brown-hirsute when young, glabrescent. *Stipules* early caducous, narrowly triangular, (1)2–5 mm long, sub-appressed-shortly hirsute. *Leaves*: petiole shallowly canaliculate above, (3)4–7 mm long, shortly hirsute; blade coriaceous, glossy on both sides (more or less so when young), elliptic to obovate, 2–2.5 times as long as wide, (5.5)7–10(13) × (2.5)3–4.5(6) cm, rounded to obtuse to truncate and often slightly unequal sided at base, obtusely to acutely short-acuminate at the top, the acumen up to 1 cm long; margin often retuse in older leaves, with (5)6–8 main lateral nerves on each side of the midrib, nerves rather obscure above, prominent beneath, midrib usually impressed above, at least in the lower part; margin, midrib, and main lateral nerves hirsute when young, often sub-appressed and sparsely so, usually soon glabrescent; no glands above, beneath usually with 2 large glands near the base, flanking the midrib, and few usually smaller glands scattered over the lower surface. *Inflorescences* ca. 3–4 times branched, sparsely puberulous to sparsely shortly hirsute; bracts and bracteoles triangular, minute, at most 1 mm long, shortly sub-appressed-hirsute; peduncle (3)5–7 mm long. *Pedicel* (1)2–4 mm long, articulated at or near the top, the upper part 1 mm long at most. *Sepals* erect or slightly spreading, occasionally some reflexed, free at base or nearly so, slightly unequal, oblong, 4–5.5 × 1.5 mm, top obtuse, rounded, or acutish, both sides puberulous, but mainly in upper part. *Petals* erect, shortly adnate to filaments at base, narrowly obovate-oblong, ca. 4.5–6 × 1 mm, glabrous, top retuse or up to 0.5 mm split, often inrolled. *Stamens* erect, 4–5.5 mm long, glabrous; connective strongly prominent. *Staminodes* forming a lobate often rimlike, up to 0.5 mm high, glabrous cupula around the ovary. Pistil 5.5–6.5 mm long, glabrous; style shortly 3-lobed; ovary depressed-globose, obscurely 3-lobed, 3-locular. *Fruits* unknown (see note).

Distribution: Lindi District, S.E. Tanzania.

Ecology: Savannah woodland.

Specimens examined. Tanzania: Lindi Distr., near Mtua, *Braun in Herb. Amani 606* (BM, type); Mayanga, *Busse 2538* (EA); Mtua, near Lindi, *Ewerbeck in Herb. Amani 606* (EA, PRE); Lutamba Lake, *Schlieben 5196* (B, BM, BR, G, M, LISC, P, Z).

Notes. VERDCOURT's statement (VERDCOURT & TRUMP, l.c.: 67) that the type material lost in Berlin had not been collected by BRAUN, but by EWERBECK (or ERVERBECK) seems to be incorrect. There is no reason to doubt BRAUN's statement (l.c.: 246): 'Verf. fand die Pflanze im Juni 1906 bei Mtua im Bezirk Lindi', because at the beginning of his article BRAUN said: 'Im Jahre 1906 hatte Verf. dann Gelegenheit die Pflanze selbst an Ort und Stelle zu sammeln und konnte

darauf der Name derselben festgelegt werden'. EWERBECK's collection was made in March 1906 and BRAUN's collection from the same location was given the same number, most likely because it had been taken from the same plant or at least from the same population. That BRAUN indeed travelled in the area at the time indicated is shown by his collection no. 1283 (= *D. mossambicense*) gathered on 31.5.1906, 'zwischen Kilwa und dem Singino'.

ENGLER and KRAUSE described the ovary and the lower part of the style as being pilose, which cannot be confirmed. The pistil is completely glabrous in all specimens examined. It might be that some mycelium on the pistil has been mistaken for true hairs. They stated further that the sepals are glabrous inside and the petals completely entire. The sepals, however, are puberulous inside, and the petals are either retuse or shortly incised at apex, as was pointed out by BRAUN (l.c.).

The fruit of *D. braunii* is most probably glabrous. In BRAUN's article a fruit is figured and his description runs: 'Die Frucht ist gross, länglich, zugespitzt, bis 3 cm lang und ziemlich kahl'. The specimen in PRE (*herb. Amani no. 606*, ? collector *Warnecke*) bears two very young, completely glabrous fruits.

Various collectors described *D. braunii* as a shrub. To judge from *Schlieben 5196* (B), however, the habit may also be that of a scandent shrub or liana.

D. braunii can easily be distinguished from its close relatives in East Africa (*D. ruhlandii* & *D. stuhlmannii*) by the completely glabrous pistil and most probably also by the glabrous fruit.

This species is reported as being poisonous to domestic stock (BRAUN, l.c.) in a similar manner as found in other species, like *D. cymosum* and *D. stuhlmannii*.

***D. brazzae* Pellegr.**

Fig. 25 Map 15

D. brazzae Pellegrin, 1912: 276; 1913: 647; De Wildeman, 1919: B21; Hauman, 1958-a: 304, p.p. (except *Gerard 435*).

Type: Congo, Brazzaville, *J. de Brazza 31* (lectotype: P; isotypes: BR, K, WAG).

D. brazzae Pellegrin var. *purpurascens* Hauman, 1955: 348; 1958-a: 304. Type: Zaïre, between Lubutu and Kirundu, *Bequaert 6849* (holotype: BR, photograph WAG).

D. butayei De Wildeman, 1919: B22; Hauman, 1958-a: 306. Type: Zaïre, between Dembo and Kwango R., *Butaye in Gillet 1504* (holotype: BR).

D. divaricatum De Wildeman, 1919: B26. Type: Zaïre, Sabuka, *Claessens 386* (holotype: BR).

Diagnostic characters. Liana or shrub. Freshly cut bark of branches and branchlets exuding a reddish, sour, sticky slime, turning blackish-brown when dry. Branchlets densely tomentose, glabrescent with age. Petiole 2–5(10) mm long, tomentose. Leafblade obovate-elliptic or oblong, (5)10–15(21) × 3–7(8.5) cm; leaftip usually densely tomentose on both sides, glandular beneath; midrib

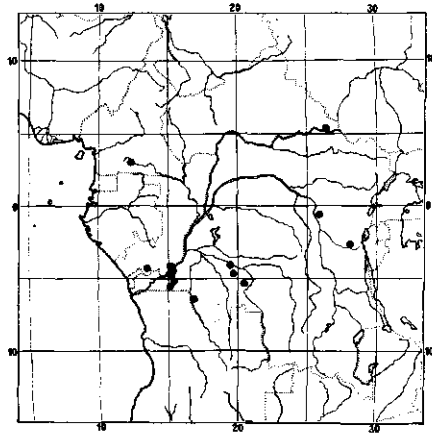


FIG. 25. *D. brazzae*: 1. flowering branch, $\frac{1}{2} \times$; 2. leaftop beneath, $2 \times$; 3. inflorescence, $\frac{1}{2} \times$; 4. flower, $6 \times$; 5. pistil with staminodes, $6 \times$; 6. fruit, $1 \times$; 7. detail endocarp inside, $6 \times$ (1-2. Achten 199B; 3-5, 7. J. De Brazza 31; 6. Carlier 265).

impressed above. Inflorescences many-flowered, usually rather loose and pedunculate, tomentose. Sepals reflexed. Petals suberect, the top often curved inwards. Ovary, and often the lower part of the style, densely lanate, 3-locular. Fruits consisting of 1 or 2–3 deeply divided mericarps; mericarp subreniform, laterally compressed, softly velutinous-tomentose; endocarp usually loosely pubescent inside.

Description. Liana, lianescent shrub, or shrub. *Branches* glabrous or glabrescent, often obscurely lenticellate. *Branchlets* pale yellowish- or dark-reddish-brown-tomentose. Fresh bark of branches and branchlets when cut exuding a usually reddish, sour, sticky slime, turning dark brown when dry. *Stipules* early caducous, triangular-subulate, 1–4(7) mm long, tomentose. *Leaves*: petiole subterete, 2–5(10) mm long, tomentose; blade obovate-elliptic or oblong, sometimes narrowly so, 1.75–2.5(3) times as long as wide, (5)10–15(21) × 3–7(8.5) cm, cuneate, rounded, obtuse, truncate, or cordate at base, acute or abruptly short-acuminate at top, the acumen up to 5 mm long; midrib impressed above, lateral nerves (4)5–7(9) on each side of the midrib, rather obscure above, prominent beneath, both sides tomentose on the midrib and often also on the main lateral nerves, sometimes on tertiary veins as well or completely tomentose in young leaves, glabrescent, the glandular leaf tip rather densely tomentose on both sides and this indumentum longer persistent, especially beneath; glands conspicuous, usually beneath only, rather concentrated near the base and on the tip, usually with some scattered glands mainly along the midrib as well. *Inflorescences* usually pedunculate and rather loose, more rarely congested, many-flowered, up to ca. 6 times branched and 7 cm in diam., tomentose, sometimes several together on leafless axillary shoots; peduncle (0)1–25 mm long, sometimes very lowly branched in the axil of the subtending leaf, free or sometimes adnate to the petiole (see notes); bracts and bracteoles minute, triangular, usually ca. 1 mm long, rarely up to 2 mm long. *Flowers* short but distinctly pedicellate; pedicel up to 5 mm long, the upper part up to 1.5 mm long, tomentose. *Calyx* usually obtuse at base. *Sepals* reflexed in mature flowers, shortly united at base, usually oblong-elliptic, occasionally ovate, or obovate, or triangular, 2.5–3.5(4) × ca. 1 mm, top truncate to acute, tomentose outside, inside sparsely so and mainly in the upper part, occasionally quite glabrous inside. *Petals* suberect or spreading, often the top curved inwards, shortly adnate to filaments at base, narrowly obovate-oblongate in outline, (2.5)3–4 mm long, 0.5–1.5(2) mm split, glabrous or with a few hairs outside, lobes usually concave, with a rounded top. *Stamens* usually erect, rarely spreading, 3.5–5.5 mm long, glabrous; anthers ca. 0.5 mm long; connective prominent. *Staminodes* subquadrate to subobovate, occasionally bilobed at the top, up to 0.5 mm long, glabrous. *Pistil* erect, (2.5)4–6 mm long; ovary 3-locular, densely lanate; style glabrous or the lower part lanate, top 3-lobed, the lobes short, at most up to 0.5 mm long. *Fruits*: 1 or 2–3 deeply divided mericarps, the aborted mericarps represented by a small lobe or ridge; mericarps sub-reniform, laterally compressed, not or slightly apiculate, 15–18 mm long, 10–15 mm wide, up to ca. 8

MAP 15. *D. brazzae*



mm thick, densely softly velutinous-tomentose; endocarp with a thin, bony outer layer and a fibrous, finely striate inner lining, usually loosely pubescent inside. *Seeds* laterally compressed, up to ca. 12 mm long; testa brown, glossy, glabrous.

Distribution: Southern Cameroun, Congo, Zaïre, Central African Republic. No records from Gabon.

Ecology: Rain forest, gallery forest, semi-deciduous forest.

Specimens examined. Cameroun: Bitye, *Bates 1194* (BM); *1766* (K, P, PRE).

Congo: Brazzaville, *Chevalier 4003* (P); *11171* (P); *27190* (P); *J. de Brazza 31* (BR, K, P, WAG, type); *32* (P, WAG, paratype); *Koechlin 425* (IRSC); *1283* (IRSC); Loua F.R., *Koechlin 2839* (P); near Brazzaville, *Koechlin 5392* (IRSC); *6029* (IRSC); Brazzaville, *Trochain 7085* (IRSC); *9273* (IRSC); *11385* (P).

Zaïre: Luebo, *Achten 199B* (BR); Lubutu – Kirundu, *Bequaert 6849* (BR, type of *D. brazzae* var. *purpurascens*); between Dembo and Kwango R., *Butaye in coll. Gillet 1504* (BR, type of *D. butayei*); Kingunda, *Callens 4318* (BR); Kimuenza, *Carlier 265* (BR, K, SRGH); Sabuka, *Claessens 386* (BR); Tampa, Madimba – Kasangulu Rd., *Compère 1952* (BR); Kimuenza, *Evrard 6474* (BR); *Gillet 1619* (BR); *1626* (BR); *1633* (BR); near Kinshasa, *Jans 293* (BR); Kimuenza, *Jans 341* (BR); Nzovu, *A. Léonard 5191* (BR, WAG); near Sanda, *Oddon in Gillet 3543* (BR); Kimwenza, *Pauwels 1025* (BR, WAG); Kimuenza, *W. Robyns 4221* (BR); Ipamu, *Vanderyst 10326* (BR); *10921* (BR); between Lubue R. and Loange R., *Vanderyst 12289* (BR); *12525* (BR).

Central African Republic: Obo Region, *Descoings 12250* (IRSC).

Notes. HAUMAN based his var. *purpurascens* on the oblong leaves and the purple-hairy, more congested inflorescence. Oblong leaves instead of the usually obovate-elliptic leaves can also be observed in specimens of *D. brazzae* s.s., occasionally even a mixture of these two leaf shapes is present, e.g. in *Koechlin 425, 5392, 6029*. As regards the colour of the indumentum on the inflorescence, *Trochain 9273* forms a good intermediate towards the generally pale hairy inflorescence of *D. brazzae* s.s. The more congested inflorescence of var.

purpurascens is also linked by intermediates, e.g. *Koechlin 5392*, *Butaye in Gillet 1504*.

D. butayei was considered by HAUMAN to be a 'forme rare' of *D. brazzae*. Considering the variation in the latter the type specimen of *D. butayei* fits very well in *D. brazzae*.

D. divaricatum has already been reduced into the synonymy of *D. brazzae* by HAUMAN. His decision is fully supported.

The two specimens from Bitye, Cameroun, *Bates 1194* and *Bates 1766*, have the peduncle adnate to the petiole, a phenomenon not seen in other specimens of *D. brazzae*. As no other character could be observed to keep these two specimens apart from *D. brazzae* and considering the doubtful value of the above-mentioned character (e.g. *D. angolense*), these specimens are referred to *D. brazzae*.

D. brazzae is very closely related to *D. librevillense*, a species of which the branches also exude the reddish slime mentioned in the description of the former. This phenomenon has, besides in these two species, only been observed in *D. crassifolium*. The two related species may be distinguished as follows:

Midrib impressed above; endocarp usually loosely pubescent inside	D. brazzae
Midrib raised above; endocarp usually glabrous inside	D. librevillense

D. brevitubulosum Engl. = **D. madagascariense** Poir.

D. brevitubulosum Engler, 1912: 589; Pellegrin, 1913: 584; De Wildeman, 1919: B22. Type: Cameroun, near Bijoka, *Zenker 3890* (holotype: B†; lectotype: E; isotypes: BM, BR, GOET, K, L, LE, M, PRE, W, WAG, WU, Z).

Note. The variability in the wide-spread *D. madagascariense*, together with the place of *D. brevitubulosum* within this species, will be discussed with the treatment of *D. madagascariense*.

D. brownii Baill. = **D. madagascariense** Poir.

D. brownii Baillon, 1892: pl. 205; Descoings, 1960: 76; 1961: 6 (in synonymy to *D. thouarsianum* R. & S.). Type: Madagascar, St. Marie Is., Ambodifototra, *Boivin 1878* (lectotype: P).

Notes. BAILLON was the first author who gave priority to the name *Dichapetalum* over the until then commonly used name *Chailletia*. When he revised the species from Madagascar the currently used name for the type species, *Chailletia dichapetalum* R.Br. ex DC., had to be changed. Most likely BAILLON did not intend to publish a new species, but only a new name for the type species when

accepting *Dichapetalum* as the valid name for the genus. As the epithet '*dichapetalum*' combined in *Dichapetalum* would constitute a tautonym, he named the type species *D. brownii* after the (supposed) author of *Chailletia dichapetalum*, overlooking the available names *D. madagascariense* and *D. thouarsianum* (see note under type species).

Contrary to DESCOINGS' findings (DESCOINGS, 1960: 76), the present author traced a specimen in the Paris herbarium bearing the name '*Dichapetalum Brownii*', undoubtedly written by BAILLON. As this specimen bears flowerbuds only, it evidently has not served for the drawing, showing an abundantly flowering specimen, published by BAILLON. Thus the original material consists of at least two specimens. The drawing might have been based on *Hildebrandt 3266*, but unfortunately this specimen lacks any pertinent information and it does not match the drawing exactly, although it seems to have been the only abundantly flowering specimen present in the Paris herbarium at the time of publication.

As the present author prefers to typify a name by a specimen rather than by a plate, he designates as lectotype the specimen found in the Paris herbarium bearing the name '*Dichapetalum Brownii*': *Boivin 1878*.

Although detailed, the drawing is rather difficult to place with certitude. It may represent *D. madagascariense*, but in some aspects also the very closely related *D. multiflorum*. The many-flowered inflorescences with the rather long-stalked flowers are more usually seen in specimens of the latter. A glabrous staminode as seen on the drawing, may be found in both species, although more often in *D. multiflorum*. The relative length of sepals, petals, stamens, and pistil is varying in both species and does not give any good indication. The anther connective does not seem to be very prominent on the plate, which fits *D. multiflorum* better than *D. madagascariense*. The main character, however, to distinguish between both species is seen in the fruit: glabrous or with a very few scattered hairs in *D. multiflorum*, and densely hairy in *D. madagascariense*. The fruit shown on the plate, is densely hairy and certainly represents an element of *D. madagascariense* and excludes *D. multiflorum*.

D. bullockii Haum. = *D. cymosum* (Hook.) Engl.

D. bullockii Hauman, 1958-b: 74; White, 1962: 185; Torre, 1963: 324. Type: Zambia, Mkupa, *Bullock 1196* (holotype: BR; isotype: K).

Note. The differences between *D. cymosum* and the type with the few specimens of *D. bullockii* collected afterwards, are of a quantitative nature and rather insignificant. They do not justify maintaining *D. bullockii* as a distinct taxon. These small differences and the variation in *D. cymosum* will be discussed in detail under the latter species.

D. bussei Engl. = **D. pallidum** (Oliv.) Engl.

D. bussei Engler, 1911: 250, f. 2; 1912-a: 574, f. 1; 1915: 845, f. 397; De Wildeman, 1919: B22. Type: Togo, near Kpeme, *Busse* 3639 (holotype: B†; lectotype: BM).

Note. The characters of *D. bussei* fall completely within the range of the very variable *D. pallidum*. In both editions of the Flora of West Tropical Africa *D. bussei* has been treated as a synonym of *D. pallidum* as well.

D. butayei De Wild. = **D. brazzae** Pellegr.

Note. For details see under *D. brazzae*.

D. buvumense Bak. f. = **D. madagascariense** Poir.

D. buvumense Baker f., 1905: 133; De Wildeman, 1919: B23. Type: Uganda, Victoria Lake, Nyanza, Island of Buvuma, *Bagshawe* 595 (holotype: BM; isotype: WAG).

Notes. Moss (1928) did not mention this species when dealing with the East African species of this genus, although the type locality of *D. buvumense* falls within the geographical boundaries of Moss' work. The type material preserved at the British Museum clearly belongs to the widely distributed *D. madagascariense* (see also under *D. abrupti-acuminatum*).

SUMMARY

This publication is the first one of a series concerning the taxonomical revision of the African *Dichapetalaceae*. Of this family the species occur almost exclusively in the tropics of both the old and the new world, but most abundantly in Africa.

In this instalment, the first concerning the genus *Dichapetalum*, the gross morphology of the species is extensively treated, and related to the morphological tendencies of the two remaining genera of the family, i.e. *Stephanopodium* and *Tapura*. This proved to be especially important in connection with the systematical position of the *Dichapetalaceae*, about which different opinions are held. These different views are mainly caused by differences in the interpretation of the petals and staminodes. It is demonstrated here, that the former should be considered to be staminodes and not proper petals, while the latter are true staminodes and not nectariferous glands.

ENGLER's conception according to which the family belongs in the order *Geraniales* is supported, but not his view concerning close relationship with *Euphorbiaceae*, *Trigoniaceae* and possibly *Malpighiaceae* appear to be the close relatives.

The growth mode of the usually lianescent species is closely observed and illustrated. The wide variation between specimens of the same species receives close attention as well. This variability concerns, amongst others, habit, indumentum, inflorescence, and fruit shape.

In the taxonomical part 18 species are described, of which 5 are new, while one is newly combined in *Dichapetalum*. The great variability has led in the past to the description of numerous species that have to be reduced into synonymy. This would hardly have been possible without the aid of repeated field observations in Africa, on which occasions ample herbarium material was collected. Apart from the author, several others, mainly staffmembers of the Laboratory for Plant Taxonomy and Plant Geography (WAG) have contributed considerably. Also this fieldwork has added substantially towards a better picture of the distribution of the species.

Specific names as well as synonyms are treated in alphabetical order to facilitate easier access to this work. For the accepted species the most important literature references are given followed by typification and synonyms; the latter are typified and their main literature references are given as well. As the descriptions of the species are rather extensive, the most important characters have been summarized in 'diagnostic characters'. Each species is illustrated in detail and, where useful, a distribution-map is added.

As it will take some time before the revision of the genus *Dichapetalum* will be completed, a provisional key to the continental species is appended.

SAMENVATTING

Deze publikatie is de eerste in een reeks betreffende de taxonomische revisie van de Afrikaanse *Dichapetalaceae*, een familie waarvan de soorten nagenoeg allemaal uitsluitend voorkomen in de tropen, zowel van de oude als van de nieuwe wereld, maar het meest talrijk zijn vertegenwoordigd in Afrika.

In deze aflevering, de eerste betreffende het genus *Dichapetalum*, is uitvoerig ingegaan op de uitwendige morfologie van de soorten, mede ook met betrekking tot de morfologie van de soorten van de twee andere genera die de familie telt, n.l. *Stephanopodium* en *Tapura*. Dit leek vooral gewenst in verband met de systematische plaats van de *Dichapetalaceae*, waarover veel verschil van mening bestaat. Deze onderscheiden meningen vinden hun oorsprong in een verschil in interpretatie van de petalen en de staminodiën. Aannemelijk wordt gemaakt, dat de eerste als staminodiën moeten worden opgevat en niet als petalen, en dat de laatste echte staminodiën zijn en geen honingklieren. De opvatting van ENGLER, dat deze familie thuishoort in de orde van de *Geraniales*, wordt bevestigd, echter niet zijn idee omtrent de nauwe verwantschap met de *Euphorbiaceae*. *Trigoniaceae* en mogelijk *Malpighiaceae* lijken de nauwe verwanten.

In deze aflevering wordt verder de groeiwijze van de soorten, die meestal liaanachtig is, nader beschouwd en geïllustreerd. Nader wordt ook ingegaan op de grote variatie die tussen exemplaren van één soort te constateren is. Deze variatie betreft o.a. de habitus, het beharingspatroon, de bloeiwijze en de vruchten.

In het taxonomisch deel worden 18 soorten beschreven waarvan 5 als nieuw, terwijl één soort nieuw gecombineerd wordt in *Dichapetalum*. De grote variabiliteit heeft ertoe geleid dat er in het verleden veel soorten beschreven zijn, die thans tot synoniemen worden gereduceerd. Dit was nauwelijks op verantwoorde wijze mogelijk geweest zonder meermalen veldstudies in Afrika te hebben verricht, waarbij op ruime schaal herbariummateriaal werd ingezameld. Naast de auteur hebben ook anderen, voornamelijk stafleden van het Laboratorium voor Plantensystematiek en -geografie, hieraan een grote bijdrage geleverd. Het verrichte veldwerk heeft bovendien aanzienlijk bijgedragen tot een duidelijker beeld van de verspreiding van de soorten.

De soortnamen, ook de synoniemen, worden in alfabetische volgorde behandeld om het raadplegen van het gebodene te vergemakkelijken. Van de geaccepteerde soorten wordt de belangrijkste literatuur gegeven, gevolgd door de typificatie en de synoniemen. Ook de laatste zijn voorzien van de belangrijkste literatuur en worden getypificeerd. Omdat de gegeven beschrijving van de soorten tamelijk uitvoerig is, zijn de belangrijkste kenmerken kort samengevat onder 'diagnostic characters'. Elke soort is voorzien van een gedetailleerde tekening en, voor zover gewenst, van een verspreidingskaart.

Omdat het nog enige tijd zal vergen voordat de revisie van het genus *Dichapetalum* is voltooid, is thans reeds een, weliswaar voorlopige, sleutel tot de continentaal-Afrikaanse soorten als bijlage toegevoegd.

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- ABI - Abidjan, Ivory Coast: O.R.S.T.O.M. (formerly I.D.E.R.T.).
- B - Berlin, Germany: Botanisches Museum.
- BM - London, Great Britain: British Museum (Natural History).
- BR - Brussels, Belgium: Nationale Plantentuin.
- BREM - Bremen, Germany: Übersee Museum.
- C - Copenhagen, Denmark: Botanical Museum and Herbarium.
- CGE - Cambridge, Great Britain: Botany School, University of Cambridge.
- COI - Coimbra, Portugal: Botanical Institute of the University of Coimbra.
- E - Edinburgh, Great Britain: Royal Botanic Garden.
- EA - Nairobi, Kenya: The East African Herbarium.
- ENT - Entebbe, Uganda: Forest Department.
- FHI - Ibadan, Nigeria: Forest Herbarium Ibadan.
- FHO - Oxford, Great Britain: Forest Herbarium, Commonwealth Forestry Institute.
- FI - Firenze, Italy: Herbarium Universitatis Florentinae, Istituto Botanico.
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- HBG - Hamburg, Germany: Staatsinstitut für allgemeine Botanik und Botanischer Garten.
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- Z - Zürich, Switzerland: Botanischer Garten und Institut für Systematische Botanik der Universität Zürich.

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A PROVISIONAL KEY TO THE SPECIES OF DICHAPETALUM OF CONTINENTAL AFRICA

by

F. J. BRETELER *

INTRODUCTION

As the revision of all the African species of *Dichapetalum* will take some more years, it was thought useful at this stage to present a provisional key. A more definite key will appear at the completion of the revision.

This key is not a natural one, but rather technical as the most obvious characters have been used.

Differences with present flora treatments of this genus (e.g. Flora of West Tropical Africa, 2nd ed., Flore du Congo) are considerable as a large number of species are reduced to synonymy. The supplement to this key gives the synonymy of the accepted species (in so far as they are not treated in the first instalment of the author's revision), often accompanied by some notes concerning distribution, habit, fruiting material, etc.

This key does not account for the Madagascar species, for which DESCOINGS' flora treatment should be used (Flore de Madagascar, 110e famille, 1961).

DIRECTIONS FOR USE

The key is mainly based on flowering material. As far as possible fruit characters have been avoided or they have been added to other characters, as fruiting material is usually scarce and even unknown for some species.

The main division is based on the type of indumentum of the ovary. One should treat this character carefully, as after fertilisation, i.e. in young developing fruits, the indumentum may be of a completely different type, especially so in the fruits of species with 'cotton-wool' on their ovaries.

A second important division is based on the sepals being either reflexed or more or less erect. In most species the sepals are of one of both types, but some species will key out under both as erect as well as reflexed sepals may occur in them. Fully expanded flowers are needed, however, as sepals of the reflexed-type are usually erect in just opened flowers.

The ovary may be 2-locular or 3(-4)-locular. A few species show a mixture (even within one inflorescence) of these ovary-types. These also will key out by either choice. As the number of locules is strictly correlated with the number of

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style-lobes, careful dissecting of the ovary can generally be avoided. Do not judge the number of locules by the number of mericarps on the fruits.

The inflorescences are always axillary, but may be mistaken for terminal when some or several inflorescences are found together at the leafless end of a shoot. They may also be similarly found together on leafless axillary shoots, which are either very short and knoblike or normally developed. In all these leafless 'compound inflorescences', however, the stipules are usually present at the nodes where the subtending leaf of the single inflorescence is wanting.

Whether the peduncle of the inflorescence is adnate to the petiole or not may be difficult to judge when the blade of the subtending leaf is strongly reduced. In such cases the adnate parts of peduncle and petiole usually show a marked difference in indumentum, i.e. at least in density, the peduncle being more densely hairy than the petiole.

To see whether the branches are hollow or not, one should not check this at or close to the nodes. Very 'close-noded' branches of species with normally hollow branches may not be hollow at all.

A few species exude a colourless or pale red (drying dark brown or black), sour, sticky slime from freshly cut branches. As fieldnotes are often inadequate, this character may be checked in dried specimens at sharp cuts or wounds (i.e. made when the branches were fresh) where some dried exudate may be present.

The pedicel is always jointed. The place of the joint, dividing the pedicel into an upper and a lower part, is often of diagnostic value, but in some species the upper part is wanting, i.e. the joint is found immediately below the calyx.

The geographical terms used in the key comprise the following:

West Africa: the area of the Flora of West Tropical Africa, 2nd ed., excluding the part of the Cameroons now belonging to the United Republic of Cameroun.

Central Africa: Cameroun, Equatorial Guinea, Gabon, Congo, Zaire, and the Central African Republic.

East Africa: Uganda, Kenya, and Tanzania.

Users of this key are kindly requested to communicate their commentary to the author, which will help to make a more satisfactory definite key later; it will be highly appreciated to receive material for identification.

- 1 a Pistil completely glabrous 2
- b Pistil, at least the ovary, hairy. 3

- 2 a Sepals reflexed in fully expanded flowers. Gabon, Congo **D. bellum** Bret.
- b Sepals erect or nearly so in fully expanded flowers. S.E. Tanzania **D. braunii** Engl. & Krause

- 3 a Indumentum of the ovary like cotton-wool, i.e. with waved or strongly curled hairs, either white or dirty brown 4

	b	Indumentum of the ovary consisting of erect or nearly erect, usually straight or slightly curved hairs, either short and usually stiff or long and usually flexible	53
4	a	Sepals rather sharply reflexed in fully expanded flowers	5
	b	Sepals not sharply reflexed in fully expanded flowers, at least never all the sepals of a single flower, but usually erect or slightly or loosely spreading	30
5	a	Stipules pinnately or palmately incised, lobed, or divided, at least dentate	6
	b	Stipules entire	10
6	a	Style 2-lobed, ovary 2-locular. Principe, Sao Tomé D. bocageanum (Henr.) Engl.	
	b	Style 3(4)-lobed, ovary 3(4)-locular	7
7	a	Peduncle of the inflorescence adnate to the petiole. West- and Central Africa, Angola, Uganda D. angolense Chod.	
	b	Peduncle of the inflorescence free from the petiole	8
8	a	Stipules palmately divided to the base, at least partly so, the parts leaving separate or quite nearly separate scars. Gabon D. nyangense Pellegr.	
	b	Stipules either palmately or pinnately lobed or divided, but usually entire at base, leaving one scar only	9
9	a	First pair of branches of the inflorescence longer than the peduncle. West- and Central Africa, Uganda, Angola D. angolense Chod.	
	b	First pair of branches of the inflorescence shorter than the peduncle D. mossambicense (Kl.) Engl.	
10(5)	a	Style 2-lobed, ovary 2-locular	11
	b	Style 3(4)-lobed, ovary 3(4)-locular	12
11	a	Leaves usually densely, softly, appressed-hairy beneath, especially on the main nerves; stipules often as wide as or wider than the branchlets, longer than the petiole; inflorescences sessile or nearly so, with a few (less than 10) large flowers only. S.E. Tanzania D. macrocarpum Engl.	
	b	Leaves glabrous or nearly so beneath, at least never hairy as above; stipules narrower than the branchlets, usually shorter than the petiole; inflorescences distinctly pedunculate, many-flowered. From Nigeria to Kenya and Angola . . . D. zenkeri Engl.	

- 12 a Flowers with a long, slender pedicel, jointed in the middle and aggregated on a knoblike or very shortly branched base; peduncle at most as long as the petiole, usually adnate to it. Uganda, eastern Zaïre. **D. ugandense** Moss
 b Flowers not arranged as above 13
- 13 a Branches when freshly cut exuding a colourless or reddish, sour, sticky slime. 14
 b Branches without an exudate 15
- 14 a Midrib and usually the main lateral nerves raised above. Cameroun, Gabon. **D. librevillense** Pellegr.
 b Midrib and usually the main lateral nerves impressed above. Cameroun, Congo, Zaïre, Central African Republic
 **D. brazzae** Pellegr.
- 15 a Peduncle of the inflorescence partly adnate to the petiole 16
 b Peduncle of the inflorescence free from the petiole or 0 17
- 16 a Inflorescences and sepals outside densely appressed-pubescent; fruits hairy. Moçambique **D. deflexum** (Kl.) Engl.
 b Inflorescences sparsely puberulous; sepals glabrous outside or nearly so, the margins puberulous; fruits glabrous. Nigeria, Central Africa, Angola **D. mundense** Engl.
- 17 a Inflorescences sessile or nearly so, with a few (less than 10) flowers only; stipules often as wide as or wider than the branchlets, longer than the petiole. S.E. Tanzania **D. macrocarpum** Engl.
 b Inflorescences not as above, other characters not associated . . . 18
- 18 a Inflorescences not pedunculate or very shortly so (< 0.5 cm), but usually branched in the axil, densely hairy; midrib and the main lateral nerves usually distinctly impressed above. Nigeria, Central Africa **D. choristilum** Engl.
 b Inflorescences distinctly pedunculate, the peduncle usually 0.5 cm long at least; other characters associated or not 19
- 19 a Petals hirsute inside, the filaments usually also. Kenya, Tanzania **D. arenarium** Bret.
 b Petals and filaments glabrous inside 20
- 20 a A rhizomatous shrublet of open vegetation, yearly sprouting from a half subterranean woody base, densely hairy throughout. Angola, S.W. Africa, Zambia, Rhodesia
 **D. rhodesicum** Sprague & Hutch.

	b A forest liana; if a shrub, different from the above	21
21	a Leaves with arachnoid hairs beneath, either forming a web or a close felt.	22
	b Leaves without arachnoid hairs beneath	23
22	a The arachnoid indumentum on the leaves beneath only, usually web-like. Cameroun, Gabon, Zaïre D. arachnoideum Bret.	
	b The arachnoid indumentum forming a close felt, which is also present on the branchlets, the stipules and the inflorescences. West- and Central Africa. D. pallidum (Oliv.) Engl.	
23	a Inflorescence a slender-stalked, indistinctly branched, subglobose head; leaves with rather long, more or less appressed (but usually perpendicular to the nerves) hairs on midrib and main lateral nerves beneath. Congo, Zaïre D. gillettii De Wild.	
	b Inflorescence not as above; leaves glabrous or sparsely appressed-hairy on midrib and main lateral nerves beneath	24
24	a Inflorescences and usually the calyces outside densely, shortly brown-hairy	25
	b Inflorescences glabrous or nearly so, if densely hairy never brown.	26
25	a Inflorescence a long-stalked, shortly, but distinctly branched cyme; flowers with long, slender pedicels, aggregated on a few knoblike bases. Congo, Zaïre D. pedicellatum Krause	
	b Inflorescences with long branches; the flowers not arranged as above. Nigeria, Central Africa, Kenya, Angola . D. fructuosum Hiern	
26	a Petiole (5)7–10(12) mm long, branches usually hollow. Gabon D. beilschmiedioides Bret.	
	b Petiole (1)2–5(7) mm long, branches solid	27
27	a Fruits glabrous.	28
	b Fruits hairy	29
28	a Sepals glabrous outside or nearly so, except for the puberulous margins. Nigeria, Central Africa D. mundense Engl.	
	b Sepals tomentose outside. Ivory Coast D. dictyospermum Bret.	
29	a Leafblade 2.5–3 times as long as wide, (6)8–12(16) × (2)3–4(6) cm; exocarp reticulately fissured. Cameroun, Gabon D. altescandens Engl.	
	b Leafblade (2)3–4 times as long as wide, (4)6–10(14) × (1)2–4(5) cm; exocarp not reticulately fissured. Equatorial Guinea,	

	Gabon, Congo, Zaïre.	D. acuminatum De Wild.	
30(4)	a Style 2-lobed, ovary 2-locular		31
	b Style 3(4)-lobed, ovary 3(4)-locular		33
31	a Peduncle of the inflorescence adnate to the petiole; branchlets and branches hollow. Nigeria, western Central Africa	D. gabonense Engl.	
	b Peduncle of the inflorescence not adnate to the petiole or inflorescences sessile or subsessile; branches and branchlets solid		32
32	a Inflorescences distinctly pedunculate, distinctly branched, many-flowered. West Africa, Cameroun, Gabon	D. oblongum (Hook. f. ex Bth.) Engl.	
	b Inflorescences sessile or subsessile, indistinctly branched, with less than 10 flowers. S.E. Tanzania	D. macrocarpum Engl.	
33(30)	a Peduncle of the inflorescence adnate to the petiole		34
	b Peduncle of the inflorescence, if present, free from the petiole		39
34	a Branches and branchlets hollow. Gabon, Congo, Zaïre.	D. thollonii Pellegr.	
	b Branches and branchlets solid.		35
35	a Fruits lenticellate, glabrous or often brown-scaly, especially when young. Central Africa, Angola.	D. mombuttense Engl.	
	b Fruits not lenticellate, glabrous or not, not brown-scaly.		36
36	a Fruits glabrous. Fernando Po, Cameroun, Gabon.	D. affine (Planch. ex Bth.) Bret.	
	b Fruits tomentellous, tomentose, or puberulous, exceptionally glabrescent		37
37	a Fruits usually obtuse at top, sometimes shortly and abruptly apiculate but never beaked. From Guinea to western Ghana	D. toxicarium (G. Don) Baill.	
	b Fruits beaked, if not gradually tapering at top. Eastern Nigeria, Cameroun, Gabon		38
38	a Branchlets glabrous, if puberulous soon glabrescent. Gabon	D. pierrei Pellegr.	
	b Branchlets with a brown, powdery indumentum, often mixed with some normally developed hairs, not soon glabrescent. Eastern Nigeria, Cameroun	D. rudatisii Engl.	

- 39(33) a Stipules palmately or pinnately divided, incised or lobed, at least dentate 40
 b Stipules simple, entire 43
- 40 a Stipules usually deeply pinnately incised, lobed, or divided and entire at the base, when palmately lobed or incised rarely completely to the base; at least some sepals reflexed. Kenya, Tanzania, Moçambique. **D. mossambicense** (Kl.) Engl.
 b Stipules always palmately divided to the base, the parts leaving separate or quite nearly separate scars; usually all the sepals erect. Eastern Nigeria, Central Africa, Angola, Zambia 41
- 41 a Petals much longer than the sepals, i.e. about twice as long as the outer sepals. Central Africa . . **D. lujaei** De Wild. & Th. Dur.
 b Petals as long as or only slightly longer than the sepals 42
- 42 a Young leaves with a white, arachnoid, deciduous indumentum above. Zaïre **D. gillardinii** Haum.
 b Young leaves without an arachnoid indumentum above. Eastern Nigeria, Central Africa, Angola, Zambia
 **D. bangii** (F. Didr.) Engl.
- 43(39) a Petals, and usually the filaments also, long-hairy inside 44
 b Petals and filaments glabrous inside 45
- 44 a Leaves never completely glabrous beneath, usually shortly pubescent all over the lower surface, margins usually revolute; peduncle (4)6–11(13) mm long; petals 2.5–3.5 mm long, less than 1 mm split. Kenya, Tanzania **D. arenarium** Bret.
 b Leaves glabrous beneath, or sparsely, shortly appressed-hairy on midrib and main lateral nerves, margins not or only slightly revolute; peduncle 2–5 mm long; petals (4)4.5–5.5(6) mm long, 1–1.5 mm split. Moçambique **D. barbosa** Torre
- 45 a Inflorescences sessile or nearly so, with a few (less than 10) large flowers only; stipules often as wide as or wider than the branchlets, longer than the petioles. S.E. Tanzania . **D. macrocarpum** Engl.
 b Inflorescences usually distinctly pedunculate; if not, not with a few large flowers; stipules different 46
- 46 a A rhizomatous suffrutex of usually open vegetation, annually sprouting from a half subterranean woody base, densely hairy throughout. Zambia, Rhodesia, Angola, S.W. Africa
 **D. rhodesicum** Sprague & Hutch.
 b A forest liana or shrub different from the above 47

- 47 a Fully developed leaves usually with strongly and rather abruptly revolute margins at the extreme base, more or less covering one or a pair of rather large glands on each side of the midrib. Central Africa **D. congoense** Engl. & Ruhl.
b Base of the leafblade not as above 48
- 48 a Inflorescence a slender-stalked, indistinctly branched, subglobose head 49
b Inflorescence slender-stalked or not, but always distinctly branched 50
- 49 a Leaves, at least the midrib, hirsute beneath; fruits velutinous. Congo, Zaïre **D. gilletii** De Wild.
b Leaves tomentose, glabrescent or glabrous beneath, the hairs on the midrib beneath, when present, not erect but appressed or nearly so; fruits tomentose. Eastern Nigeria, western Central Africa. **D. tomentosum** Engl.
- 50 a Inflorescences not pedunculate or very shortly so (< 0.5 cm), but usually branched in the axil; midrib and the main lateral nerves usually distinctly impressed above. Nigeria, Central Africa. **D. choristilum** Engl.
b Either the inflorescences distinctly stalked or the leaves different. 51
- 51 a Inflorescences and calyces outside with a short, brown indumentum; leaves coriaceous, glabrous; young leaves with a few hairs on the main nerves, soon glabrescent. Kenya, Tanzania **D. eickii** Ruhl.
b Inflorescences and calyces with a whitish or greyish indumentum; leaves usually papyraceous, usually hairy at least on the midrib and the main lateral nerves beneath; young leaves not soon glabrescent. Central Africa 52
- 52 a Leaves usually tomentose all over the lower surface. Gabon, Congo, Cabinda **D. corrugatum** Exell
b Leaves beneath usually only hairy on the midrib and the main lateral nerves. Central Africa **D. unguiculatum** Engl.
- 53(3) a Sepals rather sharply reflexed in fully developed flowers 54
b Sepals not sharply reflexed in fully developed flowers, at least never all the sepals of a single flower, but usually erect or slightly or loosely spreading 65

- 54 a Leaves beneath with a close-felted whitish indumentum of arachnoid hairs. From Guinea to Ivory Coast **D. albidum** Chev. ex Pellegr.
 b Indumentum on leaves beneath different or absent 55
- 55 a Petals hirsute inside, at least below the lobes, the latter sometimes more appressed-hairy; branches hollow, hispid; inflorescences hispid, usually distinctly pedunculate and distinctly branched. Gabon, Congo, Zaïre, Angola . . . **D. chalotii** Pellegr.
 b Petals glabrous inside, if hairy at least the other characters not associated 56
- 56 a Upper part of pedicel more or less as long as the sepals, longer than the lower part. West- and Central Africa, Angola **D. parvifolium** Engl.
 b Upper part of pedicel shorter than the lower part (when equal at most half as long as the sepals) or 0, or flowers sessile or nearly so 57
- 57 a Inflorescence a distinctly pedunculate, indistinctly branched, subglobose head 58
 b Inflorescence either glomerate or fasciculate, when pedunculate distinctly branched 61
- 58 a Peduncle at most 1 cm long; petal lobes glabrous outside . . . 59
 b Peduncle usually much longer; petal lobes hairy outside . . . 60
- 59 a Leaves cuneate at base, glabrous or nearly so or sparsely hairy beneath; leaftip without conspicuous glands beneath. Central Africa, Angola, southern Sudan. **D. staudtii-complex**
 b Leaves usually cordate, subcordate, or truncate at base, often densely hairy beneath; the leaftip usually with conspicuous glands beneath. West- and Central Africa, Angola, Zambia. **D. heudelotii** (Planch. ex Oliv.) Baill.
- 60 a Petals as long as or nearly as long as the sepals, rather densely appressed-hairy outside. Nigeria, Cameroun . . **D. reticulatum** Engl.
 b Petals distinctly longer than the sepals, usually sparsely hairy outside. West- and Central Africa **D. umbellatum** Chod.
- 61(57) a Sepals, petals, stamens, and pistil subequal in length. S.E. Tanzania, N.E. Moçambique **D. edule** Engl.
 b At least the stamens, but often also the petals, much longer than the sepals 62

- 62 a Upper part of pedicel distinct, but often hidden by the reflexed sepals; fruit glabrous. Nigeria, Cameroun, Gabon **D. cymulosum** (Oliv.) Engl.
.
b Upper part of pedicel very short or 0, fruits hairy. 63
- 63 a Leaves cuneate at base; flowers usually distinctly pedicellate. Central Africa, Angola, southern Sudan . . . **D. staudtii-complex**
b Leaves cordate or subcordate at base, at least truncate; flowers distinctly pedicellate or not. 64
- 64 a Flowers fasciculate, the pedicels rather slender, often curved; fruits velutinous, hirsute or hispid. Central Africa **D. dewevrei** De Wild. & Th. Dur.
.
b Flowers usually sessile or nearly so, if pedicellate the pedicel at most as long as the sepals, not curved; fruits tomentose or velutinous. West- and Central Africa, Angola, Zambia. **D. hendelotii** (Planch. ex Oliv.) Baill.
- 65(53) a Stipules pinnately lobed, incised or divided. Zaïre **D. germainii** Haum.
.
b Stipules entire 66
- 66 a Style 2-lobed, ovary 2-locular 67
b Style 3(4)-lobed, ovary 3(4)-locular 71
- 67 a Stipules as wide as or wider than the branchlets, rather long persistent; branchlets densely soft-hairy, usually tomentose or felty; flowers ca. 2 mm long, the petals and the stamens as long as the sepals or nearly so. Western Central Africa. **D. insigne** Engl.
.
b Stipules usually narrower than the branchlets, often early caducous; if stipules not different from the above at least the other characters not associated 68
- 68 a Flowering branchlets puberulous-tomentose or with a hispid or hirsute indumentum, usually not early glabrescent; fruits velutinous, hirsute, hispid, or puberulous 69
b Flowering branchlets usually sparsely appressedly short-hairy, rather soon glabrescent; fruits glabrous 70
- 69 a Leaves beneath often with pilose domatia in the axils of the main lateral nerves; branchlets puberulous-tomentose; flowers glomerate, the pedicel at most as long as the calyx, usually shorter; fruits puberulous to tomentellous. Cameroun, Zaïre, Uganda **D. madagascariense** Poir. var. **beniense** (Engl.) Bret.

- b Leaves beneath without pilose domatia; branchlets usually hirsute or hispid; flowers usually fasciculate, the pedicel often much longer than the calyx; fruit velutinous, hirsute or hispid. Western Central Africa **D. dewevrei** De Wild. & Th. Dur.
- 70 a Leaves with a cordate or subcordate base; midrib slightly raised above. Ivory Coast, western Ghana **D. filicaule** Bret.
 b Leaves usually cuneate at base; midrib usually impressed above. Cameroun, Gabon **D. minutiflorum** Engl.
- 71(66) a Inflorescences either distinctly pedunculate or distinctly branched or both 72
 b Inflorescence a glomerule or fascicle, the peduncle indistinct or absent 90
- 72 a A rhizomatous suffrutex, anually sprouting from a woody, partly subterranean base. Southern Angola, S.W. Africa, South Africa, Zambia, Rhodesia **D. cymosum** (Hook.) Engl.
 b Trees, large shrubs, or lianas. West-, Central-, and East Africa 73
- 73 a Petals hirsute inside, at least below the lobes, the latter sometimes more appressed-hairy; branchlets hollow, hispid; inflorescences hispid, usually distinctly pedunculate and distinctly branched. Gabon, Congo, Zaire, Angola **D. chalotii** Pellegr.
 b Petals glabrous inside, if hairy at least the other characters not associated 74
- 74 a Petals adnate to the filaments at base into a distinct tube up to 2.5 mm long, entire, at most retuse or emarginate at apex; bark of branches when freshly cut exuding a reddish, sour, sticky slime. West- and Central Africa **D. crassifolium** Chod.
 b Petals free from the filaments or nearly so, usually distinctly bilobed; no exudate present 75
- 75 a Upper part of pedicel about as long as the sepals, longer than the lower part. West- and Central Africa, Angola. **D. parvifolium** Engl.
 b Upper part of pedicel shorter than the lower part (when equal at most half as long as the sepals) or 0, or flowers sessile or nearly so 76
- 76 a Sepals, petals, and stamens equal in length or nearly so 77
 b Petals and stamens at least 1.5 times as long as the sepals, if petals subequal then at least the stamens much longer than the sepals. 82

- 77 a Leaves on flowering branchlets cordate, subcordate, or truncate at base, more or less appressedly soft-hairy beneath. S.E. Tanzania, N.E. Moçambique **D. edule** Engl.
 b Leaves on flowering branchlets usually cuneate or rounded at base, other character not associated 78
- 78 a Inflorescences usually fasciculate, i.e. aggregated on a short knoblike, leafless, axillary shoot; fruits smooth, glabrous at maturity. Western Central Africa **D. integripetalum** Engl.
 b Inflorescences not arranged as above, fruits smooth or tuberculate, hairy at maturity 79
- 79 a Sepals 4–6(7) mm long; petals 5–6.5 mm long; stamens (4.5)6–6.5(7) mm long; fruits tuberculate; shrub or tree. From Ivory Coast to Nigeria. **D. barteri** Engl.
 b Sepals 3–5 mm long; petals and stamens 3–4.5 mm long; fruits tuberculate or not; tree, shrub or liana. Outside West Africa. 80
- 80 a Leaves on flowering branchlets usually tomentose, often densely so, especially beneath; tree or shrub. Kenya, Tanzania, Moçambique. **D. stuhlmannii** Engl.
 b Leaves on flowering branchlets glabrous or with a few hairs only, mainly on the midrib; tree, shrub, or liana 81
- 81 a Fruits tuberculate; leaves oblong or oblong-elliptic, 2.25–4 times as long as wide; shrub or tree. Eastern Zaïre, Rwanda, Tanzania **D. stuhlmannii** Engl.
 b Fruits (most probably) not tuberculate; leaves elliptic to obovate, relatively broader; shrub, tree, or liana. Angola, Kenya, Tanzania . **D. cazengoense** Exell & Mendonça, **D. ruhlandii** Engl.
- 82(76) a Inflorescence a distinctly pedunculate, indistinctly branched, subglobose head 83
 b Inflorescence either distinctly or indistinctly pedunculate, but always distinctly branched. 87
- 83 a Petal lobes hairy outside, at least sparsely so. 84
 b Petal lobes glabrous outside (often a few hairs present just below the lobes) 85
- 84 a Petals as long or nearly as long as the sepals, rather densely appressed-hairy outside. Nigeria, Cameroun . . **D. reticulatum** Engl.
 b Petals distinctly longer than the sepals, usually sparsely hairy outside. West- and Central Africa, Angola . . **D. umbellatum** Chod.

- 85 a Peduncle usually much longer than 1 cm; lower part of style hairy as the ovary, only less densely so. West-, Central-, and East Africa, Angola. **D. madagascariense** Poir.
 b Peduncle usually less than 1 cm long; lower part of style glabrous or with a very few hairs only 86
- 86 a Leaves cuneate at base, glabrous or nearly so or sparsely hairy beneath; leaftip without conspicuous glands beneath. Central Africa, Angola, southern Sudan. **D. staudtii-complex**
 b Leaves usually cordate, subcordate, or truncate at base, often densely hairy beneath; the leaftip usually with conspicuous glands beneath. West- and Central Africa, Angola, Zambia **D. heudelotii** (Planch. ex Oliv.) Baill.
- 87(82) a Stamens and pistil usually much longer than the petals. West-, Central-, and East Africa, Angola. . . . **D. madagascariense** Poir.
 b Stamens and pistil at most slightly longer than the petals 88
- 88 a Leaves usually densely hairy beneath, at least when young; the leaftip usually with conspicuous glands beneath; fruits hairy. West- and Central Africa, Angola, Zambia **D. heudelotii** (Planch. ex Oliv.) Baill.
 b Leaves glabrous beneath or sparsely hairy on the midrib and the main lateral nerves; leaftip without conspicuous glands beneath; fruits glabrous (at least in *D. filicaule*, probably also in *D. bodyi*) 89
- 89 a Leaves oblong-elliptic to narrowly obovate, usually cordate or subcordate and equal-sided at base, (3)6–9(13) × (1)2–3(5) cm. Ivory Coast, western Ghana **D. filicaule** Bret.
 b Leaves obovate elliptic, rounded and usually unequal-sided at base, (8)11–15(18) × 3.5–6(9) cm. Congo, Zaïre . **D. bodyi** De Wild.
- 90(71) a Stipules usually as wide as or wider than the branchlets, rather long persistent; branchlets densely soft-hairy, usually felty; flowers ca. 2 mm long, the petals and stamens as long as the sepals or nearly so. Western Central Africa, Angola. **D. insigne** Engl.
 b Stipules usually narrower than the branchlets (if not, the flowers not as above), often early caducous 91
- 91 a Petals and filaments united into a (2.5)3–4.5(5) mm long tube; sepals usually stiff, erect, united in lower half. Nigeria, Cameroon **D. longitubulosum** Engl.
 b Petals and filaments not united into a long tube, the tube at

- most 2.5 mm long; sepals free or nearly so, often spreading or partly reflexed 92
- 92 a Upper part of pedicel about as long as the sepals, longer than the lower part. West- and Central Africa, Angola **D. parvifolium** Engl.
 b Upper part of pedicel shorter than the lower part (when equal at most half as long as the sepals) or 0, or flowers sessile or nearly so 93
- 93 a Leaves glabrous or nearly so, tapering into a rounded, unequal-sided base; above usually with some glands near the base; branchlets glabrous or with a few hairs only. Congo, Zaïre **D. bodyi** De Wild.
 b Leaves not as above; branchlets glabrous or not 94
- 94 a Leaves cordate or subcordate at base, at least broadly rounded or truncate. 95
 b Leaves cuneate at base, the leaf margins often decurrent into the petiole 104
- 95 a Midrib of leaves raised above over its full length 96
 b Midrib of leaves impressed above, at least partly so. 98
- 96 a Bracts and bracteoles as long or nearly as long as the rather stout pedicels. Cameroun, Gabon **D. barbatum** Bret.
 b Bracts and bracteoles minute, up to half as long as the pedicels 97
- 97 a Branchlets hispid or hirsute, usually not soon glabrescent; upper part of pedicel 0. Western Central Africa. **D. dewevrei** De Wild. & Th. Dur.
 b Branchlets appressed-pubescent or strigose, usually soon glabrescent; upper part of pedicel short, but usually distinct. Ivory Coast, western Ghana **D. filicaule** Bret.
- 98(95) a Lower part of style hairy as the ovary, only less densely so, the hairs usually rather flexible. 99
 b Lower part of style glabrous or with a very few hairs only, the hairs usually short and stiff. 100
- 99 a Inflorescences few-flowered (usually less than 5); sepals, petals, and stamens subequal in length. S.E. Tanzania, N.E. Moçambique **D. edule** Engl.
 b Inflorescences many-flowered; petals and stamens at least 1.5 times as long as the sepals. West-, Central-, and East Africa, Angola **D. madagascariense** Poir.

- 100 a Sepals, petals, stamens, and pistil subequal in length, ca. 1.5–2.5 mm long. West- and Central Africa, Angola. **D. ndongense** Engl.
 b Petals, stamens, and pistil much longer, at least 1.5 times as long as the sepals or more 101
- 101 a Branchlets, petioles, and the midrib of the leaves beneath usually with a dense felty indumentum; flowers always sessile; fruits felty. Central Africa, Angola **D. glomeratum** Engl.
 b Branchlets, petioles, and the midrib of the leaves beneath not densely felty, but hirsute, hispid, tomentose, glabrescent, or glabrous, if felty then the leaf tip beneath usually with conspicuous glands; flowers sessile or not; fruits tomentose, velutinous, hirsute, or hispid 102
- 102 a Flowers fasciculate, the pedicels rather slender, often curved; fruits velutinous, hirsute, or hispid. Western Central Africa. **D. dewevrei** De Wild. & Th. Dur.
 b Flowers not fasciculate but usually sessile or nearly so, if not the pedicel at most as long as the sepals, not curved; fruits tomentose, velutinous, or hispid 103
- 103 a Petals adnate to the filaments, forming a 1–2(2.5) mm long tube; branchlets often hispid; fruits hispid. Western Central Africa, Angola **D. hispidum** (Oliv.) Baill.
 b Petals, if adnate to the filaments, usually very shortly so; branchlets usually not hispid; fruits tomentose or velutinous. West- and Central Africa, Angola, Zambia. **D. heudelotii** (Planch. ex Oliv.) Baill.
- 104(94) a Lower part of style usually hairy as the ovary, only less densely so, the hairs rather flexible. West-, Central-, and East Africa, Angola **D. madagascariense** Poir.
 b Lower part of style glabrous or with a very few hairs only, the hairs usually short and stiff. Central Africa, Angola, southern Sudan. **D. staudtii-complex**

SUPPLEMENT

Synonyms are, as usual, in *italics* and cited in chronological order. A specific name in *italics* provided with an asterisk means that its status as a synonym is very probable but not certain. The year cited after a name refers to the date of publication of the specific name; when preceded by a year between brackets, this refers to the publication of the basionym.

- D. cazengoense** Exell & Mendonça, 1951. See under *D. ruhlandii*.
- D. chalotii** Pellegr., 1912. *D. sapinii* De Wild., 1919.
- D. choristilum** Engl., 1912. *D. mortehanii* De Wild., 1919.
- D. cinereo-viride** Engl., 1912. See under *D. staudtii-complex*.
- D. congoense** Engl. & Ruhl., 1902. *D. mekametane* Engl., 1912.
- D. corrugatum** Exell, 1927. Closely related to and sympatric with *D. unguiculatum*. Only a few collections exist.
- D. crassifolium** Chod., 1895. *D. holopetalum* Ruhl., 1902, non Merrill; *D. brachysepalum* Engl., 1912; *D. spathulatum* Engl., 1912; *D. malembense* Pellegr., 1922; *D. palustre* Louis ex Haum., 1955. This is the only continental species with entire petals.
- D. cymosum** (Hook.) Engl., (1843) 1896. *D. venenatum* Engl. & Gilg, 1903; *D. bullockii* Haum., 1958.
- D. cymulosum** (Oliv.) Engl., (1868) 1896. *D. chartaceum* (Wright) De Wild., (1896) 1919; *D. riparium* Engl., 1912; *D. subuncinatum* Engl., 1912. Only once (the type) collected in Nigeria! Common near Kribi in Cameroun.
- D. deflexum** (Klotzsch) Engl., (1861) 1895. *D. mendoncae* Torre, 1962. Collected a few times only.
- D. dewevrei** De Wild. & Th. Dur., 1901. *D. obliquifolium** Engl., 1902; *D. micranthum* Haum., 1955. An extremely variable species.
- D. dictyospermum** Bret., 1970.
- D. edule** Engl., 1912. Known from a few collections only.
- D. eickii** Ruhl., 1902. Collected a few times only.
- D. filicaule** Bret., 1970.
- D. fructuosum** Hiern, 1896. *D. oddonii* De Wild., 1919; *D. cinnamomeum* Haum., 1955. Mature fruits unknown.
- D. gabonense** Engl., 1896. *D. soyauxii* Engl., 1896; *D. nitidulum* Engl. & Ruhl., 1902; *D. micropetalum* Engl., 1912; *D. subfalcatum* Engl., 1912; *D. verruculosum* Engl., 1912.

D. germainii Haum., 1955.

D. gillardinii Haum., 1955. Closely related to *D. lujaei*. Has been collected twice.

D. gillettii De Wild., 1911. *D. stenophyllum* Krause, 1912.

D. glomeratum Engl., 1912 (March). *D. batureense* Krause, 1912 (August); *D. klainei* Pellegr., 1912 (Nov.); *D. malchairii* De Wild., 1919.

D. heudelotii (Planch. ex Oliv.) Baill., (1868) 1874. *D. subauriculatum** (Oliv.) Engl., (1868) 1896; *D. acutisepalum* Engl., 1896; *D. cuneifolium* Engl., 1896; *D. ferrugineum* Engl., 1896; *D. johnstonii* Engl., 1896; *D. poggei* Engl., 1896; *D. schweinfurthii* Engl., 1896; *D. lolo* De Wild. & Th. Dur., 1901; *D. angustisquamulosum* Engl. & Ruhl., 1902; *D. conrauanum* Engl. & Ruhl., 1902; *D. fuscescens* Engl., 1912; *D. jabassense* Engl., 1912; *D. adolfi-friederici* Engl., 1912; *D. longifolium* Engl., 1912; *D. varians* Pellegr., 1912; *D. lescrauwaeti* De Wild., 1919; *D. lokanduense* De Wild., 1919; *D. linderi* Hutch. & Dalz., 1928; *D. kumasiense* Hoyle, 1932; *D. whitei* Torre, 1962.

This species is extremely variable in leafshape, leafsize, and indumentum of the vegetative parts. It is closely related to *D. glomeratum*, *D. hispidum* and *D. longitubulosum* and sometimes difficult to distinguish from these species.

D. hispidum (Oliv.) Baill., (1868) 1874. *D. macrophyllum* (Oliv.) Engl., (1868) 1896; *D. subsessilifolium* Chod., 1895; *D. salicifolium* Engl. & Ruhl., 1902.

D. insigne Engl., 1912. Remarkable for its stipules. Ripe fruits unknown.

D. integripetalum Engl., 1902. A common species in Gabon. Fruits rare.

D. librevillense Pellegr., 1912. Remarkable for its exudate and the raised midrib.

D. longitubulosum Engl., 1902. *D. scabrum* Engl., 1902; *D. aurantiacum* Engl., 1912; *D. batesii* Engl., 1912.

D. lujaei De Wild. & Th. Dur., 1900; *D. leucosepalum* Ruhl., 1902; *D. le-testui* Pellegr., 1922.

D. macrocarpum Engl., 1912. Few collections exist, more material highly desirable.

D. madagascariense Poir., 1812. *D. thouarsianum* R. & S., 1819; *D. guineense* (DC.) Keay, (1825) 1955; *D. paniculatum* (Thonn. ex Schum.) De Wild., (1827) 1919; *D. floribundum* (Planch.) Engl., (1848) 1896; *D. subcordatum* (Hook. f. ex

Bth.) Engl., (1847) 1896; *D. benthamii* (F. Didr.) Engl., (1854) 1896; *D. flexuosum* (Oliv.) Engl., (1868) 1896; *D. thomsonii* (Oliv.) Engl., (1868) 1896; *D. brownii* Baill., 1892; *D. batanganum* Engl. & Ruhl., 1902; *D. buvumense* Bak. f., 1905; *D. brevitybulosum* Engl., 1912; *D. cincinnatum* Engl., 1912; *D. dodoense* Engl., 1912; *D. flavovirens* Engl., 1912; *D. gossweileri* Engl., 1912; *D. subcoriaceum* Engl., 1912; *D. ombrophilum* Krause, 1912; *D. aruwimense* Engl., 1912; *D. flaviflorum* Engl., 1912; *D. abrupti-acuminatum* De Wild., 1919; *D. dundusanense* De Wild., 1919; *D. fulvialabastrum* De Wild., 1919; *D. glandulosum* De Wild., 1919; *D. pynaertii* De Wild., 1919; *D. ubangiense* De Wild., 1919; *D. bakerianum* Exell, 1927; *D. chrysobalanoides* Hutch. & Dalz., 1928; *D. rowlandii* Hutch. & Dalz., 1928; *D. flabellatiflorum* Haum., 1955.

D. madagascariense is the most variable of the African species. Its variation concerns mainly leafshape and the leaf size and the inflorescence. The latter may be a fascicle or glomerule, a distinctly branched sessile or pedunculate cyme, or even a stalked subglobose head. Fruiting specimens are rather rare. This may be due to the probability that a large number of specimens have functionally male flowers only. One variety could be distinguished (except for the type variety):

D. madagascariense Poir. var. *beniense* (Engl.) Bret., 1973. *D. beniense* Engl., 1912; *D. humbertii* Desc., 1960; *D. microphyllum* Desc., 1960.

This variety differs from *D. madagascariense* var. *madagascariense* by the usually much shorter petioles and smaller leaves. Very often the flowers have a 2-locular ovary and a 2-lobed style.

D. obanense, which is only known from the type material, is closely related to this species. More material from the type area is needed to decide whether *D. obanense* can be maintained as a distinct taxon, and it has therefore been impossible to separate this species satisfactorily in the key.

D. minutiflorum Engl. & Ruhl., 1902. Inflorescences always few-flowered. Mature fruits unknown (immature fruits are glabrous).

D. mombuttense Engl., 1896. *D. adnatiflorum* Engl., 1896.

D. mossambicense (Kl.) Engl., (1861) 1895. *D. aureonitens* Engl., 1912.

D. mundense Engl., 1896. *D. seretii* De Wild., 1912.

The stalk of the inflorescence is often slightly adnate to the petiole especially in specimens from the western part of the area, where the fruits are usually globose or nearly so. Material from Zaïre has generally long-beaked fruits.

D. ndongense Engl., 1912. *D. lukolelaense* De Wild., 1919; *D. sankuruense* De Wild., 1919; *D. gracile* Exell, 1927; *D. mildbraedianum* Exell, 1927; *D. martincaui* Aubr. & Pellegr., 1936.

This species is very closely related to *D. heudelotii* and so far it can only be distinguished from it by the smaller flowers. Mature fruits are highly desirable.

D. nyangense Pellegr., 1922. Only known from the type, which bears flowers only.

D. obanense (Bak. f.) Bak. f. ex Hutch. & Dalz., (1913) 1928. Only known from the type; fruits unknown. See also under *D. madagascariense* Poir.

D. oblongum (Hook. f. ex Bth.) Engl., (1849) 1896. *D. kamerunense* Engl., 1896.

D. pallidum (Oliv.) Engl., (1868) 1896. *D. hypoleucum* Hiern, 1896; *D. cinereum* Engl., 1902; *D. griseo-viride* Ruhl., 1902; *D. liberiae** Engl. & Dinkl., 1902; *D. warneckeii* Engl., 1902; *D. bussei* Engl., 1911; *Chailletia whytei* Stapf, 1906.

This species is very variable in its fruit characters: from strongly tuberculate to smooth. The specimens from Ivory Coast with an indeshiscent exocarp and with a more tomentose indumentum instead of easily caducous irritating hairs, may represent a distinct variety.

D. parvifolium Engl., 1896. *D. retroversum* Hiern, 1896; *D. mucronulatum* Engl., 1912.

D. pedicellatum Krause, 1912. *D. longipedicellatum* De Wild., 1919.

D. pierrei Pellegr., 1912. Collected a few times in Gabon only.

D. reticulatum Engl., 1902. *D. cordifolium* Hutch. & Dalz., 1928.

This species is very closely related to *D. umbellatum* Chod. More material from Nigeria and Cameroun is needed to decide whether it is really specifically distinct from the latter. Mature fruits unknown.

D. rhodesicum Sprague & Hutch., 1908. Fruiting material is rather rare.

D. rudatisii Engl., 1912; *D. ledermannii* Engl., 1912, non Krause; *D. suboblongum* Engl., 1912, partly.

D. ruhlandii Engl., 1904.

It has been impossible to key out this species separately from *D. cazengoense*. The latter has been collected with flowers only and is known from two collecting localities in Angola. *D. ruhlandii* is an East African species, mainly from the coastal area of Kenya and Tanzania. Although locally very common, as reported by some authors, it has not frequently been collected and mature fruits are unknown. To judge from a specimen with immature fruits in the East African herbarium (*Zimmermann s.n.*) they may be somewhat club-shaped and smooth like in *D. integripetalum*, but densely hairy and not glabrous like in the latter. More material from both taxa, especially in fruit, is highly desirable.

D. staudtii-complex.

D. staudtii Engl., 1896. *D. sulcatum* Engl., 1902; *D. mombongense** De Wild., 1911; *D. contractum** Engl., 1912; *D. luteiflorum* De Wild., 1919; *D. echinulatum** Exell, 1927.

This complex may prove to represent one species only. The indumentum of the fruits is very variable, with long irritating needle-like hairs or with short hairs or with a mixture of both.

D. cinereo-viride has been keyed out together with this complex, but seems to be distinct by its prominent reticulum on the leaves above and by the very few-flowered inflorescences. It is, however, only known from the type, collected at Bipindi, Cameroun.

D. stuhlmannii Engl., 1895. *D. schliebenii** Mildbr., 1935; *D. lebrunii** Haum., 1955; *D. michelsonii** Haum., 1958.

It has not been possible to separate these species in the key, as the characters of the flowers and the fruits are alike. The only difference is found in the leaf-indumentum, but this character does not seem to be of great value.

D. thollonii Pellegr., 1912. This species is most closely related to *D. gabonense*, but differs from the latter by the 3-merous pistil.

D. tomentosum Engl., 1896. *D. acutifolium* Engl., 1896; *D. bareense* Engl., 1912; *D. kribense* Engl., 1912.

D. toxicarium (G. Don) Baill., (1824) 1874. *D. suboblongum* Engl., 1912, partly.

D. ugandense M. B. Moss, 1928.

Remarkable by its long slender pedicels that are jointed in the middle. Fruiting material is scarce.

D. umbellatum Chod., 1895. Fruiting material is scarce. See notes under *D. reticulatum*.

D. unguiculatum Engl., 1912. *D. griseisepalum* De Wild., 1919. See notes under *D. corrugatum*.

D. zenkeri Engl., 1896. *D. molundense* Krause, 1912; *D. wildemanianum* Exell, 1927; *D. keniense** Hutch. & Bruce, 1931; *Pittosporum bicrurium* Schinz & Dur., 1896.

Most distinct by its reflexed sepals and the 2-merous pistil.