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A REVISION OF SALVIA IN AFRICA
INCLUDING MADAGASCAR AND THE CANARY ISLANDS

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ABSTRACT. A taxonomic revision is given of the native species of *Salvia* in Africa, Madagascar, Macaronesia and the Cape Verde Islands. Fifty-nine species are recognised, none of them new; almost twenty species are relegated to synonomy. The genus is best represented in northwest and southern Africa; a few species are in tropical east Africa, but the genus is absent from large areas of tropical west and central Africa; most of the species do not grow outside Africa and, except for the N African ones, very few have links beyond the continent. An appraisal of the morphological characters of the species resulted in the informal recognition of twenty-three species-groups, several of them monotypic, but of no higher supra-specific groups. This is done as a temporary expedient pending a comprehensive revision of all the Old World species. The need for field biological studies, particularly in the SE Cape, where specific limits are especially obscure, is stressed. A key is given to the cultivated and naturalised species. It is shown that the Mediterranean species *S. triloba* Linn. fil. and *S. grandiflora* Etlinger should be respectively known as *S. fruticosa* Miller and *S. tomentosa* Miller; and that the S African *S. nivea* Thunb. should be called *S. lanceolata* Lam.

INTRODUCTION

Since Etlinger published the first botanical monograph of *Salvia* in 1777 and recognised 48 species the world total has steadily risen until today the total of extant specific names stands at over 900, thus making it one of the largest of phanerogamic genera. Bentham in the *Labiatarum* (1833) and his slightly modified version in De Candolle's *Prodromus* (1848) provided the last world-wide revision of the genus, although Briquet in the *Pflanzenfamilien* (1895) did give a more recent review but not, of course, a monographic treatment.

Not surprisingly, the sheer magnitude of the task has deterred any recent author from attempting to emulate the earlier monographers and provide a modern world-wide coverage. Epling (1938–39) dealt very effectively with the c.470 species of subgenus *Calosphace* all of which are confined to the New World, mostly in Central and South America, and although a new edition of this massive work is needed, both to cover the many subsequently described species and doubtless to reduce others to synonomy, the New World does at least have a basically satisfactory classification.

The situation in the Old World, where the total of species is less than the New, is much less satisfactory. Stibal revised the Chinese (1934) and Indian (1936) species and there are numerous Floras or regional accounts available but a great deal of work involving the re-assessment of species and collating of information throughout Europe, Asia and Africa is a major desideratum. As the first stage in an attempt to improve the situation and eventually cover all the Old World species, the present paper deals with those on the African continent, together with the few that occur in Madagascar and Macaronesia. This is a fairly natural area to deal with because few species extend much, if at all, beyond this region and their affinities are predominantly with other species in the same area. It is not a major centre as far as the total number of species is concerned but the species do exhibit a very wide range of morphological variation. Many show features of habit and floral structure not represented elsewhere in the world and, from this point of view, it is a very important region in appreciating the overall range of variation in the genus.

This account is based almost entirely on the study of herbarium specimens. A considerable number of sheets has been examined but, as is no doubt very evident from what follows, there is a great dearth of biological data even at a relatively simple level. Without such data, any herbarium-based study is bound to be both incomplete and provisional. Virtually nothing is known about floral biology and pollination; this in a genus whose floral evolution must have been very intimately linked with its pollinators. Little too is known about the range of variation of characters in some species, particularly those from southeast Africa; for example, the differences that occur in populations of the very polymorphic *S. repens*, *S. runcinata* and *S. stenophylla* might well lead to a better understanding of their variability and interrelationships and in turn to a modification of their existing classification.

Relatively few of the species have been in cultivation and, although I have been able to study some of them, little new information has come from this source. Unfortunately, too, none of the species has been studied in the field; my sole claim to field experience in African sages being that of a single sighting during a bus tour to Carthage!

Throughout the area under consideration, 59 species are recognised; previously about 80 specific names had been in existence. The majority of the twenty or so new synonyms refer to species originally described from South Africa particularly the eastern Cape, an area of many intractable *Salvia* problems. Somewhat surprisingly no new species have come to light and the only new taxa recognised are two varieties within the polymorphic *S. repens* from the eastern Cape.

Most of the species in this account are restricted to Africa. Forty-three out of the 59 do not grow beyond the confines of the area under consideration and, if one takes into account those species which just extend out of Africa into closely adjacent areas, the total rises to 48 out of 59.

As already indicated, there are numerous problems still outstanding and much knowledge to be gained from field observations. Some species, such as *S. verbenaca*, seem to present almost unsurmountable problems for a taxonomist; others such as the closely related *S. algeriensis* and *S. mouretii* or *S. blancoana* and *S. lavandulifolia* pose problems which good field studies, even of a relatively simple and basic kind, would go at least part of the way towards solving.

Available Characters

In comparison with many genera of flowering plants, *Salvia* presents a vast array of characters to the taxonomist. In habit, leaf shape, leaf division and texture, indumentum, inflorescence, calyx, corolla, stamens and nutlets, there is great, often disjunct, variation and these characters are the main ones which provide the framework round which the current classification is built. Because there are many or numerous 'states' within each of them, they are now considered in a little more detail.

Habit. There is an almost equal division, among the species under consideration, between woody and herbaceous ones. Twenty-nine species are either shrubs or perennials clearly woody below and thirty are herbaceous throughout, though often with a woody rootstock. The shrubby species which can be up to over 2m high are mostly in the southwest of Africa and Madagascar but are also in Somalia, NW, NE Africa and the Canary Islands. Herbaceous species occur throughout the area and are mostly perennial, only three N African species being annual. In general, the distinction between the herbaceous and shrubby or woody species is clear-cut and the affinities of species within either are almost always with species of the same habit group.

Although many of the truly shrubby species tend to have a fairly primitive floral structure—that is with a relatively long corolla, a more or less straight, not invaginated, tube, short lips, not or scarcely falcate upper lip and little differentiated thecae (e.g. *S. fruticosa* and *S. sessilifolia*, fig. 5), there are several exceptions to this connection between habit and corolla type. One such is provided by *S. balansae*, which has a clearly falcate upper lip and strongly differentiated thecae (fig. 22). Most of the perennials and annuals on the other hand have a more or less advanced floral structure as, for example, shown by *S. radula* (fig. 24).

Several if not all the species in species-group L and M (species nos. 28–38) have more or less creeping rhizomes. They all grow in southern Africa, mostly in the southeast. Few other African species of *Salvia* have adopted this habit and it seems to be of infrequent occurrence among Old World species in general.

Leaf shape, division and texture. In shape, leaves vary between simple and more or less entire through pinnatifid and lyrate to clearly pinnate. Most of our species have basically simple leaves and those with clearly pinnate leaves are in a minority. The shrubby or woody species are usually simple-leaved but there are several exceptions to this such as *S. interrupta*, *S. jaminiana* and *S. namaensis*. Generally speaking the N African species are individually fairly constant in leaf shape but in southeast and southwest Africa there is often very great variation within a species and here little emphasis can be put on leaf shape as a taxonomic character. Two examples are *S. repens*, generally simple-leaved but with some pinnatifid-leaved forms and *S. aurita* where there is a continuous range from simple to lyrate leaves; the extremes of variation in both cases are strikingly different.

Although most species have herbaceous leaves, presumably annually deciduous, several of the Madagascar and South African species have

thick-textured or coriaceous leaves which probably persist for more than one year. Examples are provided by *S. parvifolia*, *S. leucodermis*, *S. muirii*, *S. nivea* and *S. aurea*. In the last named two species, there seems to be a rather confusing difference between juvenile leaves which are herbaceous, often ovate to suborbicular, with a relatively sparse indumentum and the adult leaves which are thick in texture, more or less oblong and densely white-tomentose.

Indumentum. Indumentum characters of leaf, axis and calyx, as in most Labiate genera, are frequently useful at specific level. Hairs may be: simple, multicellular, ± round, eglandular; simple, multicellular, flattened eglandular; simple, multicellular, round, capitate glandular or scarcely capitate; simple, very short, antrorse or retrorse. The differences between them, however, are not necessarily as distinct as these descriptions might suggest. In almost all, if not all species, sessile oil globules or punctate glands are also present and tend to be more frequent on the leaves, stems and calyces of species from desertic regions—as in *S. aegyptiaca* and *S. namaensis* where they are particularly abundant. Presumably they are the main source of the aromatic smell which, if one could adequately describe it, is probably often characteristic for a species. In a very few species, such as *S. jaminiana*, the stems and leaves are glabrous, or almost so, but in the great majority of species the indumentum is very prominent and varies between fairly dense and dense.

The differences and types of indumentum that occur on upper and lower leaf surfaces, lower and upper stem axes and on the calyx often provide diagnostic characters. They are however of little or no use above specific level. There is nevertheless, at a geographical level, a definite tendency for the southern African species to be without or with few capitate glandular hairs on the inflorescence axis whereas amongst the north African species there are very few which are not strongly capitate glandular on the flowering axis.

Inflorescence. All *Salvia* species have an inflorescence of opposite reduced cymes which form false whorls usually known as verticils or verticillasters. Some, such as *S. aethiopis*, *S. barrelieri* and *S. argentea*, have widely branched paniculate inflorescences but most species have much less spreading inflorescences and may be unbranched. The number of flowers in a verticil is occasionally diagnostic as in *S. granitica*, where they are always 2-flowered, but usually the range from 4–8(–10)—flowered verticils is of little use taxonomically.

Floral leaves, sometimes called bracts, are always present. They are either quickly deciduous or persistent and this feature among the shrubby South African species is sometimes diagnostic. In a few species such as *S. sclarea* and *S. schimperi* the floral leaves are very large, coloured and conspicuous; in *S. viridis* var. *horminum* the inflorescence is topped by a coma of conspicuous floral leaves which do not subtend flowers; in some forms of *S. argentea* also, the uppermost floral leaves of the inflorescence do not subtend flowers.

Within the floral leaves, bracts, sometimes called bracteoles, are normally present but occasionally are apparently absent as in *S. fruticosa*. Whether this is a constant character or not requires further observation. In the two

closely allied annuals, *S. algeriensis* and *S. mouretii*, bracts seem to be wanting in the former and present in the latter.

In a few species, such as *S. interrupta*, peduncles are present but in the normal *Salvia*-type inflorescence only pedicels are developed.

Calyx. The calyx provides several important characters for species recognition and for defining species-groups. In many of the African shrubby species the calyces enlarge considerably after anthesis until they are broadly infundibuliform, often sub-membranous, with widely diverging lips (as in fig. 12d). The shape of the upper calyx lip may also be important. In several species, the upper lip of the fruiting calyces is prominently bisulcate-concave and ± reflexed; as for example in *S. balansae* (fig. 22e), *S. verbenaca* and *S. algeriensis* (fig. 25). In many other species the calyx upper lip is not reflexed and not or scarcely concave. The eastern South African species-group containing *S. repens* and *S. stenophylla* (fig. 20) and several other closely related species are characterised by an upper calyx lip with three spreading subequal teeth clearly separated by wide sinuses.

In fruit, some species have calyces closed either by a constriction near the throat above the nutlets or, in the case of some of the shrubby species with greatly enlarging calyces, by strongly adpressed lips.

Corolla. A selection of some of the many variants of corolla shape is shown in figure 1. Useful diagnostic characters at specific and higher level are provided by the size of the corolla, the shape and length of the tube, by the presence or absence of an annulus or an invagination within the tube, the shape of the upper lip, whether falcate or not, and the length of the lower

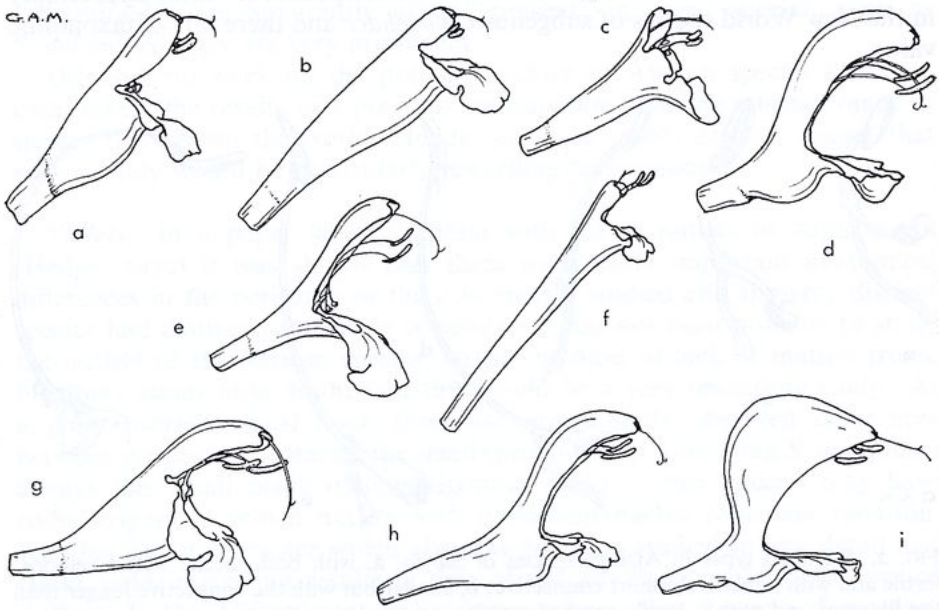

FIG. 1. Some corolla types in African *Salvia* species to show the variation in tube, upper lip and lower lip: a, *S. fruticosa*; b, *S. porphyrocalyx*; c, *S. aegyptiaca*; d, *S. garipensis*; e, *S. perrieri*; f, *S. scabra*; g, *S. granitica*; h, *S. phlomoides*; i, *S. algeriensis*. They are not drawn to the same scale.

lip relative to the upper. The shape of the middle lobe of the lower lip also may provide an additional character but frequently seems to vary considerably within a species.

Corolla colour is often characteristic for species and in some geographic regions flower colours occur which are not found elsewhere. For example in Madagascar, some species are reddish violet and in the SW Cape of South Africa two species are reddish brown; these colours are not found in any N African species. Unlike the situation in the New World, there are no scarlet-flowered species.

Stamens. Together with the characters provided by variation in calyx and corolla, the stamens are the third of the really important features used in classification at all levels. Figure 2 gives a schematic representation of the main types found among the African species. The simplest form is that shown in fig. 2a where both thecae are well-formed and fertile, although the lower one is smaller, and the connective is more or less equal in length to the filament. Between this and the most advanced type as in fig. 2f, with a very elongated curved connective and a completely sterile, flattened dolabriform lower theca, there is an almost complete range of intermediates. In these advanced staminal types the sterile thecae are usually distally attached to each other. Particular staminal types are almost always linked with other corolla characters. For example, species with prominently falcate-hooded corollas have the advanced type of stamens with strongly curved connectives whereas those with more or less straight upper lips and longish tubes have the more primitive type. The point of attachment of the stamens to the corolla is always near the throat. It is interesting to note that although there is little variation in this character in our species, it varies appreciably in the New World species of subgenus *Calosphace* and there it is of taxonomic value.

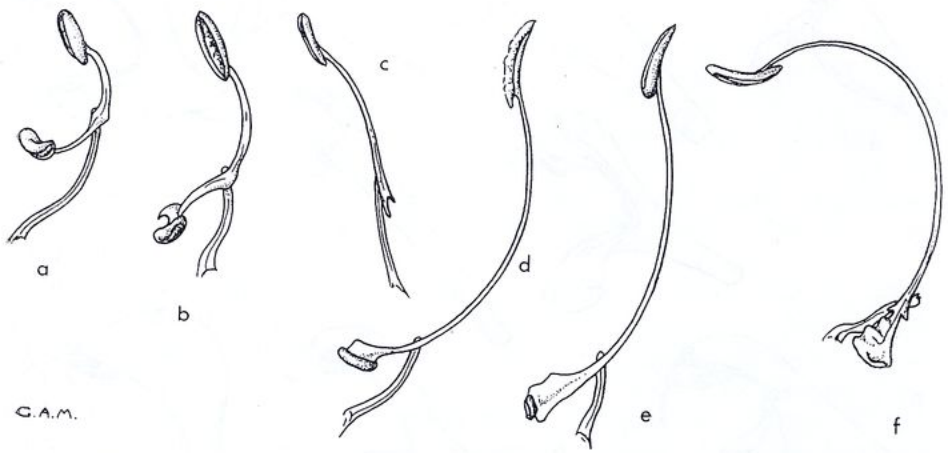

FIG. 2. Staminal types in African species of *Salvia*: a, with both thecae well-developed, fertile and with a relatively short connective; b, similar but with the connective longer than the filament and with a sterile toothed portion on the lower theca; c, with a completely unformed lower theca and a not or scarcely articulating connective (*S. namaensis*); d, with an elongated connective and the lower theca with a sterile part and a prominent fertile portion; e, as previous but with a small fertile, or not, terminal portion; f, as previous but with a completely sterile lower theca and a long strongly curved connective.

Almost all of the African species have the stamens, or at least the connectives, enclosed within the usually laterally flattened corolla upper lip but a few such as *S. pseudojaminiana* and some forms of *S. namaensis* have clearly exserted stamens. In the latter, which is one of the very few species with an almost straight corolla upper lip (fig. 14b), the staminal connectives do not, or scarcely, articulate with the filaments; as far as study of herbarium material can reveal, it is the only African species in which there is not a clear articulation.

In the species with strongly falcate corolla hoods and large dolabriform lower thecae, easy access for marauding insects to nectar around the ovary is blocked by these usually united lower thecae. That is, the throat of the corolla tube is closed by them and as the bee or other heavy insect lands on or hovers near the lower landing lip of the corolla and attempts to penetrate towards the nectar around the receptacle of the ovary, the well-known phenomenon of the insect being tapped on its back by the descending arms of the fertile thecae takes place. At least in theory this is what happens. Whether it is regularly effective in practice as a pollinating mechanism requires observation in the field.

Although stamen features are extremely valuable taxonomically, it is important not to overemphasise aspects of them. For example, within the same species the lower thecae may either be dolabriform and completely sterile or else may basically be dolabriform but have a small fertile terminal portion (fig. 2e). Likewise, the shape of the lower theca may vary considerably within a species and in the case of fertile lower thecae the amount of fertile pollen produced may vary appreciably. In general, however, the relative lengths of connectives and filaments are fairly constant within a species and provide a good taxonomic character.

Staminodes are apparently always present; in some species, such as *S. dolomitica*, they are very prominent.

Although no work on the pollen structure of African species has been undertaken, the results of a previous investigation covering a broad range of species throughout the world (Henderson *et al.*, 1968) do not suggest that such a study would be particularly rewarding taxonomically.

Nutlets. In a paper largely dealing with *Salvia* nutlets in Afghanistan (Hedge, 1970) it was shown that there were many important anatomical differences in the pericarps of the c.20 species studied and the very distinct species had distinctive pericarp structure. It has not been possible to study the nutlets of the African species, largely because of lack of mature fruits, but there seems little doubt that this would be a very rewarding study. At a gross morphological level, there are many easily observed differences between species; for instance, the small species-group containing *S. aegyptiaca* always has small black oblong/trigonous nutlets; other species may have round-trigonous brown nutlets with prominent darker reticulate venation. Another nutlet character which also has not been studied in any detail and could yield interesting results is that of the mucilage produced by wetted nutlets. In the Afghanistan species it was shown that the type of mucilage formed was in several cases fairly diagnostic. Amongst the African species considered here, 35 out of the 40, in which mature nutlets were present, produced mucilage and in only 5 cases was mucilage apparently not produced.

The above discussion covers briefly the main characters used in the classification of the African, and indeed probably all the Old World, species. It is interesting to note that Epling (1938–39) summarised the criteria he used for classifying the New World species as follows:
"the number of flowers in a glomerule, the persistent or ephemeral nature of the floral bracts, the number of veins in the upper lip of the calyx, the proportions of upper and lower corolla lips, the presence or absence of secretory appendages within the corolla tube, the entire or invaginated nature of the corolla tube, the inclusion or extrusion of the stamens from the upper lip, the attachment of the stamens with reference to the throat of the corolla, the nature of the stamens connective, particularly in its sterile portion, the proportions and shape of the style branches and the hairiness or smoothness of the style itself".

There are a few features that Epling stresses that either do not apply amongst our species or else have not been used here. They are: the number of veins in the upper lip of the calyx; the inclusion or extrusion of the stamens; the point of attachment of the stamens on the corolla throat; and the proportions and shape of the style branches and their indumentum.

Chromosome numbers. Out of the total of 59 species that are recognised in this account, only about one third have had their chromosomes counted and of those listed below some doubt must attach to the correct identifications of *S. aurita* and *S. tingitana.* The diploid counts listed below are repeated at the end of the species description in the taxonomic enumeration where reference is given to the author of the count.

2n=14 *S. interrupta, S. fruticosa*
16 *S. aurea, S. verbenaca, S. viridis*
18 *S. aurita, S. argentea*
20 *S. spinosa*
22 *S. sclarea, S. argentea, S. broussonetii, S. canariensis*
28 *S. taraxacifolia, S. aegyptiaca*
30 *S. nilotica*
32 *S. verbenaca, S. nilotica*
36 *S. algeriensis*
38 *S. algeriensis, S. barrelieri, S. tingitana*
40 *S. algeriensis, S. pseudojaminiana*
42 *S. verbenaca*
44 *S. mouretii, S. broussonetii*
48, 54, 64 *S. verbenaca*

The information given by this dysploid series with basic numbers of 7, 8, 9, 10, 11 throws little light upon species affinities or evolutionary developments in the genus. Too few counts have been made and only a smallish proportion of the species-groups recognised below are covered; and none, unfortunately, of the interesting Madagascar species has been investigated. *S. verbenaca,* as befitting its strong claim to the morphologically most variable species, has six separate numbers 16, 32, 42, 48, 54, 64 and, doubtless, counts of other forms of it would augment this total. It is the only species counted which is known with certainty to be partly inbreeding as it has cleistogamous forms. Cleistogamous flowers also occur in *S. merjamie* but

no counts of this species have been made; other species such as *S. disermas*, *S. lanigera* and *S. aegyptiaca* may have cleistogamous, or gynodioecious, forms but these are not recorded.

Habitat and altitudinal range. The species dealt with in this account grow from sea level up to 4,200 m (*S. merjamie*), in a very wide range of different habitats. For example, *S. aurea* is common on flats near the sea in the south-west Cape; *S. perrieri* and *S. somalensis* are more or less restricted to mesophytic habitats at the edge of, or in, forests; *S. broussonetii* grows on maritime cliffs; *S. schimperi* is usually found near cultivation; *S. chudaei* is found in sandy and gravel wadis in desertic regions; *S. balansae* often grows in Mediterranean garigue; *S. phlomoides* is often on rocky limestone slopes in steppic vegetation. In fact there are few types of habitats from which Salvias are quite absent, although there are no species that are truly halophytic. Habitats and the altitudinal ranges of individual species are, as far as they are known, given in the main part of the text; in general, species within particular species-groups have relatively similar habitats and altitudinal ranges.

Geography

As fig. 3 shows, the distribution of the genus extends all over northern Africa from west to east, southwards to the east African highlands thence with a small disjunction to southern Africa. The genus is absent from most of western and central Africa and, as is evident from the map, does not grow in a much greater area of the continent than where it does. The main areas of species-concentration are northwest Africa and southern Africa. The species in the former area are either endemic there, fairly widespread in south Europe and SW Asia or else their affinities, if they have any, are with other species in N Africa or with S European–SW Asiatic taxa. There are about 25 species in northern Africa. In southern Africa, there are 22 species, all endemic, and where they do have clear relatives they are almost always with other southern African species. No native species are common to both northern and southern Africa. The few species in tropical east Africa are not links between north and south: one, *S. merjamie*, is allied to the *S. verbenaca* complex in N Africa, S Europe and SW Asia: another, *S. nilotica*, is clearly allied to species from the east of southern Africa; a third, *S. somalensis*, is a relative of a Madagascar species.

In the Canary Islands, where there are 4 species, one is an endemic without any obvious allies, another has some links with southwest African species, the other two are widespread species.

The Madagascar species, 6 in number, are all endemic and with the exception of the link with Somalia already mentioned, without extra-Malagasy affinities.

The sole Madeira and Cape Verde Islands species are respectively the very widespread *S. verbenaca* and *S. aegyptiaca*.

Although the above summary gives the general picture of distribution and affinities, there are several particularly interesting patterns of distribution, internal and external, which are now cited.

Among the northwest African species, *S. phlomoides* and *S. blancoana*, both of which also grow in S Spain, have very distinct affinities with two Anatolian

FIG. 3. Distribution of *Salvia* in Africa, Madagascar, Macaronesia and the Cape Verde Islands. The numbers refer to the number of species in each grid square.

endemic species, *S. hypargeia* and *S. aucheri*. The significance of these remarkable east-west Mediterranean vicariads has been discussed elsewhere (Davis & Hedge, 1971). Another northwest African species, the very little known Moroccan endemic, *S. gattefossei*, appears to have fairly close connections with *S. palaestina* whose nearest station to it is in the east of Egypt but this apparent link needs to be backed up with new material of the Moroccan plant. Another northern species *S. aegyptiaca* has a very remarkable distribution. As fig. 9 shows it extends all the way from the Cape Verde Islands, Macaronesia, the whole of northern Africa, including the Tibesti and Hoggar ranges, through Arabia and as far to the east as Afghanistan, Pakistan and India; a total distribution from east to west of about 5000 miles. Throughout this huge range it varies but little. Although it is unusual in *Salvia* there are, of course, many similar cases at specific level in other families such as the Cruciferae, Capparaceae and Caryophyllaceae.

Amongst the shrubby species there are two whose affinities merit a special mention. *S. canariensis* is endemic to the Canary Islands and although in several respects quite different specifically from them nevertheless has affinities with the species group 'G' from the western Cape area of South Africa. Both the Canary Island and South African plants have similar calyces, greatly expanding after anthesis, and rather similar corollas. Another very disjunct affinity is provided by the east Mediterranean *S. dominica*, essentially an Irano-Turanian species in Israel and neighbouring countries but also penetrating into Saharo-Sindian and Mediterranean territories, which n several features of habit, inflorescence, calyx and cor olla is clearly similar to *S. garipensis* from South-West Africa and the Cape. Although they are quite clearly separate species, and in the past have been placed in quite separate sections, the similarities between them are so marked that they must be considered as much more closely allied than previously thought, despite the huge gap between their respective distributions; see species-group I.

The last of the examples that deserves special mention is provided by the Somalia endemic, *S. somalensis*, and the Madagascar endemic, *S. perrieri*. Both are shrubs similar in leaf shape, habit and corolla colour and structure; they also are both mesophytic species growing at the edges of forest. There seems no reason to doubt their fairly close affinity despite the gap in their ranges. It is one of the few present-day disjunct distribution patterns in *Salvia* that can tentatively be correlated with current theories on continental drift. Up till about the mid-Cretaceous, Madagascar may have been attached to, or in relatively close proximity to, the African mainland about the position of present-day Kenya and Tanzania and this ancient close connection seems the only probable explanation of how today there is such a close morphological link between these two currently widely geographically separated species which form a bitypic species-group quite clearly distant from any other species-group in Africa or elsewhere.

The question of more distant affinities for the African species, that is either in the New World or southeast Asia, cannot be answered at this stage but there is little evidence that such long range links exist. Certainly there is no connection at all between our species and those of subgenus *Calosphace* which Epling revised. In this vast New World group the lower thecae are represented by long, sterile variously shaped terminal portions, none of which resembles those shown on fig. 2, which cohere for much of their length; in addition to differences in stamen structure, there are also marked differences in calyx form.

In the New World, *Salvias* are most abundant within the tropics, no fewer than 420 (Epling 1938–39) occurring here; this compares with the c.12 species in tropical east Africa and Madagascar. The major development within the tropics of the New World is further emphasised by the presence there of 84 sections, out of the total of 91 which Epling recognised.

Infra-Generic Groupings

The species recognised in this account were distributed by Bentham (1848) among seven sections (although these, his secondary groups within the genus, really correspond to modern day subgenera). They were Sect. *Eusphace*

(*Salvia*), species nos. 1–4, 9 in this paper; Sect. *Hymenosphace* nos. 15–18, 20–21, 23–24; Sect. *Horminum*, no. 50; Sect. *Aethiopis*, nos. 22, 39, 42, 44–49; Sect. *Plethiosphace*, nos. 51–52, 54–58; Sect. *Heterosphace*, nos. 28–32, 34–36; Sect. *Notiosphace*, nos. 12–14. Briquet (1895) recognised both subgenera and sections, most of which correspond with those of Bentham, at least in content if not by name, but he placed *S. nilotica* in a new monotypic section, *Neosphace*. Since the *Pflanzenfamilien* account, a few species have been described which do not fit happily within the existing hierarchy and several others described after the *Prodromus* and before the *Pflanzenfamilien* are certainly anomalous where Briquet placed them. Examples of the latter are the six Madagascar species which were tagged onto Sect. *Eusphace* (*Salvia*) although in several characters they have nothing to do with it; several other cases could be cited.

Any satisfactory subdivision of a genus must obviously cater for *all* known species; otherwise it is unlikely to give a true picture of supra-specific taxa. Today Bentham's and Briquet's classifications are quite outdated and are neither satisfactory nor natural, this being particularly true of the African species. I have however deferred any formal recognition of new supra-specific groups until a later date, when the situation throughout the whole of the Old World can be taken into account. My current belief, based both on knowledge of the African species and of those in southwest and central Asia, is that many of the early sections/subgenera are essentially artificial and give the impression of a taxonomically neat and tidy genus, whereas in reality and as one's knowledge of the genus widens there seem to be few really distinct higher categories. At first sight, the group that appears to merit some kind of higher taxonomic status is that formed by the shrubby species with large expanded fruiting calyces. Such species occur in: the Canary Islands (*S. canariensis*, species-group H); southern Africa (species-group G); Turkey (e.g. *S. multicaulis* Vahl); Iran, Afghanistan and Soviet Central Asia (e.g. the *S. bucharia* M. Pop. complex). A few authors such as Pobedimova (in Komarov, Fl. U.R.S.S. 22: 364, 1954) have recognised the independent genus *Schraderia* Medik. (1791) to accommodate some of these species; more recently she has reiterated this opinion (247, 1972) by creating the new name *Arischrada* Pobed. (because of *Schradera* Vahl, 1796, nom. conserv.) to cover the Soviet, and only the Soviet, species. There are, however, several transitional species between those with and without expanded calyces both in SW Asia, Turkey in particular, and in Africa (species-group I in this account). While I cannot accept at this stage that an independent genus is warranted, I prefer to leave open the question of a taxonomic rank for these, at least in part, superficially similar species until they can all be compared simultaneously.

Salvia gives every impression of being an ancient genus which contains a blend of three types of species: extremely distinct relict species, of which in Africa there is a high proportion; normally variable species; and others which are extremely variable and still in a state of evolutionary flux. Within the first-named of these categories are species separated from the remaining two by several distinct, morphological stages and which would be uneasy bed-fellows beside any other species. That is, there are a considerable number of species without any obvious living allies which form monotypic species-groups, sections or sub-genera or whatever one calls them.

My present opinion is that the only natural supra-specific taxa, throughout at least the Old World, are species-groups. Often these contain only a few or, as indicated above, single species. Accordingly, I have divided the fifty-nine African species into twenty-three species-groups which I have informally described below and designated alphabetically. Usually, but not in every case, these species-groups have, in addition to morphological similarities, characteristic geographical distributions. Eventually, no doubt with considerable modifications, I hope to translate these provisional categories into formal ones.

Epling likewise did not recognise the major infra-generic categories within *Calosphace* that Bentham did, but divided the New World taxa into ninety-one species-groups which he formally described as sections. More recently Pobedimova (1972) has grouped some of the species from the U.S.S.R. into few-membered taxa and called them series, though still recognising the higher categories of Bentham and Briquet.

The degree of distinctness of the species-groups is sometimes indicated below. The monotypic ones, ten in all, clearly have no obvious allies but among the others there are some, like species-groups B, F, J and W which consist of a few closely allied taxa which are very distinctly separated from all other species-groups. The remainder, often consisting of very closely related and very variable species, are usually less readily distinguished from other groups nearby and could either be further subdivided or else united with others.

The greatest concentration of these species-groups is in northwest Africa where 11 are present; in southern Africa 7 are represented.

There is little convincing evidence to indicate what is a primitive or sub-ancestral *Salvia*. However. from the floral biology point of view, the least advanced species are those in which there is least adaptation to insect pollination. Such species would be those in which the corolla tube is fairly straight, exannulate, the upper lip short relative to tube length and more or less straight, the thecae separated by a short connective, about the same length as the filaments, and both thecae well-formed and bearing fertile pollen. On the other hand, the most advanced species would be those with a curved annulate tube, often invaginated above, a prominently falcate large upper lip, thecae widely separated by a long curved connective and the lower thecae cohering to each other, completely sterile and reduced to flat plates of tissue.

The sequence of the twenty-three species-groups which are defined below basically runs from woody or shrubby species with relatively simple corollas to herbaceous ones with advanced flowers. The high ratio of species-groups to the total number of species, 23 to 59, reflects the general situation in this area; it is of interest to compare this ratio of c.2.5 with that of c.5.1 for the New World species of *Calosphace*.

Species-group A

Shrubs or herbs woody at base. Leaves herbaceous. Calyces little enlarging in fruit, lips not diverging. Corolla upper lip ± straight; tube more than ½ length of corolla, annulate. Staminal connectives ± equal to filaments; lower thecae fertile. Sect. *Salvia* p.p.

NW & N Africa, S Europe and E Mediterranean.
1, *S. fruticosa*; 2, *S. interrupta*; 3, *S. blancoana*; 4, *S. lavandulifolia.*

Species-group B

Shrubs. Leaves simple, thick, coriaceous. Calyces little enlarging in fruit, lips not diverging. Corolla upper lip ± straight; tube ⅔–¾ length of corolla, annulate. Staminal connectives equal to or longer than filaments; lower thecae fertile.
Madagascar. A very distinct group without allies.
5, *S. sessilifolia*; 6, *S. cryptoclada*; 7, *S. porphyrocalyx*; 8, *S. leucodermis.*

Species-group C

Herb. Leaves lyrate-pinnatifid, herbaceous. Calyces scarcely enlarging in fruit, densely annulate at throat. Corolla upper-lip ± straight; tube c.⅔ length of corolla, annulate, upwardly curved. Staminal connectives slightly longer than filaments; lower thecae fertile. Sect. *Salvia* p.p.
Morocco. Monotypic.
9, *S. taraxacifolia.*

Species-group D

Shrub. Leaves simple, coriaceous. Calyces scarcely enlarging in fruit; ciliate at throat; upper lip with three short teeth scarcely reflexed. Corolla upper lip ± straight; tube c.⅔ length of corolla, straight, widening above, annulate. Staminal connectives longer than filaments; lower thecae fertile.
South Africa. Monotypic.
10, *S. muirii.*

Species-group E

Shrub. Leaves simple, coriaceous. Calyces scarcely enlarging in fruit; upper lip somewhat reflexed. Corolla upper lip ± straight; tube slightly more than ½ of corolla length, exannulate. Staminal connectives about as long as filaments; lower thecae ± well developed, fertile.
Madagascar. Monotypic.
11, *S. parvifolia.*

Species-group F

Shrubs, low-growing. Leaves simple, revolute. Flowers less than 8 mm. Calyces enlarging in fruit; upper lip somewhat reflexed. Corolla upper lip straight; tube c.⅔ of corolla length, annulate. Staminal connectives very short (1–2 mm), shorter than filaments; lower thecae fertile. Nutlets black. Equivalent of sect. *Notiosphace* Benth. p.p. and equal to sect. *Eremosphace* Bge.
N Africa, Macaronesia, SW Asia. A very distinct group without close allies.
12, *S. aegyptiaca*; 13, *S. deserti*; 14, *S. chudaei.*

Species-group G

Shrubs. Calyces much expanded, infundibuliform in fruit, lips widely divergent. Corolla upper lip ± straight or falcate; tube clearly exserted, annulate. Staminal connectives clearly longer than filaments; lower thecae ± dolabriform but with a small fertile portion. Sect. *Hymenosphace* Benth. p.p.
South Africa: western Cape, Transvaal.
15, *S. aurea*; 16, *S. lanceolata*; 17, *S. africana*; 18, *S. dentata*; 19, *S. dolomitica*.

Species-group H

Shrub. Calyx much expanded, infundibuliform in fruit, lips widely divergent. Corolla upper lip slightly falcate; tube included within calyx, not invaginated, exannulate, pilose within. Staminal connectives clearly longer than filaments; lower thecae dolabriform, sterile. Sect. *Hymenosphace* Benth. p.p.
Canary Islands. Monotypic. Similar in floral structure to 'G', but with sagittate to hastate leaf bases and floral-leaves as long as or longer than calyces.
20, *S. canariensis*.

Species-group I

Shrubs. Calyces somewhat expanding in fruit; lips divergent. Corolla upper lip strongly falcate; tube included within calyx or somewhat exserted, invaginated or not, ± pilose within. Staminal connectives longer than filaments; lower thecae dolabriform, sterile. Sect. *Hymenosphace* Benth. p.p.; sect. *Aethiopis* Benth. p.p.
South-West Africa (Namibia). South Africa, western Cape. Egypt. Palestine.
21, *S. garipensis*; 22, *S. dominica*; 23, *S. chamelaeagnea*; 24, *S. albicaulis*.

Species-group J

Shrubs. Calyces scarcely enlarging in fruit, upper lip ± reflexed, with three subequal teeth. Corolla upper lip falcate; tube c.½ of corolla length, straight, widening above, annulate. Staminal connectives clearly longer than filaments; lower thecae ± dolabriform but with a fertile portion.
Madagascar. Somalia. A very distinct group without allies.
25, *S. perrieri*; 26, *S. somalensis*.

Species-group K

Shrub. Calyx scarcely enlarging in fruit; upper lip with three ± equal teeth, truncate at their bases. Corolla upper lip straight; tube c.½ of corolla length, exserted or not, annulate. Staminal connectives slightly longer than filaments; lower thecae reduced to flattened, not dolabriform, sterile tissue.
South-West Africa (Namibia). South Africa, western Cape. Monotypic.
27, *S. namaensis*.

Species-group L

Herbs with simple to pinnate leaves. Calyx not or scarcely enlarging in fruit; upper lip with three ± subequal spreading teeth separated by wide sinuses. Corolla upper lip straight or almost so; tube exserted, annulate or not. Staminal connectives equal to or longer than filaments; lower thecae ± well-formed, fertile, free. Sect. *Heterosphace* Benth.; sect. *Neosphace* Briq.
South Africa, Cape, Natal, Transvaal; tropical E Africa. A fairly distinct species-group but containing several extremely variable species.
28, *S. nilotica*; 29, *S. aurita*; 30, *S. scabra*; 31, *S. obtusata*; 32, *S. triangularis*; 33, *S. tysonii*; 34, *S. repens*; 35, *S. runcinata*; 36, *S. stenophylla*; 37, *S. schlechteri*.

Species-group M

Herb, stoloniferous. Calyx not or little enlarging in fruit; upper lip ± truncate, with 3 spreading, subequal teeth. Corolla upper lip falcate; tube c.½ of corolla length, annulate. Staminal connectives longer than filaments; lower thecae dolabriform, but with a fertile portion.
South Africa, southwestern Cape. Monotypic.
38, *S. granitica*.

Species-group N

Shrub with simple, broad ovate leaves. Calyx not or little expanding in fruit; upper lip with 3 ± straight not reflexed teeth. Corolla upper lip falcate, compressed; tube included, not invaginated, glabrous within. Staminal connectives longer than filaments; lower thecae dolabriform, sterile. Sect. *Aethiopis* p.p.
Canary Islands. Monotypic.
39, *S. broussonetii*.

Species-group O

Shrub, with linear, revolute, leaves. Calyx slightly enlarging in fruit; upper lip very shortly 3-toothed, bisulcate-concave. Corolla upper lip strongly falcate, compressed; tube exserted widening above, invaginated at base. Staminal connectives much longer than filaments; lower thecae sterile, dolabriform.
Algeria. Monotypic.
40, *S. balansae*.

Species-group P

Shrub with pinnate leaves. Calyx slightly enlarging in fruit, annulate at throat; upper lip with 3 long teeth, not reflexed. Corolla upper lip slightly falcate; tube c.⅔ of corolla length, clearly exserted, upwardly curved, exannulate. Staminal connectives much longer than filaments; lower thecae dolabriform, sterile, cohering.
Algeria. Tunisia. Monotypic.
41, *S. jaminiana*.

Species-group Q

Herbs with simple leaves. Calyx tubular, not or little expanding in fruit; upper lip with 3 ± straight or incurved teeth, not bisulcate-concave. Corolla upper lip slightly falcate; tube straight, widening above, exannulate. Staminal connectives much longer than filaments, lower thecae dolabriform, sterile, cohering. Sect. *Aethiopis* Benth. p.p.

S Europe. N Africa. SW Asia. Ethiopia.

42, *S. phlomoides*; 43, *S. gattefossei*; 44. *S. palaestina*; 45, *S. spinosa*; 46, *S. schimperi.*

Species-group R

Herbs with simple leaves. Calyx campanulate or tubular campanulate, not or little expanding in fruit; upper lip 3-toothed, median shorter; not bisulcate-concave. Corolla upper lip ± clearly falcate; tube widening above, ventricose, invaginated. Staminal connectives much longer than filaments; lower thecae dolabriform, sterile, cohering. Sect. *Aethiopis* p.p.

S. Europe. N Africa. SW Asia.

47, *S. argentea*; 48, *S. tingitana*; 49, *S. sclarea.*

Species-group S

Annual. Calyx tubular, little expanding in fruit and deflexed. Pedicels in fruit flattened and deflexed. Corolla small, upper lip straight or falcate. Other characters as previous group.

S Europe. N Africa. SW Asia. Monotypic. Sect. *Horminum* Benth.

50, *S. viridis.*

Species-group T

Herbs with simple or pinnate leaves. Calyx tubular-campanulate, not or little expanding in fruit; upper lip with 3 short closely connivent teeth, bisulcate-concave. Corolla upper lip straight or ± falcate; tube included or exserted, exannulate. Staminal connectives longer than filaments; lower thecae dolabriform, sterile or with a fertile portion, cohering. Sect. *Plethiosphace* Benth. p.p.

S Europe. N Africa. SW Asia. E Africa. [naturalised in S Africa and elsewhere].

51, *S. verbenaca*; 52, *S. lanigera*; 53, *S. pseudojaminiana*; 54, *S. merjamie.*

Species-group U

Perennial. Pedicels up to 13 mm. Calyces slightly enlarging in fruit; upper lip shortly 3-toothed, bisculcate-concave. Corolla up to 35 mm, upper lip strongly falcate, blue, compressed; tube exserted, ventricose, invaginated. Staminal connectives much longer than filaments; lower thecae sterile, dolabriform. Sect. *Plethiosphace* Benth. p.p.

NW Africa. Spain. Monotypic (?).

55, *S. barrelieri.*

Species-group V

Perennials. Pedicels up to 4 mm. Corolla up to 25 (–30) mm; whitish; other characters as in previous group. Sect. *Plethiosphace* Benth. p.p.
South-West Africa (Namibia). South Africa.
56, *S. disermas*; 57, *S. radula.*

Species-group W

Annuals. Calyces ± reflexed in fruit; other characters as in previous group. Sect. *Plethiosphace* Benth. p.p.
Morocco. Algeria.
58, *S. algeriensis*; 59, *S. mouretii.*

Salvia Linn.

Sp. Pl. 23 (1753) et Gen. Pl. ed. 5: 15 (1754)

Shrubs, perennial or annual herbs, usually aromatic, with a varied glandular and eglandular indumentum of simple hairs. Leaves exstipulate, opposite, simple to pinnate, petiolate or sessile. Inflorescence of few- to many-flowered axillary verticils. Floral leaves usually present, sometimes showy, deciduous or persistent; bracts present rarely absent. Pedicels erect-spreading, rarely absent. Flowers white, blue, violet, lilac, purple, rose, reddish-brown or cream. Calyx 2-lipped, ovate, campanulate, tubular or infundibuliform usually with an indumentum of glandular and/or eglandular hairs and oil globules, expanding in fruit or not; upper lip of calyx 3-toothed, median often shorter or obsolete, spreading, closely connivent or with broad sinuses between teeth, bisulcate-concave in fruit or not; lower lip equally 2-toothed, longer than upper, spreading. Corolla 2-lipped; upper lip, or hood, straight or falcate, ± compressed. enclosing staminal connectives, bifid or subentire; lower lip, or labellum, shorter, equal to or longer than upper, 3-lobed, median usually concave much larger than the two lateral lobes; tube straight or curved, exserted or not, annulate or exannulate, invaginated with a plate of internal tissue or not. Stamens 2, ± enclosed in upper lip of corolla, rarely exserted, each consisting of an anterior fertile theca separated by a long or short connective from the posterior theca; posterior thecae ± fertile, smaller than anterior, or sterile and reduced to flattened plates of tissue (dolabriform) cohering to each other or not; connectives more or less equal to or clearly shorter than filaments and articulating with them at point of attachment, rarely not articulating; staminodes present, small and usually inconspicuous. Style included or exserted from corolla, with two unequal small branches, glabrous or pilose. Fruit of 4 nutlets, of which fewer may reach maturity. Nutlets ± round-trigonous, mucilaginous on wetting or not. Type species—*S. officinalis* Linn.

The above description covers the genus as it occurs in Africa and Asia.

Key to Native Species

1. Shrubs with campanulate-infundibuliform fruiting calyces with widely diverging lips and usually clearly enlarging from flower to fruit 2
+ Shrubs, subshrubs, perennial or annual herbs with campanulate to tubular calyces with not or somewhat diverging lips, not or little enlarging in fruit 11
2. Leaves lanceolate-triangular, sagittate to hastate at base 20 *S. canariensis*
+ Leaves linear-elliptic to ovate, cuneate to cordate at base . . 3
3. Calyces densely villose 4
+ Calyces pilose 6
4. Stems acutely quadrangular, white, with antrorse hairs . . 24. *S. albicaulis*
+ Stems round-quadrangular, not white, with spreading hairs . 5
5. Leaf bases cuneate; calyces enlarging and becoming purplish in fruit; flowers blue to pink . . . 17. *S. africana*
+ Leaf bases cordate; calyces scarcely enlarging in fruit, green; flowers white . . . . . 22. *S. dominica*
6. Corolla 35–40 mm 7
+ Corolla less than 30 mm 8
7. Floral leaves persistent; upper lip of corolla c.25 mm; leaves greenish, canescent . . . . . 15. *S. aurea*
+ Floral leaves soon deciduous; upper lip of corolla c.17 mm; leaves greyish white with a dense adpressed indumentum . 16. *S. lanceolata*
8. Both leaf surfaces with numerous oil globules but otherwise ± glabrous; stems with short antrorse hairs only 23. *S chamelaeagnea*
+ Both leaf surfaces with a prominent indumentum of eglandular or glandular hairs 9
9. Fruiting calyces up to 25 mm; leaf margins entire 19. *S. dolomitica*
+ Fruiting calyces up to 16 mm; leaf margins crenate-dentate or erose-dentate, rarely sub-entire 10
10. Stems with glandular hairs; leaves herbaceous; flowers whitish 21. *S. garipensis*
+ Stems with eglandular hairs; leaves coriaceous; flowers purplish-blue . . . . . 18. *S. dentata*
11. Shrubs with corollas less than 9 mm (desertic regions of northern Africa) 12
+ Shrubs or herbs with corollas more than 12 mm . . 14
12. Calyx with capitate glandular hairs . . 12. *S. aegyptiaca*
+ Calyx without capitate glandular hairs 13
13 Leaves ovate-oblong; verticils c. 8-flowered . . 13. *S. deserti*
+ Leaves narrow linear; verticils c. 4-flowered . 14. *S. chudaei*
14. Shrubs, rarely herbs, with corolla tube more than 20 mm . 15
+ Shrubs, perennial or annual herbs with corolla tube less than 15 mm 20
15. Leaves simple, ± sessile 16
+ Leaves divided, petiolate 19

16. Leaves ± herbaceous, not or scarcely overlapping each other; corolla throat c.8 mm broad . . . . 7. *S. porphyrocalyx*
\+ Leaves thick-textured or coriaceous; clearly overlapping each other; corolla throat less than 6 mm broad 17
17. Upper leaf surface with stiff shining hairs; lower lip of corolla shorter than upper . . . . 5. *S. sessilifolia*
\+ Upper leaf surface velutinous; lower lip of corolla longer than upper 18
18. Calyces with glandular hairs; leaf lamina broadest in upper third . . . . 8. *S. leucodermis*
\+ Calyces without glandular hairs; leaf lamina broadest about the middle . . . . 6. *S. cryptoclada*
19. Leaves lyrate-pinnatifid up to 5×3 cm; corolla mauve or purple, tube exannulate . . . . 30. *S. scabra*
\+ Leaves pinnate, up to 11×5 cm; corolla blue or lilac-white, tube annulate . . . . 2. *S. interrupta*
20. Annuals 21
\+ Perennial herbs or shrubs 23
21. Corolla upper lip straight or slightly falcate; pedicels flattened and deflexed in fruit . . . . 50. *S. viridis*
\+ Corolla upper lip prominently falcate; pedicels not flattened in fruit, deflexed or not 22
22. Calyces pendent in fruit; lower lip of calyx with c.4 mm teeth 58. *S. algeriensis*
\+ Calyces erect spreading in fruit; lower lip of calyces with c.2 mm teeth . . . . 59. *S. mouretii*
23. Shrubs or subshrubs with woody stems or at least woody at base above ground level 24
\+ Perennial herbs with herbaceous stems 34
24. Staminal connectives scarcely longer than to shorter than filaments 25
\+ Staminal connectives clearly longer than filaments . . . 30
25. Leaves simple with entire or finely crenulate margins (see also lead 29) 26
\+ Leaves divided with crenate to irregularly lobed margins . 29
26. Corolla up to 15 mm (Madagascar) . . . . 11. *S. parvifolia*
\+ Corolla more than 2 mm 27
27. Leaves obovate-elliptic, thick-textured, up to 13×8 mm; calyx pilose-ciliate at margin; corolla blue . . . . 10. *S. muirii*
\+ Leaves oblong-linear, herbaceous, more than 20 mm; calyx not pilose-ciliate; corolla violet-blue 28
28. Stems glabrous or with a few adpressed hairs below; pedicels 1–10 mm; corolla 25–38 mm . . . . 3. *S. blancoana*
\+ Stems with adpressed hairs above and below; pedicels 0–2 mm; corolla 20–25 mm . . . . 4. *S. lavandulifolia*
29. Leaves all or at least some trilobed; calyx with glandular hairs; corolla 20–25 mm . . . . 1. *S. fruticosa*
\+ Leaves irregularly lyrate-pinnatifid; calyx without glandular hairs; corolla c.12 mm . . . . 27. *S. namaensis*

30. Leaves pinnate with narrow linear segments . . . 41. *S. jaminiana*
\+ Leaves simple 31
31. Leaves broad ovate; corolla c.15 mm . . 39. *S. broussonetii*
\+ Leaves narrow linear to oblong-lanceolate 32
32. Leaves linear up to 7.5×0.7 cm, revolute; corolla tube exannulate; suffruticose herb to 70 cm. . . . . 40. *S. balansae*
\+ Leaves linear-lanceolate to lanceolate up to 12×2 cm, not revolute; corolla tube annulate: shrub up to 2 m . . . 33
33. Leaves discolorous; pedicels up to 10 mm; calyx triangular-campanulate (Madagascar) . . . . 25. *S. perrieri*
\+ Leaves not discolourous, pedicels up to 5 mm; calyx tubular-campanulate (Somalia) . . . . . 26. *S. somalensis*
34. Calyces tubular 35
\+ Calyces campanulate, ovate-campanulate or tubular-campanulate 38
35. Leaves all or mostly basal; inflorescence not or little branched . 36
\+ Leaves distributed over stem; inflorescence much branched . 37
36. Leaves oblong-spathulate, lanate, eglandular, sessile . . 42. *S. phlomoides*
\+ Leaves ovate, with glandular hairs on both surfaces; petiole c.3 cm . . . . . 43. *S. gattefossei*
37. Leaves pinnatifid or lyrate, oblong in outline; calyx 10–14 mm; floral leaves slightly shorter than calyces . 44. *S. palaestina*
\+ Leaves simple, with erose or crenate margins, broad ovate; calyx 15–20 mm; floral leaves slightly longer than calyces 45. *S. spinosa*
38. Floral leaves clearly longer than calyces, ± enclosing the verticils 39
\+ Floral leaves shorter than calyces 40
39. Calyx c.10 mm; corolla tube not exserted; bracts absent 49. *S. sclarea*
\+ Calyx c.20 mm; corolla tube clearly exserted; bracts present, prominent, up to 2×0.5 cm (Ethiopia) . 46. *S. schimperi*
40. Corolla upper lip clearly falcate 41
\+ Corolla upper lip ± straight 47
41. Verticils 2-flowered; lower thecae with a fertile terminal portion . . . . . 38. *S. granitica*
\+ Verticils 6–8 flowered; lower thecae dolabriform, sterile, rarely not and fertile (?) 42
42. Corolla up to 14 mm; lower thecae adhering, fertile (?) . . 54. *S. merjamie*
\+ Corolla 20–35 mm; lower thecae free or adhering, sterile, dolabriform 43
43. Pedicels 13 mm; corolla up to 35 mm, bluish or lilac; leaves with subentire to deeply laciniate margins . . 55. *S. barrelieri*
\+ Pedicels less than 10 mm; corollas less than 25 mm, white to lilac; leaves subentire to erose 44
44. Lower stem indumentum without glandular capitate hairs . 57. *S. radula*
\+ Lower stem indumentum with numerous capitate glandular hairs 45

45. Corolla tube invaginated with a plate of tissue . . 47. *S. argentea*
\+ Corolla tube straight or widened above, not invaginated, without a plate of tissue 46

46. Stem and calyx with scattered white spreading, eglandular hairs up to 3 mm; corolla tube exannulate . 48. *S. tingitana*
\+ Stem and calyx without very long spreading eglandular hairs; corolla tube annulate below lower lip . . . 56. *S. disermas*

47. Leaves pannose beneath 48
\+ Leaves not pannose beneath 49

48. Corolla c. 30 mm, pinkish; tube densely annulate; leaves mostly in basal rosettes, lyrate-pinnatisect (Morocco) . . 9. *S. taraxacifolia*
\+ Corolla up to 15 mm, pale blue to lilac; tube exannulate; leaves distributed over stem, simple (Madagascar) . . 11. *S. parvifolia*

49. Upper lip of fruiting calyx with closely connivent teeth; corolla tube exannulate 50
\+ Upper lip of fruiting calyx with distinct ± spreading teeth separated by rather broad truncate sinuses; corolla tube annulate or exannulate 53

50. Leaves pinnatisect with narrow linear ultimate segments. . 51
\+ Leaves simple to pinnatifid with broad lobes . . . 52

51. Calyx ± plumose, with very long spreading eglandular hairs; corolla white or pale blue . . . 53. *S. pseudojaminiana*
\+ Calyx not plumose, with long and short eglandular hairs and short glandular capitate hairs . . . . 52. *S. lanigera*

52. Bracts absent; corolla tube with a panel of hairs from base of lower lip half-way down tube . . . . 54. *S. merjamie*
\+ Bracts present; corolla tube exannulate, glabrous within. . 51. *S. verbenaca*

53. Lower parts of stem and upper leaf surface glabrous; corolla 20–25 mm. . . . . 31. *S. obtusata*
\+ Lower parts of stem and upper leaf surface pilose; corolla 12–40 mm 54

54 Leaves simple ovate-triangular, up to 3 × 2 cm 32. *S. triangularis*
\+ Leaves simple to pinnate, not ovate-triangular more than 3 × 2 cm 55

55. Corolla 25–40 mm with a long ± straight tube; calyx tubular 10–20 mm . . . . . 30. *S. scabra*
\+ Corolla 12–26 mm; tube narrow and straight or broad and widened above; calyx tubular, tubular-campanulate, ovate-campanulate or ovate 56

56. Stems, above and below, and calyces with capitate glandular hairs . . . . . 28. *S. nilotica*
\+ Stems below always, and calyces usually without, rarely with capitate glandular hairs; stems above rarely with capitate glandular hairs 57

57. Leaves pinnatifid to pinnate with ± linear segments . . 58
\+ Leaves simple, lyrate or runcinate 60

58. Calyx 4–5 mm, ovate or ovate-campunulate, ± adpressed to axis in fruit; corolla 7–14 mm 59
\+ Calyx c.9 mm, tubular, not adpressed to axis in fruit; corolla c.25 mm . . . . . 37. *S. schlechteri*
59. Stems almost glabrous with few scattered, very short eglandular hairs; leaves narrow linear-oblong to oblong-lanceolate; calyx ovate . . . . . 36. *S. stenophylla*
\+ Stems with a distinct indumentum of short to long eglandular hairs; leaves oblong-lanceolate to obovate; calyx ovate-campanulate . . . . . 35. *S. runcinata*
60. Leaves runcinate with a terminal segment of up to 9.5 × 5 cm; corolla tube exannulate; stems c.6 mm thick at base 33. *S. tysonii*
\+ Leaves simple or runcinate or lyrate with a terminal segment of less than 5 × 3 cm; corolla tube annulate; stems less than 4 mm thick at base 61
61. Calyx upper lip with lateral teeth c.2.5 mm and median clearly shorter . . . . . 29. *S. aurita*
\+ Calyx upper lip with subequal teeth 0.5–1.5 mm . . . 62
62. Calyx 4–5 mm, ovate or ovate-campanulate, ± adpressed to axis in fruit; corolla 7–14 mm 63
\+ Calyx 5–10(–13) mm, tubular-campanulate, not adpressed to axis in fruit; corolla 10–26 mm . . . . 34. *S. repens*
63. Stems almost glabrous with few scattered, very short eglandular hairs; leaves narrow linear-oblong to oblong-lanceolate; calyx ovate . . . . . 36. *S. stenophylla*
\+ Stems with a distinct indumentum of short to long eglandular hairs; leaves oblong-lanceolate to obovate; calyx ovate-campanulate . . . . . 35. *S. runcinata*

Enumeration of Species

The synonyms cited in the following enumeration are not necessarily comprehensive for the species throughout its range but, one hopes, are fairly complete for the situation in Africa. References cited are also not exhaustive and only cover the more important ones from the time of Linnaeus to the present day. Likewise, only a selection of herbarium specimens are cited in order to give a reasonable coverage of the distribution of the species. In general, more specimens from southern Africa than northern Africa are cited because the latter countries have several recent Floras which give a good idea of local distributions within them.

Species-group A
(p. 13)

1. S. fruticosa Miller, Gard. Dict. ed. 8, Salvia no. 5 (1768).

Syn.: *S. baccifera* Etlinger, Salvia 18 (1777)?
S. triloba Linn. fil., Suppl. Pl. 88 (1781).
S. libanotica Boiss. & Gaill. in Boiss., Diagn. Pl. Or. Ser. 2, 4:16 (1859).
S. lobryana Azn. in Mag. Bot. Lap. 1: 95 (1902).

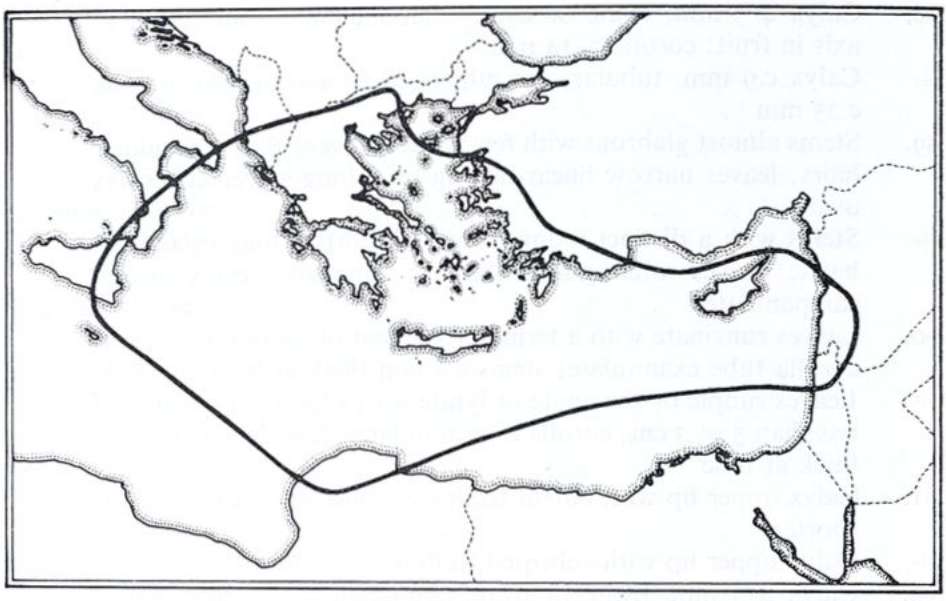

FIG. 4. Total distribution of *Salvia fruticosa* Miller.

Type. Cultivated specimen labelled Hort. Miller (BM!)—possibly raised from seed from Smyrna.

Ic.: Sibth. & Sm., Fl. Graeca 1: t.17 (1806).

Ref.: Aiton, Hort. Kew. 1:38 (1789); Vahl, Enum. 1:224 (1804); Benth., Labiat. 210 (1833); DC., Prodr. 12:265 (1848); Durand & Barratte, Fl. Libycae Prodr. 187 (1910); Lindinger, Beitr. Fl. kanar Ins. 224 (1926); Pampanini, Fl. Cirenaica 395 (1931); Notes R.B.G. Edinb. 23:47 (1959); Quezel & Santa, Nouv. Fl. Algér. 2:794 (1963); Tutin et al., Fl. Europaea 3: 189 (1972).

Shrub up to 1 m or more. *Stems* much branched below with an eglandular ± lanate indumentum, above glandular-tomentose. *Leaves* simple or ± trilobed, ovate-oblong, subcordate, with or without a pair of small lateral segments at base of lamina, crenulate, white tomentose beneath with oil globules, above colliculate with numerous short eglandular hairs. *Inflorescence* much branched; verticils up to 10–flowered, distant below approximating above. *Floral leaves* small acuminate soon deciduous; bracts absent. *Pedicels* erect-spreading, up to 5 mm. *Calyx* tubular-campanulate, c.8 mm in flower enlarging to c.11 mm in fruit, 13-veined, with a dense indumentum of capitate glandular hairs and, at base, with fewer longer eglandular hairs; upper lip with 3 subequal teeth, c.1.5 mm; lower with two triangular acuminate teeth c.2 mm. *Corolla* violet blue to pale lilac or almost white, up to 25 mm; upper lip ± straight; tube prominently annulate c.5 mm from base. *Staminal connectives* up to 7 mm; filaments up to 8 mm; lower thecae ± well-developed, fertile. *Nutlets* ± terete, mucilaginous on wetting. 2n = 14 (Delestaing 1954, as *S. triloba*). *Fl.* Mar.–May.

Macchie or garigue among limestone rocks; near sea level to c.700 m.

Sicily, S Italy, Albania, Greece, Crete, Rhodes, W Turkey, Cyprus, S Syria, Lebanon, Israel, Libya. Fig. 4.

LIBYA. Cyrenaica: Derna, *Taubert* 327! (E); Lamluda, *Pampanini* 6862! (BM); above Tolmeith on road to El Merj (Barce), *Davis* 50450! (E, K). Tripolitania: Marcella, Gargaresh, *Keith* 943! (K).

A characteristic member of E Mediterranean macchie or garigue vegetation, *S. fruticosa* is known as a native species on the African continent only from Libya. In the Canary Islands, Morocco and Algeria it is cultivated as a pot-herb, sometimes used to flavour tea, and occasionally is more or less established there.

Although this species has always been known since the younger Linnaeus's time as *S. triloba*, it is unfortunately necessary to relegate this well-known name to synonomy and adopt Philip Miller's name published thirteen years earlier and typified by a fairly adequate specimen in the British Museum (BM).

Although no corollas are present on the specimen, there is no doubt from the form of the leaves, clearly trilobed, the indumentum of the stem, leaves and calyces, and the shape and size of the calyces that this is the species that was later described and widely known as *S. triloba*. It is of interest to note that on the type sheet, Solander, at a somewhat later date, had pencilled on "*S. triloba* Linn. Suppl." *S. fruticosa* appears to have been known in cultivation in this country for a long time, Aiton recording that it was cultivated by John Gerard in 1597.

S. fruticosa has no relatives among the African species but is allied to the S European *S. officinalis* and the east Mediterranean *S. tomentosa* Miller (syn. *S. grandiflora* Etlinger).*

At least in Greece and Turkey, plants of this early flowering species are frequently covered with insect galls on the stem branches.

2. S. interrupta Schousboe, Vextr. Morokko 18, t.1 (1801).

Syn.: *S. paui* Maire in Emberger & Maire, Pl. Mar. nov. 1: 5 (1929).
S. interrupta Schousboe ssp. *paui* (Maire) Maire in Jahandiez & Maire, Cat. Pl. Maroc 3: 641 (1934).

Described from cultivated material raised at Copenhagen from seed collected in southern Morocco. No specimen has been seen.

Ic.: Bot. Mag. t. 5860 (1870).

Ref.: Vahl, Enum. 1: 226 (1804); Benth., Labiat. 211 (1833); DC., Prodr. 12: 266 (1848); Jahandiez & Maire, Cat. Pl. Maroc 3: 641 (1934).

Suffruticose perennial. *Stems* much branched, woody below, herbaceous above; indumentum below absent or viscid, above glabrous or with a dense covering of capitate glandular hairs. *Leaves* irregularly pinnate with a large ovate–oblong terminal segment, up to 11 × 5 cm, 1–2 smaller lateral lobes and occasionally with smaller lobules, margins irregularly crenate, below ± white tomentose, above g een, usually colliculate; petiole up to 6 cm. *Verticils* up to 10, c.8–flowered, distinct, up to 10 cm apart below closer above. *Floral leaves* ovate-acuminate, deciduous, up to 10 × 4 mm.; bracts present. *Pedicels* up to 8 mm, usually less, erect-spreading. *Calyx* ± tubular, up to 15 mm, with 14 prominent veins; indumentum ± densely glandular-pilose, of capitate glandular hairs, eglandular hairs and oil globules; upper lip 3-toothed with median shorter; lower lip with two c.4.5 mm teeth. *Corolla*

* *S. tomentosa* Miller, Gard. Dict. ed. 8 Salvia no. 2 (1768) Syn.: *S. grandiflora* Etlinger Salvia 17 (1777).

up to 35 mm, blue or white tinged lilac or rose; upper lip almost straight, deeply bifid; lower lip longer than upper, with reflexed lateral lobes and a large deeply bifid median lobe; tube annulate c.10 mm from base. *Staminal connective* c.7 mm; filaments c.8 mm; lower thecae lightly cohering, ± well developed, fertile. *Nutlets* c.3·8 × 2·8 mm, ± round, very dark brown, not mucilaginous. 2n = 14 (Delestaing 1954, as *S. paui*). *Fl.* Mar.-May.
Rocky calcareous slopes, in light forest; 400–1500 m.
Morocco.
MOROCCO. Great Atlas, Djebel Amsitten, *Maire* s.n.! (MPU). loc. cit., *Lindberg* 2716! (MPU); Ida-ou-Tanan, N of Agadir, *Maire* 2577! (MPU, BM). Ida-ou-Tanan, 28 i 1936, *Gattefossé* s.n.! (K). Mogador to Agadir, near Dar el Cadi, *Romieux* 1428! (G). Jebil Tisuka, Xauen, *Stocken* 1964: 25! (E). Beni Hosmar, *Font Quer* 572! (BM).

Known from several collections from the southwest of Morocco, the Grand Atlas and the northwest Rif, *S. interrupta* is most closely related to *S. candelabrum* Boiss. from southern Spain (of which there is a very good illustration in Boissier, Voy. Bot. Hispan. 1: t. 136, 1840). The two species are similar in habit, leaf shape and flower colour but in the Spanish species, the peduncles are long and spreading. Although they are geographically somewhat separated there is little doubt that they are a closely related species-pair and would repay more detailed study to determine their true status.

3. S. blancoana Webb & Heldr. in Walpers, Ann. Bot. Syst. 3: 254 (1852–53).
Syn.: *S. candelabrum* Boiss. subsp. *maurorum* Ball in Journ. Bot. 13: 175 (1875).
S. maurorum (Ball) Ball in Journ. Linn. Soc. Bot. 16: 615 (1878).
S. aucheri Boiss. subsp. *blancoana* (Webb & Heldr.) Maire in Bull Soc. Hist. Nat. Afr. Nord. 20: 196 (1929).
S. candelabrum Boiss. subsp. *blancoana* (Webb & Heldr.) Cuatr. in Trab. Mus. Cienc. Nat. Barcelona 5, 7: 36 (1926).
Type. [Spain, Jaen] "In prov. Giennensi prope Chorraderos" *Blanco* 1849: 308! (E).
Ic.: Journ. Linn. Soc. Bot. 16: t. 28 (1878)—as *S. maurorum*.
Ref.: Lunds Univ. Arsskr. n.f. 2, 19, 1: 29 (1923); Bull. Soc. Hist. Nat. Afr. Nord 20: 196 (1929); Jahandiez & Maire, Cat. Pl. Maroc 3: 640 (1934); Emberger & Maire, l.c. 4: 1113 (1941); Quezel & Santa, Nouv. Fl. Algér 2: 194 (1963).

Shrub or herb woody at base up to 1 m. *Flowering stems* unbranched or branched above, glabrous throughout or with some short eglandular ± adpressed white hairs below. *Leaves* mostly in lower part of stem, oblong-elliptic to linear-oblong, white tomentose when young, greyish green at maturity with a varying density of short eglandular hairs and oil globules; basal leaves petiolate, upper ± sessile. *Inflorescence* unbranched or with spreading-erect lateral branches; verticils up to 8, 2–6-flowered, distant below, scarcely approximating above. *Floral leaves* ovate, soon deciduous or not; bracts present. *Pedicels* 1–10 mm, erect-spreading, sometimes erect, thickening in fruit. *Calyx* tubular-campanulate, 10–15 mm, with oil globules,

short capitate glandular hairs or longer eglandular ± adpressed hairs, 16-veined; upper lip with three subequal teeth, 2·5–3 mm; lower lip with two equal 3–5 mm teeth. *Corolla* violet-blue to pinkish-white, 25–38 mm; upper lip ± straight; lower lip equal to or shorter than upper; tube 17–25 mm, clearly exserted, widening from base to c. 10 mm at throat, annulate c. 8 mm from base. *Staminal connectives* c. 5·5 mm; filaments c. 6 mm; lower thecae fertile, free. *Nutlets* 3 × 2·5 mm, trigonous, brown with darker venation, at apex with a few oil globules, mucilaginous on wetting. *Fl.* June–July.
Dry, rocky slopes, in Oak and Juniper scrub; 800–2200 m.
Spain SE, Morocco, Algeria.
MOROCCO. Middle Atlas, Dayet Achlef, *Jahandiez* 1923: 591 bis! (E). Dayet Iffer, 22 km NE Ifrane, *de Wilde* et al. 2588! (BM). Azgour, *Balls* 2845! (E, K, BM). Great Atlas, Amsmiz, 1100–1700 m, 21–23 v 1871, *G. Ball* sn.! (K, BM–type of *S. candelabrum* Boiss. subsp. *maurorum*) Taroudant to Azni, *de Wilde* et al. 1933! (BM).
ALGERIA. Mountains near Batna, *Balansa* 830! (E, BM). Near Bossuet, *Faure* s.n.! (E, BM).

Although the synonyms cited above cover the pertinent species and subspecies, I have not included the several varieties that have been recognised by Maire which may or may not warrant recognition. Insufficient herbarium material has been seen, and no field studies are at hand, to help reach a conclusion but according to Maire they form a series of morphologically and geographically disjunct races. There is certainly a great range of variation within *S. blancoana* in NW Africa with regard to degree of branching of inflorescence, length of pedicels and calyx and corolla size. Some of these variants approach *S. candelabrum*—those with clearly pedunculate inflorescences—others, with simple condensed inflorescences, are similar in facies to *S. lavandulifolia*. A field study of N African and/or Spanish plants of *S. lavandulifolia*, *S. blancoana*, *S. interrupta* and *S. candelabrum* is much needed to clarify their inter-relationships, but from herbarium material hybridisation amongst them seems a possibility. In Spain, *S.* × *hegelmaieri* Porta & Rigo (Atti Accad. Agiati 9: 1891) is reputedly a hybrid between *S. lavandulifolia* and *S. candelabrum* but I have not seen other inter-specific hybrids recorded from this species complex.

The eight varieties of this species which Maire recognised, under the name *S. aucheri* subsp. *blancoana*, are as follows: var. *amethystea* Emberger & Maire in Bull. Soc. Nat. Hist. Afr. Nord 28: 374 (1937); var. *aurasiaca* Maire, l.c. 20: 196 (1929); var. *claryi* Faure & Maire, l.c.; var. *maurorum* (Ball) Maire l.c.; var. *mesatlantica* Maire, l.c. 197; var. *oranensis* Maire, l.c. 28: 374 (1937); var. *reboudiana* Maire, l.c. 20: 196 (1929); var. *tananica* Maire, l.c.24: 226 (1933).

Most authors dealing with this species in NW Africa have included *S. blancoana* as a subspecies of the Turkish endemic *S. aucheri* Boiss., and there is no doubt that they are a closely allied species-pair providing, like *S. phlomoides* and *S. hypargeia*, another striking example of East-West Mediterranean vicariads. I prefer, however, to give *S. aucheri* independent status on account of its rather different facies and differently shaped leaves; it is known only from a relatively small area in Cilicia, S Turkey.

4. **S. lavandulifolia** Vahl, Enum. Plant. 1: 222 (1805).

Syn.: *S. hispanorum* Lagasca, Gen. et Sp. Nov. 1 (1816).
S. officinalis Linn. var. *hispanica* Boiss. in Boiss., Voy. Bot. Hispan. 2: 481 (1841).
S. officinalis Linn. subsp. *lavandulifolia* (Vahl) Cuatr. in Trab. Mus. Cienc. Nat. Barcelona 12: 409 (1929).

Type. [Spain] "In monte Moncayo inque montosis circa Siguensam" (Sequienza), *Vahl* (C).

Ic.: Coste, Fl. France 3: 100 (1906).

Ref.: Benth, Labiat. 208 (1833); DC., Prodr. 12: 264 (1848); Jahandiez & Maire, Cat. Pl. Maroc 3: 640 (1934); Quezel & Santa, Nouv. Fl. Algér. 2: 794 (1963).

Shrub or herb woody at base. *Flowering stems* usually unbranched, up to 50 cm, ascending-erect, above and below with short eglandular ± adpressed white hairs. *Leaves* entire, mostly basal, oblong to oblong-linear, aromatic, rugose, narrowed at base, regularly crenulate, densely white tomentose on both surfaces when young becoming less so at maturity, with oil globules above and below; basal leaves petiolate, upper ± sessile. *Inflorescence* usually unbranched, verticils up to 8, 6–8-flowered, lowermost up to 6 cm apart, approximating or condensed above. *Floral leaves* narrow ovate, acuminate, up to 14 × 6 mm, later deciduous; bracts present, similar to but smaller than floral leaves. *Pedicels* 0–2 mm, suberect. *Calyx* tubular-campanulate, 8–10 mm, 16-veined, often reddish-purple, with oil globules, otherwise glabrous or with short ± adpressed eglandular hairs; upper lip with three subequal 1·5–2 mm teeth; lower lip with two 3–4 mm long acuminate teeth. *Corolla* violet blue, 20–25 mm; upper lip ± straight; lower lip equal to, or longer than upper; tube c.13 mm, annulate c.5 mm from base. *Staminal connectives* c.6 mm; filaments c.5 mm; lower thecae ± well developed, fertile, free. *Nutlets* c.3 × 2·5 mm, brown with darker venation and sometimes a few oil globules at apex, not mucilaginous on wetting.

Rocks.

Spain (C, S & E), France (S), Morocco?, Algeria ?.

MOROCCO. Between Tanger and Tetoun, *Legrange* in herb. Cosson, spontan.? Ain Yagout, 10 v 1862, *Letourneaux*! (MPU).

ALGERIA. Recorded from Dj. Refaa and Ouled Fatma (Quezel & Santa, 1963).

S. lavandulifolia is primarily a Spanish species, just extending into France. No recent or adequate specimens have been seen from Morocco or Algeria and its presence there as a native is uncertain. At least some of the few records may refer to cultivated specimens of *S. officinalis*. The two species are quite closely allied but *S. lavandulifolia*, which in the past has often been regarded as a synonym of *S. officinalis* can usually be distinguished by the narrower (oblong-linear v oblong) leaves which are mostly basal and the smaller corollas. However, some narrow-leaved forms of *S. officinalis* could be wrongly identified as *S. lavandulifolia* and because the former is cultivated in NW Africa this may be the origin of records of the latter. Only adequate new gatherings can resolve the question.

Species-group B
(p. 14)

5. S. sessilifolia Baker in Journ. Linn. Soc. Bot. 18:276 (1881).
Ref.: Notes R.B.G. Edinb. 32:6 (1972).

Shrub up to 1 m. *Stems* woody, densely leafy below inflorescence, above and below with a dense indumentum of ± spreading eglandular hairs. *Leaves* ascending-erect, sessile, overlapping, linear oblong to oblanceolate, cuneate, rarely auriculate at base, crenulate and slightly revolute, thick-textured, densely pubescent above, below with a dense eglandular indumentum and oil globules. *Inflorescence* short, 5–6 cm; verticils 5–7, 4–6(–8)-flowered, ± approximating. *Floral leaves* linear-lanceolate to lanceolate, up to 13 × 4 mm; bracts present. *Pedicels* erect-spreading, 5–6 mm. *Calyx* tubular, green or tinged purple, 8–13 mm, 13-veined, with short eglandular hairs, mostly at base and on veins, and some oil globules; upper lip 3-toothed, subequal, up to 2.5 mm or median shorter; lower lip with two 2–4 mm acuminate-cuspidate teeth; calyx slightly expanding in fruit, spreading-deflexed. *Corolla* reddish violet, rose or white, up to 33 mm; upper lip ± straight, narrow; lower lip reflexed, shorter than upper; tube long, up to 22 mm, clearly exserted, slightly widening from base to the 4–6 mm wide throat, annulate near base. *Staminal connectives* 9–12 mm; filaments 4–5 mm; lower thecae with a small fertile portion, not cohering. *Nutlets* c.3 × 2·5 mm, round-trigonous, reddish brown.

1 Leaves auriculate at base, up to 6·5 × 1·5 cm; verticils 8-flowered
b. var *auriculata*
\+ Leaves not auriculate at base, up to 3·5 × 0·6 cm; verticils 4–6-flowered . . . . . a. var. *sessilifolia*

a. var. **sessilifolia**
Syn.: *S. hildebrandtii* Briq. in Bull. Herb. Boiss. 2:135 (1894).
S. stenodonta Briq., l.c.
S. tananarivensis Briq., l.c. 136.
Type. Madagascar, N and E of Ankaratra mountains, *Kitching* s.n.! (holo. K).
Ic.: Fig. 5.
Madagascar.
MADAGASCAR. Antsirabe, Sahatany, *Humbert & Swingle* 4623! (P). Tananarive, ann. 1839, *Goudot*! (G - holo. *S. stenodonta*). Betsileo, Antsirabe volcano, *Hildebrandt* 3535! (G - holo. *S. hildebrandtii*). West of Tananarive, ann. 1840, *Goudot* s.n. ! (G - holo. *S. tananarivensis*).

This is known from a considerable number of gatherings and is fairly variable. As is also the case with *S. leucodermis*, the first-gathering of this species was made by Hilsenberg & Bojer. There is a specimen at the British Museum, (BM) labelled "*S. madagascarica* Hilsenberg & Bojer (an unpublished name)—corolla coccinea—ad fluvium Indriendroo prov. Imani", collected in 1822–23.

b. var. **auriculata** Hedge in Notes R.B.G. Edinb. 32:8 (1972).
Syn.: *S. goudotii* Briq. in Bull. Herb. Boiss. 2:137 (1894) non Benth. (1848).
Type. Madagascar, near Tananarive, ann. 1840, *Goudot* s.n.! (holo. G).

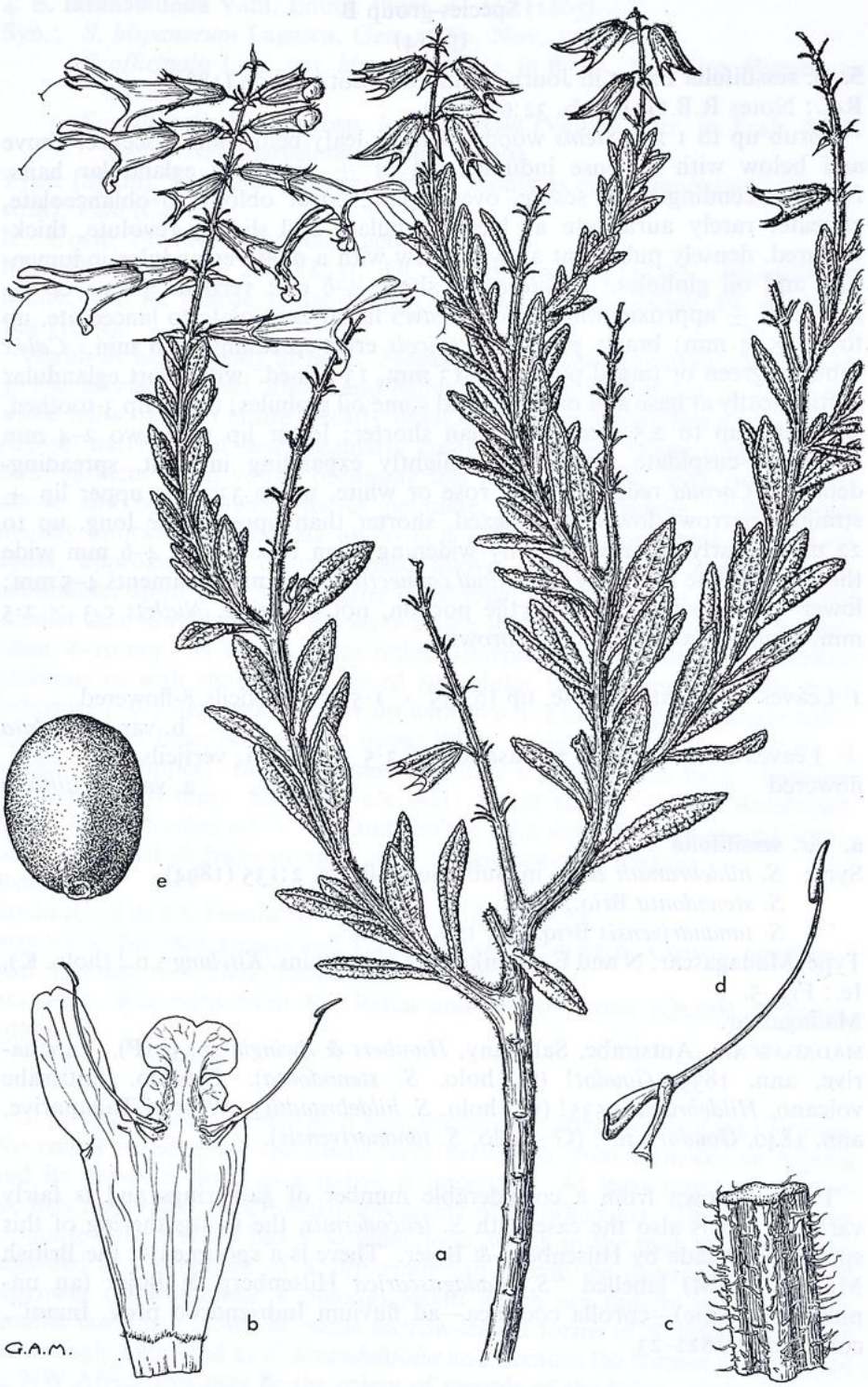

FIG. 5. *Salvia sessilifolia* Baker var. *sessilifolia*: a, habit × $\frac{2}{3}$; b, corolla dissected × $1\frac{1}{2}$; c, upper stem indumentum × $4\frac{2}{3}$; d, stamen × $3\frac{1}{3}$; e, nutlet × 10. (*Perrier de la Bâthie* 10457).

A variety of doubtful worth known only from one gathering; field observations are needed to confirm that it is outwith the variation range of the typical variety.

6. S. cryptoclada Baker in Journ. Linn. Soc. Bot. 18:275 (1881).
Type. Madagascar: N and E of Ankaratra mountains, *Kitching* s.n. ! (holo. K).
Ref.: Notes R.B.G. Edinb. 32:9 (1972).

Shrub. *Stems* erect, up to 1 m, above and below with a dense indumentum of eglandular hairs; densely leafy with spreading-erect overlapping leaves up to base of racemes, lowermost parts of stem leafless. *Leaves* simple, lanceolate or oblanceolate up to 4 × 1·3 cm, crenulate and slightly revolute, coriaceous, velutinous on upper surface, below with a very dense matted lanate indumentum; leaves usually sessile or rarely with a petiole of up to 3 mm. *Verticils* up to 12, c.12-flowered, approximating. *Floral leaves* lanceolate, acuminate, up to 12 × 4·5 mm; bracts present. *Pedicels* erect-spreading up to 15 mm. *Calyx* tubular campanulate, usually purple, c.14 mm, 15-veined, with long simple eglandular hairs and oil globules; upper lip with three subequal 1·5–2·5 mm acuminate teeth; lower lip with two lanceolate-acuminate, mucronate c.5 mm teeth; calyx slightly enlarging in fruit to c.16 mm. *Corolla* reddish or white up to 32 mm; upper lip ± straight; lower lip slightly longer than upper, deflexed; tube up to 25 mm, widening from base to throat, annulate c.6 mm from base. *Staminal* connectives c.10 mm; filaments c.7 mm; lower thecae fertile, not cohering. *Nutlets* black, round-trigonous, lucid, 2 × 2·5 mm. *Fl.* Sept.–Nov.
Rocky slopes; c.2000 m.
Madagascar, C.
MADAGASCAR. Vakinankaratra: Betafo, *Viguier & Humbert* 1591 ! (P). Faratsiho, massif of Vavavato, *Decary* 15494 ! (P). Ankaratra, *Baron* 3461!, 3467!, 3469!, 3471! (all K). Behenjy, *Decary* 13883! (P).

S. cryptoclada is recognised by the densely leafy stems, the velutinous indumentum on the upper side of the leaf lamina and the reddish or white flowers. It is similar in habit to *S. leucodermis* but has a denser indumentum on the lower leaf surface, the lamina is broadest at the middle and has no glandular hairs on the calyx. *S. cryptoclada* is only known from a few gatherings and its range of variation is not adequately known.

7. S. porphyrocalyx Baker in Journ. Linn. Soc. Bot. 18:277 (1881).
Type. Madagascar: N and E of Ankaratra mountains, *Kitching* ! (holo. K).
Ref.: Notes R.B.G. Edinb. 32:8 (1972).

Shrub up to 1 m. *Stems* erect or ascending, above and below with flat spreading multicellular eglandular hairs of varying lengths, denser on inflorescence axis. *Leaves* distributed over stem, not or scarcely overlapping, broad ovate-lanceolate, up to 4·5 × 1·8 cm, cuneate below, acute at apex, crenulate, above with flat eglandular hairs, below similar but denser and with numerous oil globules; leaves sessile or with a petiole up to 6 mm. *Verticils* up to 8, c.6-flowered, lowermost up to 3 cm apart, scarcely approximating above. *Floral leaves* lanceolate, acuminate up to 18 × 6 mm; bracts present.

Pedicels erect-spreading up to 6 mm. *Calyx* tubular-infundibuliform, purple, 13-veined, c.17 mm, with simple eglandular hairs, especially on nerves, and oil globules; upper lip ± truncate, with three subequal, 3·5–4 mm teeth; lower lip with two narrow subulate teeth up to 7 mm; calyx scarcely expanding in fruit. *Corolla* white, up to 40 mm; upper lip ± straight, very short; lower lip slightly longer than upper, deflexed; tube c.30 mm, exserted, annulate, c.8 mm broad at throat. *Staminal connectives* c.7·5 mm; filaments c.7 mm; lower thecae with a fertile terminal portion, not cohering. *Nutlets* not known. *Fl.* Nov.
Rocky slopes; 1900–2000 m.
Madagascar, C.
MADAGASCAR. Ankaratra, *Perrier de la Bâthie* 13414! (P). Vakinankaratra, *Viguier & Humbert* 1615! (P).

Although only known from a few gatherings, *S. porphyrocalyx* is apparently distinct on account of the leaves evenly distributed over the stem, the purplish calyces, white corollas and the fairly loose inflorescences; it is, however, undoubtedly quite closely related to *S. sessilifolia.*

8. S. leucodermis Baker in Journ. Linn. Soc. Bot. 18:276 (1881).
Type. Madagascar, C. Betsileo country. *Kitching* ! (holo. K).
Ref.: Notes R.B.G. Edinb. 32:8 (1972).

Shrub up to 1 m. *Stems* below leafless, above densely leafy; indumentum below of short eglandular hairs, above of ± adpressed hairs and a few oil globules. *Leaves* erect-spreading, overlapping, oblong-elliptic to obovate, up to 6 × 1·7 cm, coriaceous, crenulate; upper surface green, thinly velutinous, lower surface with a denser white velutinous indumentum; petioles up to 5 mm or leaves sessile. *Verticils* up to 10, up to 10-flowered, lowermost up to 2·5 cm apart, approximating above. *Floral leaves* narrow-oblong, up to 12 × 2 mm; bracts numerous, subulate. *Pedicels* erect-spreading up to 7 mm. *Calyx* tubular-campanulate, c.12 mm, green or flushed purple, enlarging in fruit to c.15 mm, 13-veined, with numerous long simple, eglandular hairs, shorter glandular hairs and oil globules; upper lip with three subequal, 2–3 mm acuminate teeth; lower lip with two 4 mm acuminate-cuspidate teeth. *Corolla* white or tinged violet, 30–35 mm; upper lip very short, ± straight; lower lip longer than upper, deflexed; tube up to 28 mm, gradually widening from base to throat, annulate c.6 mm from base. *Staminal connectives* c.10 mm; filaments c.6 mm; lower thecae fertile, free. *Nutlets* black, round-trigonous, c.3·5 × 3 mm. *Fl.* Aug.–Dec.
Volcanic rocks and lava, rocky slopes, uncultivated hills, burnt scrubland, grassland, forest clearings; 1400–2000 m.
Madagascar, C.
MADAGASCAR. N Betsileo, Sirabé, *Hildebrandt* 3535a ! (P, G). Andringitra, *Perrier de la Bâthie* 10513 ! (P). Betafo, *Decary* 13809 ! (P). Antsirabe, *Perrier de la Bâthie* 10472 ! (P). Ankaratra, *Benoist* 212 ! (P).

A close ally of *S. cryptoclada* but with a less dense indumentum on the lower leaf lamina, leaves broadest in the top third and densely glandular calyces. The two species grow together in central Madagascar and field studies are needed to confirm their distinctness.

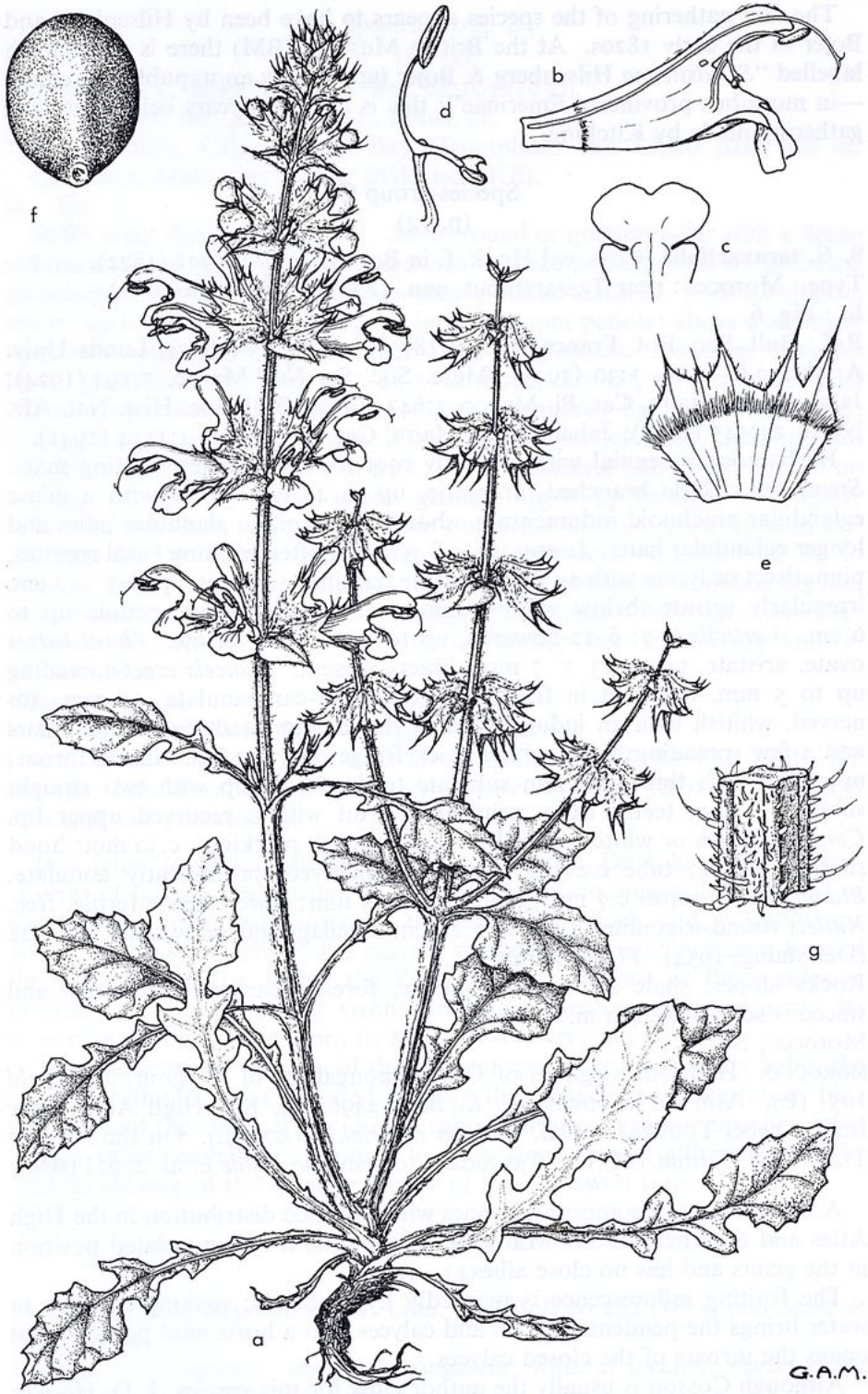

FIG. 6. *Salvia taraxacifolia* [Coss. ex] Hook. f.: a, habit × $\frac{2}{3}$; b, L.S. of corolla × $1\frac{1}{3}$; c, lower lip of corolla × $1\frac{1}{3}$; d, stamen × 2; e, calyx opened out × $1\frac{2}{3}$; f, nutlet × 9; g, part of upper stem × 4. (*Archibald* 105).

The first gathering of the species appears to have been by Hilsenberg and Bojer in the early 1820s. At the British Museum (BM) there is a specimen labelled "*S. hastieana* Hilsenberg & Bojer (apparently an unpublished name) —in montibus provinciae Emerinae"; this is about 60 years before the type gathering made by Kitching.

Species-group C
(p. 14)

9. S. taraxacifolia [Coss. ex] Hook. f. in Bot. Mag. 98:t.5991 (1872).
Type. Morocco: near Tassaremout, ann. 1871, *G. Maw*! (holo. K).
Ic.: Fig. 6.
Ref.: Bull. Soc. Bot. France 20:253 (1873); l.c., 22:65 (1875); Lunds Univ. Arsskr. n.f. 2, 19, 1:30 (1923); Mém. Soc. Sc. Nat. Maroc. 7:194 (1924); Jahandiez & Maire, Cat. Pl. Maroc. 3:643 (1934); Bull. Soc. Hist. Nat. Afr. Nord. 29:545 (1938); Jahandiez & Maire, Cat. Pl. Maroc 4:1114 (1941).

Herbaceous perennial with a woody rootstock sometimes forming mats. *Stems* erect, little branched, aromatic, up to 45 cm, below with a dense eglandular arachnoid indumentum, above with capitate glandular hairs and longer eglandular hairs. *Leaves* up to 8 × 2 cm, often forming basal rosettes, pinnatisect or lyrate with an oblong-ovate terminal segment up to 3 × 2 cm, irregularly serrate, below white-pannose, above arachnoid; petiole up to 6 cm. *Verticils* 8–9; 6–12-flowered, up to 3 cm apart below. *Floral leaves* ovate, aristate, up to 13 × 7 mm; bracts present. *Pedicels* erect-spreading up to 5 mm, recurved in fruit. *Calyx* tubular-campanulate, 15 mm, 10-nerved, whitish with an indumentum of dense adpressed eglandular hairs and a few spreading hairs; with a thick fringe of white hairs inside throat; upper lip with three 3–4 mm subulate teeth; lower lip with two straight subulate 7 mm teeth; calyx pendent in fruit with a recurved upper lip. *Corolla* pinkish or white with yellow and purplish markings, c.30 mm; hood slightly falcate; tube c.20 mm, slightly upcurved, prominently annulate. *Staminal connectives* c.7 mm; filaments c.5·5 mm; lower thecae fertile, free. *Nutlets* round-trigonous, c.2·5 × 2·2 mm, mucilaginous on wetting. 2n=28 (Delestaing, 1954). *Fl.* May–July.
Rocky slopes, shale scree, river shingle, forest clearings, calcareous and siliceous soil; 600–2400 m.
Morocco, SW.
MOROCCO. High Atlas, gorge of Oued Anougal, N of Azegour, *Archibald* 105! (E). Asni to Ichonkak, *E. K. Balls* 2496! (E, K). High Atlas, near Imlil, Djebel Toubkal massif, *Clayton & Brinklow* 97! (E). On the road to Tizi n'Test, *Easton* 18! (K). Taroudant to Asni, *de Wilde* et al. 2002! (BM).

A very distinct oligomorphic species with a limited distribution in the High Atlas and elsewhere in SW Morocco. It occupies a rather isolated position in the genus and has no close allies.

The fruiting inflorescence is markedly hygrochastic; soaking the axis in water brings the pendent pedicels and calyces into a horizontal position and opens the throats of the closed calyces.

Although Cosson is usually the author cited for this species, J. D. Hooker published Cosson's name in the Botanical Magazine with a full description a year before Cosson did.

Species-group D
(p. 14)

10. S. muirii L. Bolus in Journ. Bot. 68:103 (1930).
Syn.: *S. muirii* var. *grandiflora* L. Bolus, l.c.
Type. S Africa, Cape: Mossel Bay, Grootplaats near Cloets pass, 360 m, 14 v 1915, *Muir* 2025! (holo. BOL, iso PRE).
Ic.: Fig. 7.

Stiffly erect shrub up to 60 cm. *Stems* round or quadrangular with a dense indumentum of short spreading-antrorse eglandular hairs and oil globules, glabrescent on old wood. *Leaves* simple, thick-textured, obovate-elliptic, entire, up to 13 × 8 mm, narrowed into a c.3 mm petiole; above and below velutinous with short adpressed hairs and oil globules. *Flowering branches* short, graceful; verticils up to 7, 2(–3)-flowered, distinct, up to 2·5 cm apart below, closer above. *Floral leaves* ovate-acuminate, up to 5 × 2·5 mm; bracts present. *Pedicels* c.4 mm. *Calyx* narrow campanulate, c.10 mm, not (?) enlarging in fruit, 13-veined, with short ± antrorse hairs on veins and on margin, pilose-ciliate, and sessile glands; upper lip straight or slightly reflexed, outer teeth c.1·5 mm, median somewhat shorter; lower lip with two 3–4 mm narrow triangular-lanceolate acuminate teeth. *Corolla* blue up to 26 mm; hood ± straight; tube 14–18 mm, clearly exserted, annulate c.4 mm from base; lower lip as long as or longer than upper. *Staminal connectives* c.9 mm; filaments c.6 mm; lower thecae fertile, free. *Nutlets* not known. *Fl.* Jan.–June.
Hills; 60–360 m.
S Africa, Cape: Mossel Bay, George. Fig. 15a.
SOUTH AFRICA. Mossel Bay: near Great Brak river, *Ryder* 83! (BOL, K). George: hills E of Great Brak river, *Fourcade* 3854! (BOL, K—type of *S. muirii* var. *grandiflora*).

In a letter to Mrs L. Bolus dated 16 June 1928, Dr John Muir, the discoverer of this species, wrote, "it extends [from Grootplaats] to the west of the Gouritz river and grows on the farms Waaihock and Wagenbooms Rivier. It occurs chiefly in the narrow strip parallel to the northern base of the Langebergen (i.e. facing the Klein Karoo) and two or three miles in breadth. It is a somewhat strong and rigid shrub, locally frequent. Its flowering period is from April to June but it is very fine in May".

The characteristic features of this distinct species are the woody habit, the small velutinous thick-textured leaves, the broad and long-tubed blue corollas and the ciliate fringe on the calyx margins. It is not closely related to any other species but appears to have some distant affinities with the general alliance of the shrubby species of the southwest Cape.

Species-group E
(p. 14)

11. S. parvifolia Baker in Journ. Linn. Soc. Bot. 20:232 (1883) non Sessé & Moc. (1894).
Isotypes. Madagascar: central Madagascar, without locality, *Baron* 2011! (K), 2073! (K, BM), 2074! (K).
Ic.: Notes R.B.G. Edinb. 32:2, fig. 2 (1972).
Ref.: l.c. 3.

FIG. 7. *Salvia muirii* L. Bolus: a, habit × $\frac{2}{3}$; b, L.S. of corolla × $4\frac{1}{3}$; c, calyx × $3\frac{1}{3}$; d, stamen × $5\frac{1}{3}$; e, staminode × $13\frac{1}{3}$. (*Ryder* 83).

Herbaceous aromatic perennial with a woody rootstock branching from crown. *Stems* ascending or erect, 15–40 cm, above and below with very short antrorse eglandular hairs and oil globules. *Leaves* simple, linear-elliptic to oblong, slightly cordate at base, up to 17 × 8 mm, coriaceous, crenulate, white-pannose below, above with numerous oil globules otherwise glabrous; petiole up to 1·5 mm or leaves sessile. *Verticils* up to 10, c.6-flowered, distinct, up to 4·5 cm apart below, approximating above. *Floral leaves* broadly ovate to ovate-elliptic up to 6 × 3·5 mm; bracts present, very small. *Pedicels* erect-spreading, up to 5 mm. *Calyx* tubular campanulate, 4·5–6 mm, 13-veined, with short simple eglandular hairs especially on veins and numerous oil globules; upper lip with three subequal, acuminate, 1–1·5 mm teeth; lower lip with two 2·5 mm teeth; calyx slightly enlarging in fruit to 8·5 mm with the upper lip somewhat reflexed. *Corolla* pale blue to lilac, up to 15 mm; upper lip ± straight; lower lip clearly longer than upper; tube 8–9 mm, exannulate. *Staminal connectives* 3 mm; filaments c.2·5 mm; lower thecae fertile (?), not cohering. *Stylar arms* broad and flat. *Nutlets* round-trigonous, c.2 × 1·7 mm, not (?) mucilaginous on wetting.

Rocky slopes; c.1500 m.

Madagasgar, C.

MADAGASCAR. Vakinankaratra, dist. Ambatolampy, Tsinjoarivo, *Viguier & Humbert* 1785! (P). Antsirabe, *Perrier de la Bâthie* 10485! (P).

A very distinct oligomorphic species characterised by the small leaves, white-pannose below and with only oil globules above, and the small blue or lilac corollas of which the lower lip clearly exceeds the upper. *S. parvifolia* is without any close allies either amongst the few other Madagascar species or among the species of continental Africa.

Species-group F
(p. 14)

12. S. aegyptiaca Linn., Sp. Pl. 23 (1753).

Syn.: *S. arida* Salisb., Prodr. Stirp. Chapel Allerton 73 (1796)—nomen illegit.

Thymus hirtus Viv., Fl. Lib. Spec. 30, t.14, f.1 (1824).

Type. Egypt! (BM—Hort. Cliff.).

Ic.: Jacquin, Hort. Vindob. 2:t.108 (1772); Ozenda, Fl. Sahara 404, fig. 148 (1958); Fig. 8.

Ref.: Linn., Mantissa 26 (1767); Etlinger, Salvia 29 (1777); Aiton, Hort. Kew. 1:37 (1789); Desf., Fl. Atlant. 1:19 (1798); Vahl, Enum. 1:221 (1804); Benth., Labiat. 309 (1833); Webb & Berthelot, Hist. Nat. Iles Canar. 3:91 (1845); DC., Prodr. 12:355 (1848); Bonnet & Barratte, Cat. Pl. Tunis. 334 (1896); Pitard & Proust, Fl. des Iles Canaries 309 (1909); Durand & Barratte, Fl. Libycae Prodr. 187 (1910); Lunds Univ. Arsskr. n.f. 2, 19, 1:30 (1923); Lindinger, Beitr. Fl. kanar. Ins. 223 (1926); Pampanini, Fl. Cirenaica 397 (1931); Mém. Soc. Hist. Nat. Afr. Nord 3:185 (1933); Jahandiez & Maire, Cat. Pl. Maroc 3:644 (1934); Revue Bot. Appl. Agric. Trop. 15:733 (1935); Schwartz, Fl. Trop. Arab. 226 (1939); Guinea, Sahara Español 780 (1949); Täckholm, Students Fl. Egypt 146 (1956); Andrews, Fl. Pl. Sudan 3:224 (1956); Ozenda, Fl. Sahara 405 (1958); Sarracenia 5:52 (1960); Bull. Jard.

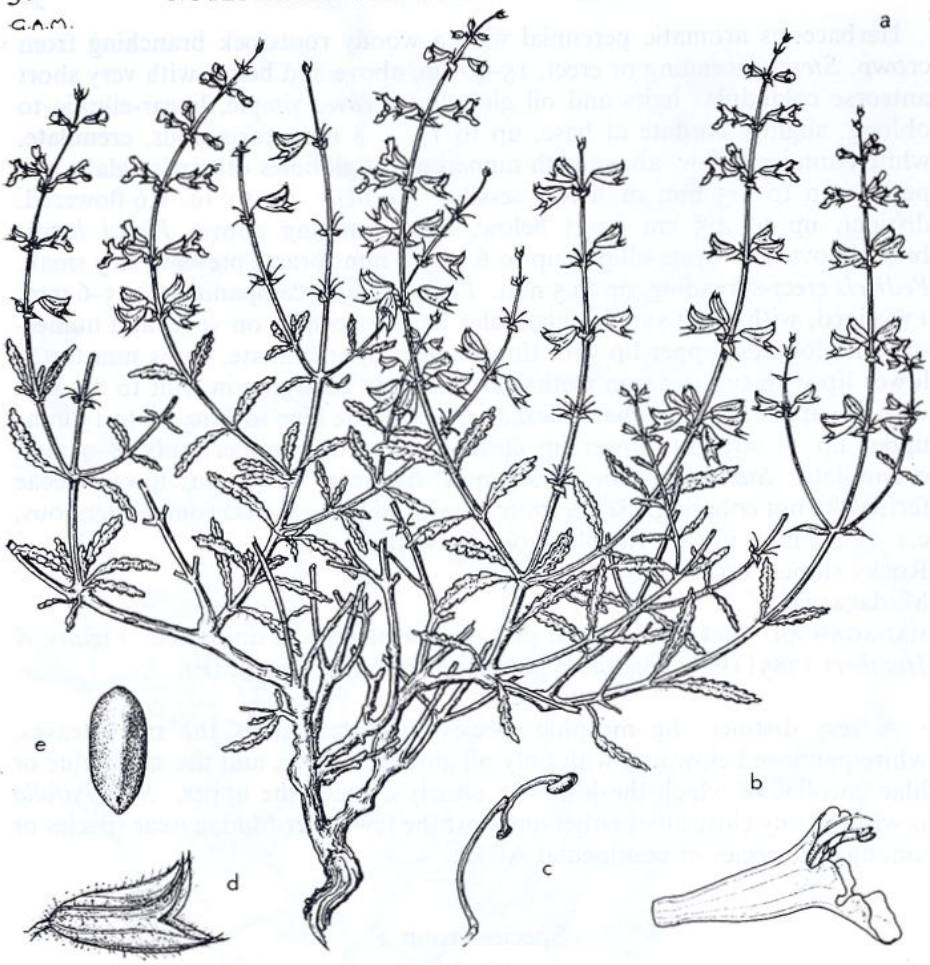

FIG. 8. *Salvia aegyptiaca* Linn.: a, habit × ⅔; b, corolla × 4; c, stamen × 6; d, fruiting calyx × 2½; e, nutlet × 8. (*Davis* 48465).

Bot. Brux. 32:318 (1962); Quezel & Santa, Nouv. Fl. Algér. 2:795 (1963); Lid, Contrib. Fl. Canar. 153 (1967); Publ. Cairo Univ. Herb. no. 4:63 (1971); Sunding, Check list Cape Verde Is. 17 (1973).

Much branched suffruticose herb, 10–20(–40) cm. *Stems* above and below with short or longer retrorse eglandular hairs. *Leaves* narrow linear-elliptic, rarely obovate-oblong, up to 55 × 8 mm, crenate to serrate, sessile or narrowed into an indistinct petiole; above and below with very short eglandular hairs and at leaf base with long spreading eglandular hairs. *Verticils* up to 8, 2–6-flowered, up to 3 cm apart below, less above. *Floral leaves* ovate-lanceolate, up to 4·5 × 2 mm; bracts present. *Pedicels* up to 5 mm. *Calyx* ovate to tubular campanulate, up to c.5 mm, enlarging in fruit to 7 mm, 13-veined, with a prominent indumentum of glandular capitate hairs and eglandular hairs; upper lip of three closely connivent teeth up to 0·3 mm, concave in fruit; lower lip with two c.3 mm acuminate-subulate teeth. *Corolla* pale lilac or lavender up to 8 mm; upper lip fairly broad, ± straight or somewhat reflexed; lower lip longer than upper; median lobe clearly bifid; tube with a thin annulus. *Staminal connectives* c.2 mm; filaments

c.2·5 mm; lower thecae fertile. *Nutlets* black, trigonous, 2 × 1 mm, mucilaginous on wetting. 2n=28 (Delestaing, 1954). *Fl.* Oct.–June.
Arid to desertic habitats.
Cape Verde Islands, Canary Islands, NW and N Africa, Sudan, Ethiopia eastwards to W Pakistan and India. Fig. 9.
CAPE VERDE ISLANDS. St. Vincent, 1822, *Forbes*! (K). Also present on all the larger islands (9) of the archipelago from near sea level to 1500 m, and one of the most characteristic species of the lower regions. Cf. Chevalier (1935).
CANARY ISLANDS. Tenerife: Santa Cruz, Bourgeau 549! (E) Gran Canaria: Bco. Arguiniguin near Maspalomas, *Bramwell* 1245! (E). Lanzarote, Arecife, *Murray* s.n.! (K).

Also on Gomera, Fuerteventura; arid uncultivated places in the lower maritime region.
SPANISH SAHARA. Common in the N of the country. Cf. Guinea 780 (1949).
MAURITANIA. No records or specimens have been seen but it is probably present at least in the NW of the country.
MOROCCO. 5 km E of Tiznit, *Davis* 48697! (E). Imouzzer-des-Ida-Outanane to Oulma, *Davis* 48526! (E). Sous valley, 16–24 km from Taroudannt to Irherm, *Davis* 48900! (E). Cap Ghir, *Davis* 48465! (E).

Also throughout most of the country in the drier regions. Cf. Jahandiez & Maire 3:644 (1934).
ALGERIA. Oued-Biskra, *Balansa* 832! (E). Widespread in desertic regions in the south of the country including Ahaggar Mts, from 750–2100 m. Cf. Quezel & Santa 2:795 (1963).
TUNISIA. Kébili, sandy desert, *Pitard* 459! (E). Djerba, *Kralik* 121! (E,K).
LIBYA. Tripolitania: Homs, *Vaccari* 173! (E). Cyrenaica, Benghazi, *Cavarra*. Scegga, El Garn-a-i-Gren, *Krüger*. Wadi Tangesir, *Guichard* KG/Lib./134! (BM). Fezzan, Gat (Corti, 226, 1942).
NIGER (French Soudan). Mts. Baguezane, 1 vii 1920, *Buchanan* s.n.! (BM).
CHAD. Tibesti Mts. Cf. Mém. Inst. Fr. d'Afrique Noire 8:51 (1950).
EGYPT. Nubian coast, Gebel Ferrajeh near Berenice, *Schweinfurth* 1864: 138! (K).

Mainly in the N and E. Cf. Täckholm, Students Fl. Egypt 146 (1956).
SUDAN. Red Sea hills, Erkowit, *Aylmer*. Mainly in the E near the Red Sea. Cf. Andrews 3:224 (1956).
ETHIOPIA. Eritrea-Amasen, Dongollo presso Ghinda, *Pappi* 4199! (EA). Eritrea-Assaorta, lungo il torrente Aideresso, *Pappi* 5090! (EA).

Considering its very great geographical range (fig. 9), *S. aegyptiaca* is a remarkably oligomorphic species. There is a tendency for the N African plants to have narrower leaves (with a length/breadth ratio of 6–10:1) than those from the extreme east of its total range (with a ratio of 3–5:1) but there are many exceptions. Also, at the eastern end of its range, in Afghanistan and Pakistan, forms with a glandular indumentum on the inflorescence axis and leaves are more frequently found than in Africa. From the available field notes these glandular forms appear to be more frequent in relatively mesophytic habitats but this requires confirmation. Although some authors of local Floras have recognised varieties or forms, *e.g.* var. *pumila* Asch. & Schweinf., var. *glandulosissima* Kneucker and f. *colorata* Maire (Bull. Soc. Hist. Nat. Afr. Nord 23:205, 1932), they scarcely merit formal recognition.

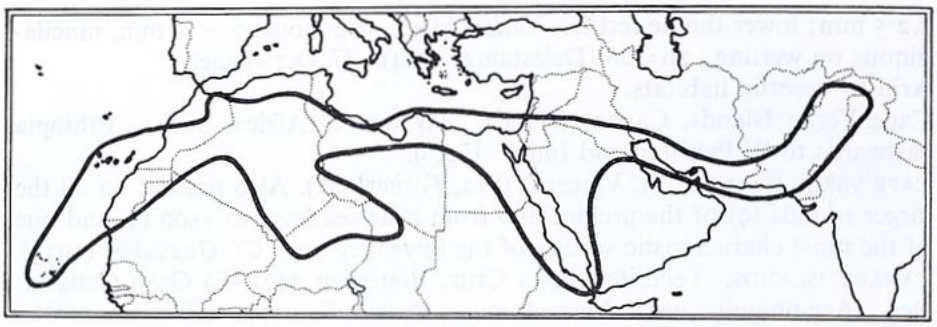

FIG. 9. Total distribution of *Salvia aegyptiaca* Linn. From east to west the total range is over 5,000 miles.

In addition to the specimen in the Hortus Cliffortianus herbarium which has the strongest claim to be the type specimen there are two other very early collections: one, no. 42/1, in the Linnaean herbarium (LINN!) and the other, labelled "ex oriente, Forskohl" in the British Museum (BM!).

S. aegyptiaca is related, in addition to the other two African species in this species-group, to several other species in SW Asia (such as *S. santolinifolia* Boiss., *S. eremophila* Boiss., *S. trichocalycina* Benth., *S. tebesana* Bge. and *S. macilenta* Boiss. All of them are restricted to desertic areas, have similar morphological characters and together form a natural taxonomic group.

13. S. deserti Dcne. in Ann. Sc. Nat. Paris ser. 2, 2:248 (1834).
Type. Sinai: desert du Sinai, *Bové*, s.n.
Ref.: DC., Prodr. 12:356 (1848); Täckholm, Students Fl. Egypt 146 (1956); Publ. Cairo Univ. Herb. 4:64 (1971).

Suffruticose much branched herb up to 30 cm. *Stems* white pubescent with long spreading to retrorse eglandular hairs. *Leaves* simple, ovate-oblong, up to 18 × 6 mm, undulate-crenate, revolute, white pubescent above with short spiky eglandular hairs, below similar and with numerous oil globules, prominently colliculate-reticulate; leaves sessile or with a petiole up to 10 mm. *Verticils* up to 10, 7–8-flowered, all distinct, up to 2·5 cm apart below, scarcely approximating above. *Floral leaves* ovate, up to 4·5 × 1·5 mm; bracts present. *Pedicels* ± erect, up to 0·6 mm. *Calyx* ovate-campanulate, 3–4 mm in flower expanding to c. 7 mm in fruit, 5-veined, with an indumentum of long spreading eglandular hairs and oil globules; upper lip with three subequal teeth c. 1 mm; lower lip with two c. 2 mm long acuminate teeth. *Corolla* up to 6 mm, white(?); upper lip small, ± straight; tube with a small annulus. *Staminal connective* c. 1 mm; filaments c. 1·7 mm; lower thecae fertile(?), very small; staminodes prominent. *Nutlets* black, trigonous, mucilaginous on wetting. *Fl.* Mar.-Apr.
Deserts
Egypt, E (?), Sinai, Transjordan, Arabia.

Täckholm (1956) records *S. deserti* from the Egyptian and Arabian deserts. No specimens from the African continent have, however, been seen. It is related to *S. aegyptiaca* but differs in the denser indumentum and the hirsute-lanate calyces. See remarks under the previous species.

14. S. chudaei Battand. & Trab. in Bull. Soc. Bot. France 53: xxx, t.10 (1907).
Syn.: *S. tibestiensis* A. Cheval. in Bull. Soc. Bot. France 78:322 (1931).
S. chudaei var. *tibestiensis* (A. Cheval.) Maire in Bull. Mus. Paris sér. 2, 4:908 (1932).
S. chudaei var. *tefedestica* Maire in Bull. Soc. Hist. Nat. Afr. Nord. 23:205 (1932).
Type. Algeria: Ahaggar mts., Tit, 6 viii, *Chudeau.*
Ic.: Battandier & Trabut, Atlas Fl. Alger. 3: t.37 (1913); Ozenda, Fl. Sahara 406, t.149 (1958).
Ref.: Mém. Soc. Hist. Nat. Afr. Nord. 3:186 (1933); Mém. Inst. Fr. Afr. Noire 8:51 (1950); Ozenda, Fl. Sahara 405 (1958); Quezel & Santa, Nouv. Fl. Algér. 2:794 (1963).

Suffruticose much branched herb, 30–60 cm. *Stems* leafy, brittle, above and below with simple, eglandular, retrorse hairs and oil globules, more frequent below. Leaves simple, narrow linear, 20–30 × c. 2 mm, thick-textured, undulate-crenate, revolute, on both surfaces with very short simple eglandular hairs and numerous oil globules; leaves sessile or with an indistinct petiole. *Verticils* up to 8, c. 4-flowered, up to 13 mm apart below, numerous and approximating above. *Floral leaves* ovate, slightly acuminate, c. 3 × 0·7 mm; bracts absent. *Pedicels* up to 1·5 mm. *Calyx* ovate-campanulate, up to 4 mm, elongating to c. 6 mm in fruit, c. 14-veined, with a very dense indumentum of long spreading white eglandular hairs, shorter around calyx teeth, and oil globules; upper lip with three subequal teeth, c. 0·7 mm; lower lip with two 2 mm acuminate-subulate teeth. *Corolla* violet-blue to deep purple, up to 7 mm; upper lip small, straight; lower lip as long as upper; tube annulate c. 1·5 mm from base. *Staminal connectives* 0·5 mm; filaments 1 mm; lower thecae fertile, very small; staminodes prominent. *Nutlets* black, trigonous, c. 2 × 1 mm, mucilaginous on wetting. *Fl.* Mar. Sandy and gravel wadi beds, basalt rocks. Frequent from 1000–2000 m. Algeria (Ahaggar), Libya/Chad (Tibesti).

ALGERIA. Ahaggar: Taharanet, 10 iii 1931, *Meinertzhagen* s.n.! (BM). S of Ideles, *Hunting Technical Services* 33 (01)! (E). Oued Tit, *Chudeau.* Tefedest, Tehi-n-Beidigen, *Maire* 953 (type of var. *tefedestica* Maire). Near Fort Gardel, *Popov* 60/157! (BM). Oued Tamanrasset, *Meinertzhagen* 116! (K,BM).

LIBYA/CHAD. Tibesti: Without exact locality, *Chevalier* (type of *S. tibestiensis*). Tarso Tousside, ann. 1957, *Grove* s.n.! (K).

CHAD. Tibesti, mountains E of Bardai, *Hinchingbrooke* 68! (K).

S. chudaei is, together with *S. deserti* and *S. aegyptiaca*, a member of this xerophytic and very distinct species-group which Briquet called section *Notiosphace*. The group as a whole contains about eleven currently recognised species which in their distribution are essentially Saharo-Sindian marker species.

S. chudaei is probably closest to *S. santolinifolia* Boiss., found from Iran to Sind, but has much narrower, longer leaves, the verticils are usually crowded and the flowers have very short pedicels. Its relationships to the only other African representatives of the section, *S. aegyptiaca* and *S. deserti* are considerably more distant.

Although Maire recognised three varieties in *S. chudaei*, they all merge into each other and do not seem to be worth maintaining in what is a fairly oligomorphic species.

Species-group G
(p. 15)

15. S. aurea Linn., Sp. Pl. ed. 2:38 (1762).
Syn.: *S. afr. lutea* Linn., Sp. Pl. 26 (1753).
S. colorata Linn., Syst. Nat. ed. 12, 2:66 (1767).
S. eckloniana Benth. in DC., Prodr. 12:273 (1848).
Type. [S Africa, Cape] "Cap. bon spei, juxta rivulos" (LINN—42/38!).
Ic.: Bot. Mag. t.182 (1792); Dyer, Flow. Pl. Africa 37:1461 (1965–66).
Ref.: Miller, Gard. Dict. ed 8, Salvia no. 10 (1768); Etlinger, Salvia 22. (1777); Aiton, Hort. Kew. 1:45 (1789); Thunb., Prodr. Pl. Cap. 96 (1800); Vahl, Enum. 1:231 (1804); Thunb., Fl. Cap. ed. 2:448 (1823); Benth., Labiat. 216 (1833); Meyer, Comment. 1:233 (1837); DC., Prodr. 12:273 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:313 (1910); Adamson & Salter, Fl. Cape Penins. 697 (1950).

Much branched aromatic shrub up to 2 m (or more). *Stems* densely leafy with an indumentum of short eglandular hairs and oil globules, varying in density from sparse to densely adpressed white-tomentose. *Leaves* simple, suborbicular to elliptic, up to 4·2 × 4·5 cm, usually less, entire to irregularly crenate-dentate, cuneate to cordate at base; indumentum as on stem, densely covered with oil globules; petiole up to 1·5 cm, usually much less. *Inflorescence* of short crowded terminal racemes; verticils up to 12, 2(–4)-flowered. *Floral leaves* ovate or obovate, up to 9 × 7 mm, persistent; bracts present. *Pedicels* c. 4 mm. *Calyx* broad campanulate, 13–15-veined, up to 2 cm in flower expanding to 3 cm in fruit, purplish and membranous, with short spreading glandular and eglandular hairs and oil globules; upper lip with two broad short obtuse lobes; lower lip with two c. 4 mm broad ovate lobes. *Corolla* golden-brown, reddish brown, khaki or mauve, 35–45 (–50) mm; hood c. 25 mm long and c. 9 mm deep, slightly falcate; lower lip much shorter than hood, c.12 mm with a very broad suborbicular median lobe; tube broad with a very thick annulus 2 mm from base. *Staminal connectives* c. 16 mm; filaments c. 6 mm, sturdy; fertile thecae sometimes cohering; lower thecae dolabriform but with a small terminal fertile(?) portion, free. *Nutlets* c. 3 × 2 mm, mucilaginous on wetting. 2n = 16*. *Fl.* June–Dec.

Coastal sand dunes, arid fynbos, rocky banks, shales and hills. Frequent, near sea level to 600 m.

S Africa, Cape: Little Namaqualand to the Cape Peninsula and eastwards to Bathurst. Fig. 10b.

SOUTH AFRICA. Cape. Little Namaqualand; SE of Hondeklip bay, *Pillans* 18195! (BOL); Witbank, *Pillans* 5213! (BOL,K). Vanrhynsdorp: Gift Berg, *Phillips* 7605! (K). Clanwilliam: Bull Hoek, *Schlechter* 8376! (E,K); Modderfontein, *Schlechter* 4421! (PRE); sine loc., *Ecklon* s.n.! (K—type of *S. eckloniana* Benth.). Piketberg: NW of Moutons Vlei, *Pillans* 7403! (BOL). Malmesbury: summit of Conterberg, *Pillans* 6940! (BOL). Cape: Table

* I am grateful to Miss C. Milne for this new count, based on a cultivated specimen at Edinburgh (C.9261).

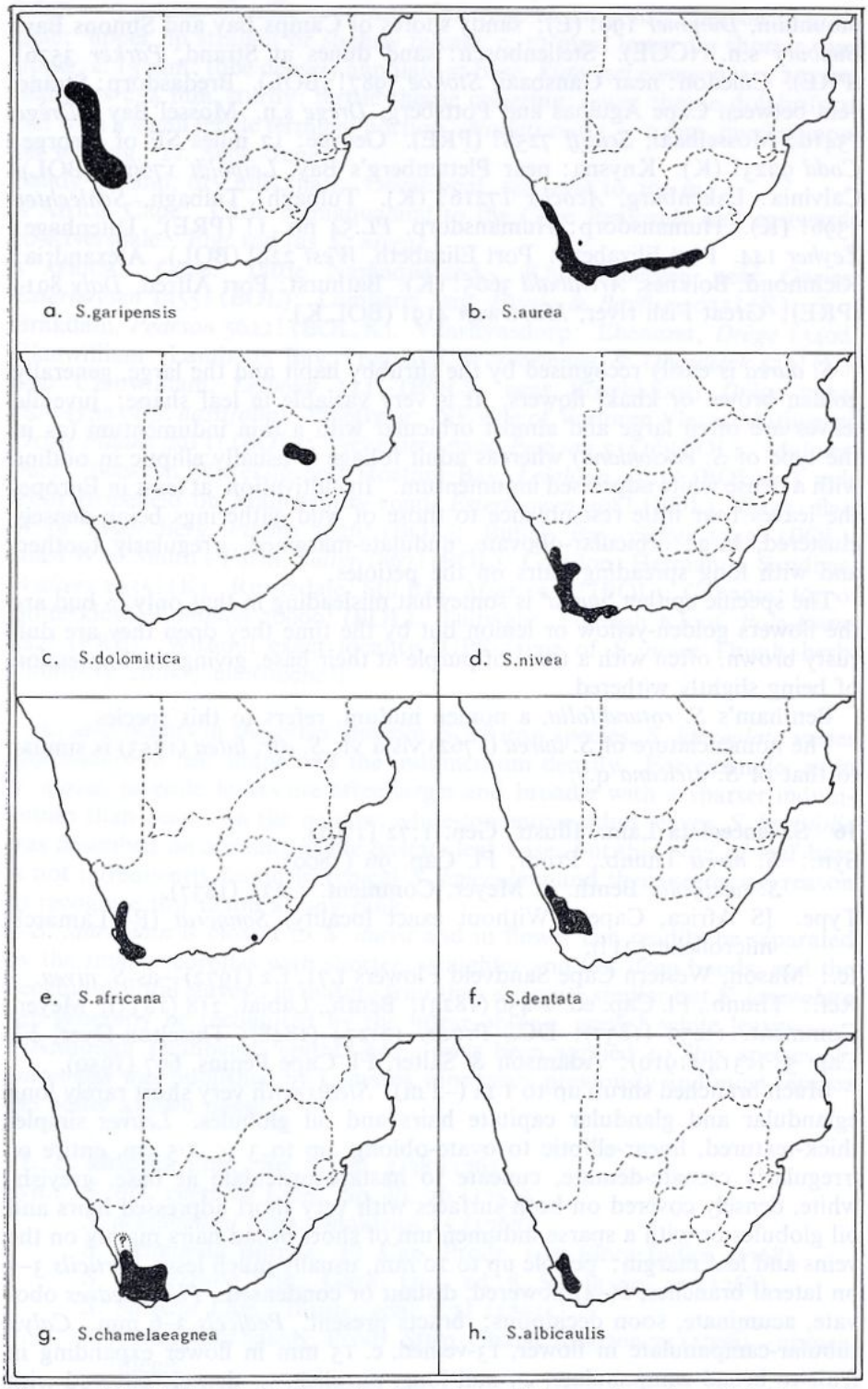

FIG. 10. Distribution of *Salvia* species in southern Africa: a, *S. garipensis* E. Meyer; b, *S. aurea* Linn.; c, *S. dolomitica* Codd; d, *S. lanceolata* Lam. (syn. *S. nivea*); e, *S. africana* L.; f, *S. dentata* Aiton; g, *S. chamelaeagnea* Berg.; h, *S. albicaulis* Benth.

mountain, *Dümmer* 199! (E); sandy shores of Camps Bay and Simons Bay, *Bunbury* s.n.! (CGE). Stellenbosch: sand dunes at Strand, *Parker* 3576! (PRE). Caledon: near Gansbaai, *Stokoe* 7987! (BOL). Bredasdorp: Strand veld between Cape Agulhas and Pottsberg, *Drège* s.n. Mossel Bay: *Drège* 1341d; Mosselbaai, *Schijff* 7258! (PRE). George: 17 miles SE of George, *Codd* 9923! (K). Knysna: near Plettenberg's Bay, *Leipoldt* 17091! (BOL). Calvinia: Lakenburg, *Acocks* 17216! (K). Tulbagh: Tulbagh, *Schlechter* 1396! (K). Humansdorp: Humansdorp, *PL.*54 no. 1! (PRE). Uitenhage: *Zeyher* 144. Port Elizabeth: Port Elizabeth, *West* 224! (BOL). Alexandria: Richmond, Bolknes, *Archibald* 3665! (K). Bathurst: Port Alfred, *Daly* 891! (PRE); Great Fish river, *MacOwan* 419! (BOL,K).

S. aurea is easily recognised by the shrubby habit and the large, generally golden brown or khaki flowers. It is very variable in leaf shape; juvenile leaves are often large and almost orbicular with a thin indumentum (as in the type of *S. eckloniana*) whereas adult foliage is usually elliptic in outline with a dense white adpressed indumentum. In cultivation, at least in Europe, the leaves bear little resemblance to those of wild gatherings being densely clustered, large orbicular-obovate, undulate-margined, irregularly toothed and with long spreading hairs on the petioles.

The specific epithet '*aurea*' is somewhat misleading in that only in bud are the flowers golden-yellow or lemon but by the time they open they are dull rusty brown, often with a trace of purple at their base, giving the impression of being slightly withered.

Bentham's *S. rotundifolia*, a nomen nudum, refers to this species.

The nomenclature of *S. aurea* (1762) vis á vis *S. afr. lutea* (1753) is similar to that of *S. africana* q.v.

16. S. lanceolata Lam., Illustr. Gen. 1:72 (1791).

Syn.: *S. nivea* Thunb., Prodr. Pl. Cap. 96 (1800).
S. hastifolia Benth. in Meyer, Comment. 1:233 (1837).

Type. [S Africa, Cape]. Without exact locality, *Sonnerat* (P—Lamarck microfiche 521!).

Ic.: Mason, Western Cape Sandveld Flowers t.71, f.2 (1972)—as *S. nivea*.

Ref.: Thunb., Fl. Cap. ed. 2:450 (1823); Benth., Labiat. 218 (1833); Meyer, Comment. 1:233 (1837); DC., Prodr. 12:274 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:314 (1910); Adamson & Salter, Fl. Cape Penins. 697 (1950).

Much branched shrub up to 1 m (–2 m). *Stems* with very short rarely long eglandular and glandular capitate hairs and oil globules. *Leaves* simple, thick-textured, linear-elliptic to ovate-oblong, up to 3 × 2·5 cm, entire or irregularly crenate-dentate, cuneate to hastate-auriculate at base, greyish-white, densely covered on both surfaces with very short adpressed hairs and oil globules or with a sparse indumentum of short broad hairs mainly on the veins and leaf margin; petiole up to 20 mm, usually much less. *Verticils* 3–5 on lateral branches, 2(–4)-flowered, distant or condensed. *Floral leaves* obovate, acuminate, soon deciduous; bracts present. *Pedicels* 3–6 mm. *Calyx* tubular-campanulate in flower, 13-veined, c. 15 mm in flower expanding in fruit to broad campanulate, 25 mm long, purplish, ± densely covered with long glandular hairs, shorter eglandular hairs and oil globules; upper lip with 2–3 indistinct broad rounded lobes; lower lip with two broad ovate

lobes c. 3·5 mm. *Corolla* c. 35 mm, dull rose to brownish crimson to grey-blue; upper lip straight or slightly falcate, c. 17 mm; lower lip shorter than upper, c. 13 mm; tube densely annulate at base. *Staminal connective* c. 20 mm; filaments c. 4 mm, sturdy; fertile thecae cohering; lower thecae dolabriform but with a small fertile terminal portion. *Nutlets* c. 3·5 × 2 mm, mucilaginous on wetting. *Fl.* Sept.–June.

Sandy ground, dry hills, flats. Occasional, sea level to 300 m.

S Africa, Cape: Little Namaqualand to the Cape Peninsula and eastwards to Riversdale. Fig. 10d (as *S. nivea*).

S AFRICA. Cape. Little Namaqualand; Khamiesbergen near Garies, *Esterhuysen* 1355! (BOL); Lamberts Bay, *Hardy & Bayliss* 1031! (K); S of Brakdam, *Pearson* 5622! (BOL,K). Vanrhynsdorp: Ebenezer, *Drège* 1340d. Clanwilliam: Lamberts Bay, Vredental, *Werdermann & Oberdieck* 530! (K); near Clanwilliam, *Leipoldt* 114! (BOL); near Boschkloof, *Drège* 7934! (K—type of *S. hastifolia*). Piketberg: NE side of Verloren Vlei at Matjisgoed Drift, *Pillans* 7913! (BOL); Piekeniers pass, *Pearson* 5151! (BOL). Malmesbury: between Witteklip and Hoetjies Bay, *Leighton* 1525! (BOL); 1 mile from Hopefield on Malmesbury road, *Esterhuysen* 368! (BOL). Cape: flats W of Tyger Berg, *Pillans* 7626! (BOL); Buffels Bay, *Salter* 1842! (BOL); coast W of Smith's Farm, *Salter* 1867! (BOL). Caledon: Hermanus, Sandbaai *Walters* 1035! (K). Riversdale: Stil Bay, *Muir* 1924! (BOL). Calvinia: top of Botterkloof, *Compton* 20900! (BOL). Tulbagh: Tulbagh Kloof, *Pole-Evans* 482! (PRE). Without exact locality (UPS—type of *S. nivea* Thunb.-herb. Thunberg 26/609 microfiche!).

As also occurs in the other shrubby S African species, *S. lanceolata* varies appreciably in leaf shape and the indumentum density. For example, as in *S. aurea*, juvenile leaves are often larger and broader with a sparser indumentum than occurs on the narrow, white-tomentose adult leaves. *S. hastifolia* was described on account of the hastate leaf bases but this type of leaf base is not infrequently found in typical *S. lanceolata* and there seems no reason to recognise this taxon at any rank.

S. lanceolata is closest to *S. aurea* and in flower can readily be separated by the smaller corollas with shorter, straighter and less deep hoods, and the deciduous floral leaves; in mature fruit they are quite similar but *S. lanceolata* can generally be recognised by the linear-oblong, greyish-white leaves.

Although Thunberg's epithet has always been applied to this species, *S. lanceolata* was published by Lamarck nine years previously and must replace the better known name.

17. S. africana Linn., Sp. Pl. ed. 2:38 (1762).

Syn.: *S. afr. caerulea* Linn., Sp. Pl. 26 (1753).
S. acetabulosa Linn., Mantissa 25 (1767).
S. lanuginosa Burm.f., Fl. Cap. Prodr. 1 in Flora Indica (1768).
S. integerrima Mill., Gard. Dict. ed. 8, Salvia no. 12 (1768).
S. barbata Lam., Illustr. gen. 1:72 (1791).
S. rotundifolia Salisb., Prodr. Stirp. Chapel Allerton 74 (1796)—nomen illegit.
S. undulata Benth. in DC., Prodr. 12:275 (1848).
S. subspathulata Lehm. in Hamburg. Gart. Blumenzeit. 6:457 (1850).

Type. [S Africa, Cape] "Caput bonae spei, locis argillosis"! (BM—Hort. Cliff.).

Ic.: Rice & Compton, Wild Fl. of Cape t.125 (1950); Mason, Western Cape Sandveld Flowers t.71, f.4 (1972).

Ref.: Miller, Gard. Dict. ed. 8, Salvia no. 11 (1768); Etlinger, Salvia 21 (1777); Aiton, Hort. Kew. 1:45 (1789); Thunb., Prodr. Pl. Cap. 96 (1800); Vahl, Enum. 1:230 (1804); Thunb., Fl. Cap. ed. 2:449 (1823); Benth., Labiat. 216 (1833); Meyer, Comment. 1:234 (1837); DC., Prodr. 12:274 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:315 (1910); Adamson & Salter, Fl. Cape Penins. 696 (1950); Notes R.B.G. Edinb. 22:427 (1958).

Much branched aromatic shrub up to 1·8(–2·5) m. *Stems* greyish tomentose with short or long eglandular hairs, glandular hairs and oil globules. *Leaves* simple, thick, variable in shape from elliptic to obovate, 8 × 4–22 × 13(–40 × 25) mm subentire to erose-dentate, greenish above with short eglandular hairs, greyish below with a dense covering of eglandular hairs and oil globules, rarely almost glabrous. *Verticils* up to 12, 2–6-flowered, up to 2·5 cm apart below, approximating above. *Floral leaves* ovate, cuspidate, up to 10 × 9 mm, persistent; bracts present. *Pedicels* 2–3 mm. *Calyx* infundibuliform-campanulate, 8–10 mm in flower expanding to c.14 mm in fruit and becoming purplish, c. 14-veined, villose with long spreading eglandular hairs, a few glandular hairs and oil globules; upper lip with three short broad ± apiculate lobes; lower lip with two broad deltoid apiculate lobes, c. 2 mm. *Corolla* bright blue, violet or pink with white to yellow markings, 16–28 mm; hood falcate; lower lip as long as upper with a very broad reflexed median lobe; tube scarcely exserted, annulate c. 3 mm from base. *Staminal connectives* c. 12 mm; filaments c. 6 mm; lower thecae dolabriform with a small fertile terminal portion. *Nutlets* ± round-trigonous, c. 3 × 2·5 mm, mucilaginous on wetting. *Fl.* July–Jan.(–May).

Sandy soil, coastal fynbos and rocky slopes. Common from near sea level to 400(–600) m.

S Africa, Cape: Vanrhynsdorp to the Cape Peninsula and east to Peddie. Fig. 10e.

S AFRICA. Cape. Vanrhynsdorp: sine loc., *Leipoldt* 4122! (BOL). Giftberg, *Phillips* 7608! (BOL,K). Clanwilliam: Graafwater to Lambert's Bay, *Hardy & Bayliss* 1022! (K); sine loc., *Ecklon* s.n.! (K—type of *S. undulata* Benth). Piketberg: foot of Piketberg, *Schlechter* 5221! (E,K); 8 miles NW by N of Aurora turning, *Acocks* 19809! (K—form with ± glabrous leaves). Malmesbury: Zwartland, *Zeyher*. Cape: Table mountain, *Dümmer* 358! (E); Simonstown, Red Hill, *Taylor* 6009! (K); Philadelphia, Mamre road, *Wasserfall* 989! (PRE), Stellenbosch: between Stellenbosch and Somerset West, *Drège* 7939b; foothills of Stellenbosch mts., *Bos* 13! (PRE). Caledon: Zwart Berg, *Galpin* 4424! (K); Sir Lowry's pass, *Page & Guthrie* s.n.! (PRE). Calvinia: 21 km S of Nieuwoudtville, *Story* 4291! (K). Ceres: foot of Mostertsberg, near Mitchell's pass, *MacOwan* 1640! (BOL). Worcester: near Brand Vlei, *Bolus* 5223 p.p.! (K). Paarl: between Paarl and Lady Grey railway bridge, *Drège* 7938; Wellington, *Knobel* 22924! (BOL). Montagu: Montagu, *Leipoldt* 21828! (BOL). Peddie: Woolridge, *Bayliss* 3351! (PRE).

In common with most of the shrubby sages of the Cape, *S. africana* is very variable in the size and shape of the leaves and the density of indumentum.

For example, of the two new synonyms *S. undulata* is merely a broader, longer-leaved variant than usual and *S. lanuginosa* (type G!) has very large lowermost leaves very unlike those of typical forms of *S. africana* but in other characters seems not to differ from it.

In the first edition of *Species Plantarum*, Linnaeus described this species with the epithet "*afr. caerulea*". This is one of the relatively few instances where he did not give a clear specific name. In the second edition, giving the same description and protologue, he gave it the specific epithet *africana*. Because the name "*afr. caerulea*" is out of context with Linnaeus's thinking and nomenclature at the time of the first edition of the *Species Plantarum* it seems preferable to adopt *S. africana* as the correct name.

In addition to the specimen of *S. africana* in the Hortus Cliffortianus herbarium, the species is also represented in the Linnaean herbaria in London (LINN!) and Stockholm (S).

18. S. dentata Aiton, Hort. Kew. 1:37 (1789).

Syn.: *S. angustifolia* Salisb., Prodr. Stirp. Chapel Allerton 73 (1796)—nomen illegit.
S. rigida Thunb., Prodr. Pl. Cap. 96 (1800).
S. crispula Benth. in Meyer, Comment. 1:234 (1837).

Type. S. Africa. Cape of Good Hope, *Masson*! (BM).

Ref.: Vahl, Enum.1:232 (1804); Thunb., Fl. Cap. ed. 2-451 (1823); Benth., Labiat. 217 (1833); Meyer, Comment. 1:234 (1837); DC., Prodr. 12:275 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:315 (1910).

Shrub up to 2 m. *Stems* much branched, grey-pubescent when young with very short white eglandular hairs and oil globules, becoming glabrous later. *Leaves* often clustered, coriaceous, simple, aromatic, obovate, linear-elliptic or linear, up to 2·8 × 1·8 mm, usually less, margins undulate, irregularly crenate-dentate, rarely subentire or leaves pinnatifid, with a ± grey indumentum on both surfaces of short eglandular hairs and numerous oil globules; lamina tapering into an indistinct petiole or petiole up to 10 mm. *Verticils* crowded or distant, up to 8, 2–4(–6)-flowered. *Floral leaves* broad ovate, to 7·5 × 7 mm, persistent; bracts present. *Pedicels* up to 3 mm. *Calyx* campanulate-infundibuliform, 8–10 mm in flower, expanding in fruit to c. 15 mm, green or tinged purple, 13-veined, with short, rarely long eglandular hairs, and numerous oil globules; upper lip with three very short broad rounded lobes; lower lip with two broad obtuse lobes c.2 mm. *Corolla* light or dark purple or violet blue or white, up to 25 mm; upper lip slightly falcate; lower lip longer than upper with a deeply emarginate median lobe; tube annulate c. 5 mm from base. *Staminal connectives* c. 9 mm; filaments sturdy, c. 5 mm; lower thecae dolabriform with a small fertile terminal portion. *Nutlets* trigonous c. 3 × 2 mm, mucilaginous on wetting. *Fl.* Jul.–Jan.

Dry slopes, rocky hillsides and watercourses, granite kopjes; 600–1500 m.

S Africa, Cape: Little Namaqualand to Clanwilliam. Fig. 10f.

S AFRICA. Cape. Little Namaqualand; Brackdamm N of Garies, *Schlechter* 11161! (BOL,K); between Garies and Leliefontein, *Esterhuysen* 1340! (BOL); Modderfonteinsberg, *Drège*! (BM—type of *S. crispula*); Klipfonteinberg, Steinkopf, *Meyer* 10! (STE); Camiesbergen, *Drège* 3113! (K—type of *S. crispula*); Khamiesberg, Namaroup, *Pearson* 6590! (K). 18 miles NE Garies, *Van Breda* 4074! (PRE). Vanrhynsdorp: Karee Berg, *Schlechter* 8247!

(K,E). Clanwilliam: Cederbergen, *Drège* 4742 (K,CGE). Calvinia: top of Botter Kloof pass, *Compton* 1902! (BOL); Ganaga pass, Roggeveld escarpment, *Acocks* 18456! (K); Klipfontein, *Hutchinson* 905! (K,BOL); Nieuwoudtville, *Galpin* 11166! (PRE).

S. dentata is undoubtedly very closely related to *S. africana* and only marginally worth its separate specific rank. However, there are few specimens that are intermediate and usually the differences of leaf size and shape are clear enough to distinguish the two species. In addition, the calyx indumentum comprises longer hairs in *S. africana* and in it the calyx lobes are generally acute, not obtuse; these differences, however, do not always hold true. Geographically, as fig. 10e and f show, *S. dentata* lies more to the north than *S. africana*. In the area of overlap, as in Clanwilliam, some rather anomalous forms occur. The most noteworthy is *Drège* 4742 from the Cederbergen which has long linear leaves; a specimen at CGE on which calyces and flowers are present (unlike most specimens of this widely distributed number) shows however that there are no differences other than those of leaf shape.

19. S. dolomitica Codd in Dyer, Flow. Pl. Africa 32:t.1248 (1957).

Type. S Africa, Transvaal: cultivated in Pretoria from seed collected in Transvaal, Pilgrim's Rest, *Codd* 8848 in Nat. Herb. Pret. 28575! (holo. PRE; iso K).

Shrub up to 2 m, branched from base. *Stems* above and below with short crisp simple hairs and short glandular hairs. *Leaves* simple, elliptic to obovate, c. 2·5 × 1·5 cm (up to 6·5 × 3 cm), cuneate at base, ± acute at apex, entire-margined, prominently reticulate below, on both surfaces with a dense matted, often whitish indumentum of short crisp hairs and oil globules; petiole 1–1·5 cm. *Inflorescence* condensed; verticils 2-flowered. *Floral leaves* ovate, acute, c. 4 × 3·5 mm; bracts present. *Pedicels* c. 3 mm or flowers ± sessile. *Calyx* broad campanulate, often purplish tinged, c. 1·5 cm in flower expanding in fruit to 2·5 cm, c. 8-veined, with a dense indumentum of long eglandular hairs, shorter glandular hairs and oil globules; lobes of upper lip ovate, c. 2·5 mm long; lobes of lower lip c.4 mm long, rounded. *Corolla* up to 28 mm, light pink or lilac with yellow throat markings; upper lip falcate, shorter than lower lip; tube constricted about half way down, and within with five plates of tissue, ± pilose. *Staminal connective* c.11 mm; filaments c. 5 mm; lower thecae free, fertile or sterile (?); staminodes prominent. *Nutlets* dark brown, 3 × 2·5 mm, mucilaginous on wetting. *Fl.* Sept.–Feb.

Dolomitic outcrops; 1000–1500 m.

S Africa, Transvaal, NE & E. Fig. 10c.

S AFRICA. Transvaal: Lydenburg, between Ohrigstad and Pilgrims Rest, *Rauh & Schlieben* 9658! (EA,K); common at Pilgrims Rest, *Rogers* 14867! (BOL,K). Pietersburg: Haenertsburg, Wolkberg, *Thompson* s.n. (PRE,K); Letaba, the Downs, *Codd & de Winter* 3089. Potgietersrust: Makapan valley, *Maguire* 2531! (K).

Although in the original description Codd related his new species to *S. aurea*, it is clearly quite different from it in many floral and morphological characters and its relationship to it, and indeed to all the shrubby species of

the Cape, is slight. Nevertheless there is no doubt that it is within this shrubby group of species with expanded fruiting calyces that *S. dolomitica* has its broad taxonomic links. Geographically and ecologically it is far removed from its general allies: the nearest shrubby Cape species, *S. aurea*, is about 700 miles to the south (cf. fig. 10b); ecologically, it is confined in the Transvaal to dolomitic rocks in contrast to the much broader range of habitats of the Cape species.

Species-group H
(p. 15)

20. S. canariensis Linn., Sp. Pl. 26 (1753).

Syn.: *Sclarea tomentosa* Miller, Dict. Gard. ed. 8, Sclarea no. 13 (1768).
Schraderia hastata Moench, Method. 378 (1794)—nomen. illegit.
Salvia lanata Salisb., Prodr. Stirp. Chapel Allerton 74 (1796)—nomen illegit.

Type. Canary Islands ! (BM—Hort. Cliff.).

Ic.: Fig. 11.

Ref.: Etlinger, Salvia 38 (1777); Aiton, Hort. Kew. 1:44 (1789); Vahl, Enum. 1:268 (1804); Benth., Labiat. 218 (1833); Webb & Berthelot, Hist. Nat. Iles Canar. 3:88 (1845); DC., Prodr. 12:275 (1848); Bonplandia 8:284 (1860); Pitard & Proust, Fl. des Iles Canaries 307 (1909); Lindinger, Beitr. Fl. kanar. Ins. 223 (1926); Publ. Fac. Pharm. Paris 16:47 (1930); Sarracenia 5:53 (1960); Lid, Contrib. Fl. Canar. 153 (1967).

Shrub up to 70 cm. *Stems* little branched, eglandular and densely floccose below, above usually with a thinner similar indumentum and with capitate glandular hairs. *Leaves* simple, lanceolate triangular, up to 10·5 × 6·5 cm, aromatic, sagittate to hastate, crenulate, apex acute, lanate-floccose below with oil globules, above generally with less indumentum and eglandular, rarely lanate floccose; petiole up to 5 cm. *Inflorescence* paniculate-racemose. *Verticils* 3–4 flowered, approximating. *Floral leaves* up to 17 × 10 mm, sometimes coloured; bracts present. *Pedicels* up to 3 mm. *Calyx* tubular-campanulate, up to 12 mm, reddish purple or green, expanding to c. 17 mm in fruit with recurved ± membranous lips, 14-veined; indumentum of ± short eglandular and shorter glandular hairs, mostly at base of calyx, and oil globules; upper lip ± unlobed; lower lip with two broad obtuse lobes c. 5 mm. *Corolla* 18 mm, purplish violet to white; hood slightly falcate; lower lip shorter than upper with tube broader and slightly ventricose above with a very small partial annulus c. 4·5 mm from base. *Staminal connectives* c. 15 mm; filaments c. 3 mm; lower thecae sterile, cohering. *Nutlets* trigonous, c. 2·2 × 1·7 mm, mucilaginous on wetting. 2n=22 (Larsen, 1960). *Fl.* Feb.–June.

Stony uncultivated places. Common with a wide ecological range, often in xerophytic scrub, from sea level to 1850 m.

Canary Islands.

CANARY ISLANDS. Gran Canaria: Santa Lucia de Tirajana, *Bramwell* 1034! (E); Santa Lucia, *Burchard* 344! (E); near Las Palmas, *Asplund* 1412! (K). La Palma: Barranco de las Angustias, *Bramwell* 1911! (E). Tenerife: Guya, *Dolkowsky* s.n.! (E). Cultivated specimen in Miller herbarium! (BM—type of *Sclarea tomentosa* Miller). Also recorded from Fuerteventura and Gomera.

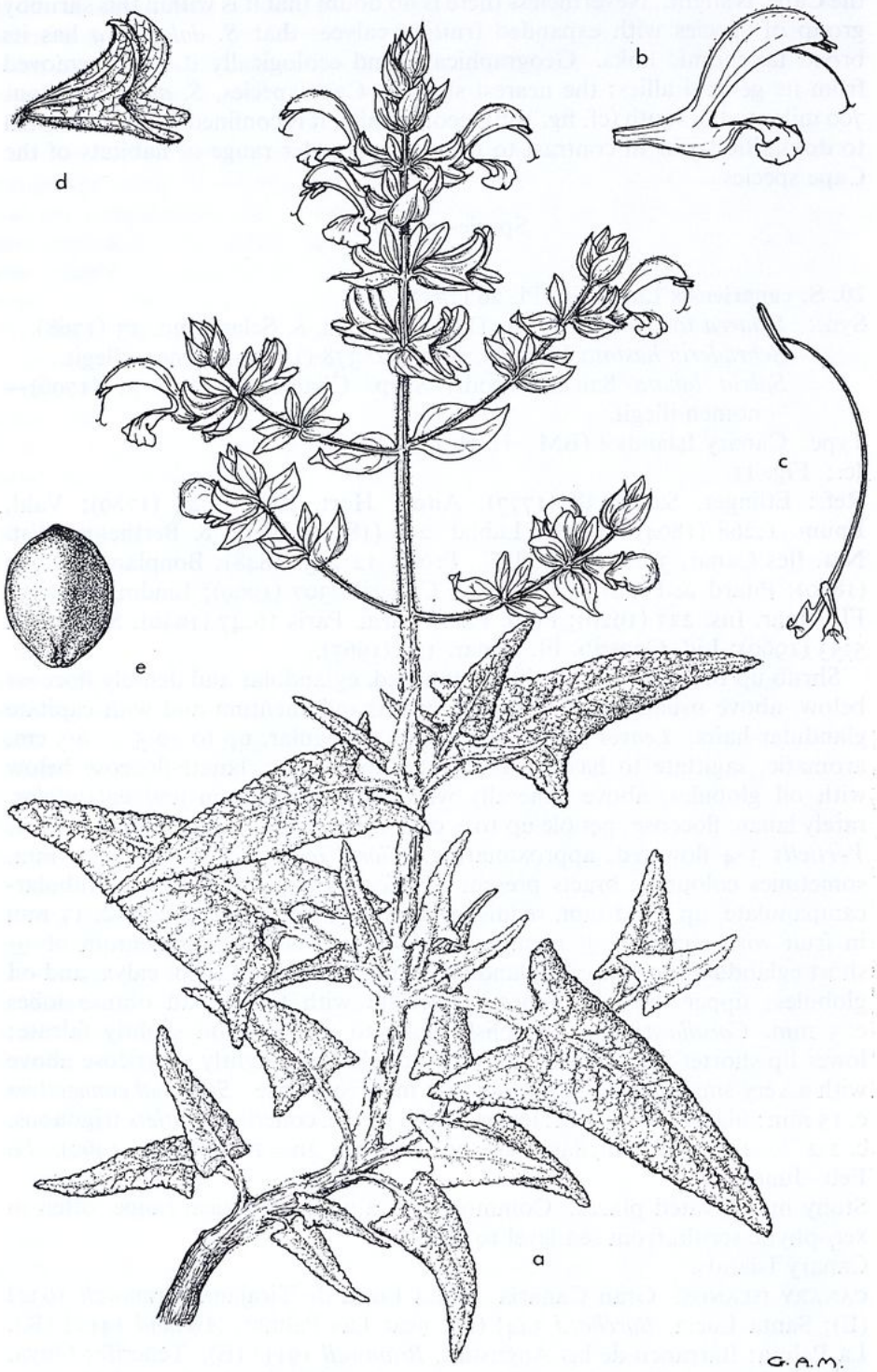

FIG. 11. *Salvia canariensis* Linn.; a, habit × $\frac{2}{3}$; b, corolla × 1; c, stamen × $2\frac{1}{2}$; d, fruiting calyx × $1\frac{1}{3}$; e, nutlet × 7. (*Burchard* 241).

A frequent shrub in the Canary Islands varying, for the most part, only in leaf shape and the density of leaf indumentum, *S. canariensis* is quite distinct from all of the African species of *Salvia* on account of the combination of the following characters: habit, leaf shape, the expanding calyces and the shape of the corolla. Although it is placed in a species-group of its own here, it does have some general connections with the species of the previous group, and in Bentham's account in the *Prodromus* it was placed in the same section/subgenus (*Hymenosphace*) as them. It thus provides an interesting long-range link between the Canary Islands and southwestern Africa.

There seems no reason to recognise the following varieties: var. *candidissima* Noé (Bonplandia 8, 17–18:284, 1860); var. *albiflora* Noé (l.c.); var. *villosa* Pitard (Pitard & Proust, Fl. des Iles Canaries 307, 1909). Recently Kunkel (Monogr. Biol. Canar. 3:65, 1972) has recognised three forms: f. *canariensis*; f. *albiflora* (Bolle) Sunding (l.c.); and f. *candidissima* (Bolle) Kunkel (l.c.) in Gran Canaria.

S. canariensis is sometimes cultivated and naturalised in parts of S Europe, as for instance Sicily.

Species-group I
(p. 15)

21. S. garipensis E. Meyer, Comment. 1:232 (1837).

Syn.: *S. steingroeveri* Briq. in Bot. Jahrbuch. 19:191 (1894).
S. dinteri Briq. in Bull. Herb. Boiss. ser. 2, 3:1075 (1903).

Type. [S Africa, Cape: Little Namaqualand] "Verlaptpram ad fluvium Garip, alt. 400–800 ped., 1836, *Drège* 3112"! (K).

Ic.: Fig. 12.

Ref.: DC., Prodr. 12:273 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:311, 312 (1910); Merxmüller, Prodr. Fl. Südwestafrika 123:27 (1969).

Much branched shrub up to 1·2 m. *Stems* quadrangular, woody or herbaceous, glandular pubescent with long spreading eglandular hairs, shorter glandular hairs and oil globules. *Leaves* very variable, simple, oblong to broad ovate to subtriangular, up to 4·5 × 3 cm, irregularly erose-dentate, truncate, cordate or rounded at base, with glandular and eglandular hairs and oil globules; petiole up to c. 1·5 cm. *Verticils* up to 10, 2(–4)-flowered, up to 1·5 cm apart below, approximating above. *Floral leaves* broad ovate, acuminate, persistent; bracts present. *Pedicels* up to 4 mm, erect-spreading. *Calyx* campanulate, with ± widely spreading lips, 10–12 mm, enlarging in fruit to 16 mm long, 13-veined, glandular pubescent with long eglandular and shorter glandular hairs; upper lip recurved, 3-toothed, median shorter than laterals; lower lip with two narrow ovate-acuminate c. 4 mm long teeth. *Corolla* white or pale blue, or light mauve, up to 25 mm, usually less; upper lip falcate; lower lip ± equal to or slightly shorter than upper; tube slightly ventricose and constricted with a small annulus. *Staminal connectives* c. 14 mm; filaments c. 4·5 mm; lower thecae dolabriform, sterile, adhering. *Nutlets* ± trigonous, c. 2·5 × 2 mm, mucilaginous on wetting. *Fl.* May–Feb.

Stony slopes, stream courses, rock crevices; (100–)1400–1500 m.

SW Africa (Namibia), S. S Africa, Cape: Little Namaqualand, N. Fig. 10a.

SW AFRICA (NAMIBIA). Keetmanshoop, 35 km S by W of Narubis, *Acocks*

FIG. 12. *Salvia garipensis* E. Meyer: a, habit × $\frac{2}{3}$; b, T.S. of corolla × $1\frac{1}{2}$; c, stamen × 2; d, fruiting calyx × $1\frac{2}{3}$; e, nutlet × 6; f, branch of a xerophytic form with narrow, oblong, revolute leaves × $\frac{2}{3}$. (a-e, *Pearson* 8135; f, *Dinter* 4109).

18049! (K). Aus, *Dinter* 3547! (G, PRE, STE). Garub, Tigerberg, *Dinter* 4109! (G). Gubub, *Dinter* 1111! (Z—type of *S. dinteri*). Great Karasberg, lower slopes of Lord Hill, *Pearson* 8509! (BOL,K). Little Karasberg, *Galpin* 14199! (PRE,K). Warmbad dist.: right bank of Orange River, 3–6 miles down from Chamgab, *Pillans* 6547! (K,BOL). Bethanie: Tirasberge, *Merxmüller & Giess* 2846! (PRE). Without exact locality, *Steingröver* 55 (type of *S. steingroeveri*).

§ AFRICA. Cape. Little Namaqualand: 6 miles from Viools Drift towards Steinkopf, *Schelpe* 234! (BM).

S. garipensis stands rather apart from the other shrubby *Salvia* species of the Cape region on account of the size, shape and colour of the corolla, the calyx form and the scarcely increased size of the fruiting calyces. Its general affinities, however, are with the other species in this species-group (cf. remarks under following species).

It is variable in leaf shape and two of its extremes are shown on fig. 12a and f. This very pronounced variation appears to be connected with either habitat conditions or, in some cases, with different growth stages.

Although Bentham in the *Prodromus* altered the original spelling of the epithet to '*gariepensis*', there does not appear to be any valid etymological reason for the change and consequently Meyer's name should be retained.

Merxmüller (27, 1969) mentions a possible hybrid between *S. namaensis* and *S. garipensis*; the specimen is *Dinter* 4109 (LUS) from Garub. Field observations are needed to confirm this but if the two species do hybridise this would be an addition to the relatively small number of known examples of hybrids in the genus outside Europe; there are no positive records of hybrids among any of the African species. Cf. fig. 12f.

22. S. dominica Linn., Sp. Pl. 25 (1753).

Syn.: *S. graveolens* Vahl, Enum. 1:273 (1804).
S. commutata Benth., Labiat. 222 (1833).

Type. In herb. Linn. 42/19! (LINN—but habitat not 'Domingo' as stated in the original description).

Ref.: Miller, Gard. Dict. ed. 8, Salvia no. 9 (1768); Vahl, Enum. 1:273 (1804); Benth., Labiat. 230 (1833); DC., Prodr. 12:279 (1848); Täckholm, Students Fl. Egypt 146 (1956).

Much branched very aromatic shrub. *Stems* erect or ascending, above and below with spreading eglandular hairs and shorter capitate glandular hairs. *Leaves* simple, ovate, up to 8 × 4 cm, cordate, rugose, erose, above with eglandular and glandular hairs, below with numerous glandular hairs, a few eglandular hairs and oil globules; lower leaves with petioles up to 1 cm, uppermost sessile. *Verticils* up to 15, usually approximating, c. 6-flowered. *Floral leaves* ovate-acuminate, up to 12 × 7 mm; bracts present. *Calyx* obtriangular-campanulate, up to 10 mm, 10-veined, densely villose with long spreading eglandular and shorter glandular hairs and oil globules; upper lip with three small closely connivent teeth, 1 and 0·2 mm long; lower lip with two lanceolate acuminate 4 mm teeth. *Corolla* cream or whitish, 20 mm; upper lip clearly falcate; lower lip shorter than upper; tube c. 8 mm, ventricose and with a pilose plate of tissue at the invagination. *Staminal connectives*

c. 13 mm; filaments c. 4·5 mm; lower thecae dolabriform, sterile, adhering. *Nutlets* round-trigonous, yellow brown with dark venation, c. 3 × 2 mm, mucilaginous on wetting. *Fl.* Feb.—June.
Rocky slopes.
Egypt, Israel, Jordan, Syria.

No specimens from Africa have been seen but this very distinct essentially East Mediterranean species is recorded by Täckholm (l.c.) from the Isthmic desert in Egypt. In the Israel region, *S. dominica* is a more or less Irano-Turanian species which penetrates into the Mediterranean and Saharo-Sindian phytogeographic regions.

Although geographically far separated from it, *S. dominica* has several features in common with the previous species, the essentially SW African (Namibia) *S. garipensis*. These are: shrubs with petiolate simple leaves, ± truncate or cordate at base; white flowers with short tubes ± included within the calyx; calyces with very wide-spreading lips somewhat enlarging in fruit; long staminal connectives with dolabriform sterile distal thecae. They differ in the very villose calyces and densely glandular tomentose stems of *S. dominica* as opposed to the much less densely glandular pubescent indumentum on the calyces and stems of *S. garipensis*. In fact, on gross morphological evidence they have more characters in common than not and despite the huge geographical disjunction, present evidence suggests that they are near allies, more closely related to each other than to the other two members of this species-group.

23. S. chamelaeagnea Berg., Descr. Pl. Cap. 3 (Sept. 1767).
Syn.: *S. paniculata* Linn., Mantissa 25 (Nov, 1767)—Mantissa alt. 551 (1771).
Type. [S Africa Cape] "Cap. bon. spei, *Ekeberg*" (STB).
Ic.: Bot. Mag. 110:t.6790 (1884) as *S. paniculata*; Dyer, Flow. Pl. Africa 31:t.1219 (1956).
Ref.: Etlinger, Salvia 23 (1777); Aiton, Hort, Kew. 1:45 (1789); Thunb., Prodr. Pl. Cap. 96 (1800); Vahl, Enum. 1:229 (1804); Thunb., Fl. Cap. ed. 2:450 (1823); Benth., Labiat. 217 (1833); Meyer, Comment. 1:235 (1837); DC., Prodr. 12:275 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:315 (1910); Adamson & Salter, Fl. Cape Penins. 696 (1950).

Much branched, scabrid to pilose shrub up to 2 m. *Stems* round or slightly quadrangular with short antrorse hairs and oil globules, more numerous above. *Leaves* simple, coriaceous, ovate to obovate, up to 3·5 × 2 cm, subentire to dentate, cuneate at base, acute at apex, aromatic; on both surfaces with numerous oil globules, otherwise ± glabrous or with few adpressed eglandular hairs; petiole up to 7 mm. *Inflorescence* much branched, paniculate; verticils 2-flowered, congested; pedicels c. 1 mm. *Floral leaves* small, ovate, soon deciduous; bracts absent or very small. *Calyx* campanulate, up to 7 mm, enlarging slightly in fruit, with four main veins and an indumentum of short eglandular and glandular hairs and oil globules; upper lip rounded with two 0·5 mm teeth; lower lip with two 2·5 mm acuminate teeth. *Corolla* blue (coerulea), purplish blue with or without white markings, c. 25(–30) mm; tube short, not or scarcely exserted,

annulate; hood slightly falcate; lower lip with a broad undulate median lobe. *Staminal connectives* c. 12 mm; filaments c. 4 mm; lower thecae dolabriform with or without a small fertile terminal portion, free. *Nutlets* ± round; often only one developing to maturity. *Fl.* Nov.–May.

Hill slopes, roadside, stream beds, sandy soil, open veld, among bushes. Common, 20–1100 m.

S Africa, Cape: Little Namaqualand south to the Cape Peninsula and east to Prince Albert. Fig. 10g.

S AFRICA. Cape. Little Namaqualand: sine loc., *Wyley* 90. Clanwilliam: Pakhuis pass, *Acocks* 8584! (BOL,K); near Citrusdal, *Esterhuysen* 3060! (BOL); Olifants river, ann. 1879, *Dickson*! (BOL). Piketberg: Piketberg, *Theiler* 42! (PRE). Cape: Devil's peak, *Bolus* 4992! (BOL); Table mountain, *Ecklon*; Wynberg, near Cape Town, *Bolus* s.n.! (BOL); S. slope of Signal hill, *Kinges* 3508! (PRE). Stellenbosch: Stellenbosch, *Bos* 13! (STE). Caledon: Genadendal, *Schlechter* 9866! (E). Swellendam: Swellendam, *Liebenberg* 7180! (PRE). Riversdale: between Little Vet river and Garcias pass, *Burchell* 6923. Ceres: on road to Blinkberg pass, *Esterhuysen* 12746! (BOL); near Ceres, *Bolus* 490! (BOL). Tulbagh: Tulbagh, *Scott Elliot* 36! (E). Worcester: Worcester, *Drège*; near Worcester, *van Breda* 29411! (PRE). Paarl: Paarl, *Burchell* 952; Fransch Hoek, *C. Smith* 2658! (PRE). Montagu: E of Montagu, *Taylor* 380! (BOL). Prince Albert: Gamka river, *Burke* s.n.

A quite distinct species with little apparent range of variation. Even the indumentum is fairly constant comprising on the stem characteristic antrorse hairs, sometimes with tuberculate bases. Although the calyx of *S. chamelaeagnea* does expand slightly in fruit, it is a considerably smaller increase than occurs in its allies, albeit not close allies, of this species-group. Often the calyces drop off shortly after flowering (and fruiting?) leaving the pedicels on the elongated flowering axis, thus giving *S. chamelaeagnea* a very distinct appearance.

I am grateful to Dr Jan Tengnér for examining the relevant original specimens in the Bergius herbarium, Stockholm, and providing the following information. Three sheets of the species are present of which one (the second of the three pinned together) has the strongest claim to be regarded as the type because what is written on it by Bergius agrees best with the original description. On the front of this sheet is written "*S. paniculata* Linn." (in J. E. Wikström's handwriting) and on the reverse:

"Salvia minor aethiopica, folius Chamaelaeagni asperis. Breyn. Cent. p. 169 t.85. *bona*"

"Horminum african. frutesc. chamaedrius folio setinosus. Herm. afr. 14?"

"Salvia *mihi* Chamaelaeagnea"

"Cap. b. sp. Ekeberg".

Wikström had also written "*S. paniculata* Linn." on this side of the sheet but with this exception all the handwriting on the reverse side is that of P. J. Bergius.

It will be noted that Bergius spelt the epithet "Chamaelaeagnea" on the type specimen. On another of the three sheets at Stockholm he spelt it "chamaeleagna". The third variant is that of the published description, "*S.* chamelaeagnea"!

FIG. 13. *Salvia albicaulis* Benth.: a, habit × $\frac{2}{3}$; b, calyx opened out × $2\frac{2}{3}$; c, T.S. of corolla × $1\frac{1}{2}$; d, lower lip of corolla × $1\frac{2}{3}$; e, stamen × 3; f, part of stem × $1\frac{1}{3}$. (*Pillans* 8682).

24. S. albicaulis Benth. in Meyer, Comment. 1:234 (1837).

Syn.: *S. dregeana* Benth. in Meyer, l.c.
S. albicaulis Benth. var. *dregeana* (Benth.) Skan in Thiselton-Dyer, Fl. Cap. 5, 1:317 (1910).

Type. [S Africa, Cape] Tulbagh, *Ecklon* 7937! (K).

Ic.: Fig. 13.

Ref.: DC., Prodr. 12:274 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:317 (1910).

Much branched shrub up to 50 cm (or more). *Stems* clearly quadrangular, white, with a very fine dense indumentum of short antrorse-adpressed eglandular hairs. *Leaves* simple, thick, coriaceous, variable in shape from obovate to suborbicular to spathulate, irregularly crenate to dentate, up to 3·5 × 2·8 cm, glabrous or shortly hispid above, below white pubescent with prominent reticulate nervation; petiole up to 1 cm. *Inflorescence* much branched; verticils up to 8, ± condensed, 2(–3)-flowered. *Floral leaves* lanceolate, soon deciduous; bracts present. *Pedicels* up to 3 mm. *Calyx* wide campanulate, up to 12 mm, 12-veined, villose, densely covered with long white spreading eglandular hairs, scarcely expanding in fruit; upper lip 3-toothed, truncate, median tooth shorter than laterals; lower lip with two narrow lanceolate-acuminate c. 4 mm teeth. *Corolla* up to 24 mm, purplish; tube 10–12 mm, somewhat constricted and annulate there; hood falcate. *Staminal connective* c. 12 mm; filaments c. 5 mm; lower thecae free, sterile, dolabriform or crumpled. *Nutlets* rounded trigonous, brown, 3 × 2 mm. *Fl.* Nov.–May. Rocky slopes, vlei, fynbos, burnt areas; 200–1100 m. S Africa, Cape: Clanwilliam to Tulbagh. Endemic. Fig. 10h.

S AFRICA. Cape. Clanwilliam: Pakhuis mts., *Leipoldt* 3423! (BOL,PRE); hills a mile SE of Keercm, *Pillans* 8682! (BOL); Cederbergen, between Pakhuis and Biedow, *Drége* 3114! (K,E—type of *S. dregeana*); Cedarberg forest reserve, *Taylor* 6195! (STE). Piketberg: hills NW of Mouton's vley, *Pillans* 7465! (BOL). Ceres: near Ceres, *Bolus* 5224! (E); Ceres, *Thode* A2275! (PRE); Mitchell's pass, *Thode* 3196! (STE). Worcester: Brand vlei, *Bolus* 5223! (K); Paarl: Wellington, Groenberg, *Taylor* 4799! (K,STE).

With a limited distribution in the southwest Cape, *S. albicaulis* is a quite distinct species easily recognised by the acutely quadrangular white stems and the villose calyces that expand but little in fruit. Although placed in the same species-group as the previous three species, it stands rather apart from them on account of these features.

Species-group J
(p. 15)

25. S. perrieri Hedge in Notes R.B.G. Edinb. 32:3 (1972.)

Suffruticose perennial or shrub up 1·5 m. *Stems* arachnoid below and above with simple, eglandular ± adpressed hairs and oil globules rarely with capitate glandular hairs in region of inflorescence. *Leaves* narrow linear-lanceolate to lanceolate, discolorous, cuneate, rarely auriculate below, ± acute at apex, 8–12 × 1·5 — 1·8 (–3) cm, margin finely crenulate, ± glabrous above with a few oil globules and very short hairs on veins, colliculate, below with a dense indumentum of short simple hairs and oil globules, prominently areolate-reticulate; leaves sessile or with a petiole up to 8 mm.

Flowering stems little branched; verticils up to 14, c. 10-flowered, distinct below, approximating above. *Floral leaves* broad lanceolate, up to 14 × 5 mm; bracts present or absent. *Pedicels* erect-spreading up to 10 mm. *Calyx* triangular-campanulate, up to 11 mm, 12–14-veined, with short and longer eglandular and glandular hairs and oil globules; upper lip with three 2–3·5 mm teeth; lower lip with two up to 4 mm long mucronate teeth; calyx slightly enlarging in fruit and deflexed. *Corolla* pale blue or whitish, up to 27 mm; upper lip falcate; lower lip ± straight or deflexed, longer than upper; tube c. 10 mm, exserted, annulate c. 5 mm base. *Staminal connectives* 11–14 mm; filaments c. 5 mm; lower thecae with a ± well developed fertile terminal portion, not cohering. *Nutlets* black, ± round-trigonous, c. 2·5 × 2 mm, slightly mucilaginous on wetting. *Fl.* Nov.–Dec.
Edge of forests, streamsides; 1000–2000 m.
Madagascar, C S and N. Fig. 17d.

1 Lower lip of corolla c. 10 mm, clearly divergent from upper lip; upper lip prominent, falcate, ± entire . . . a, subsp. *perrieri*
\+ Lower lip of corolla c. 4 mm, scarcely divergent from upper lip; upper lip very short, straight or slightly curved bifid b, subsp. *brevilabiata*

a. subsp. **perrieri**
Type. Madagascar, central-south: Horombe, 1300 m, *Perrier de la Bâthie* 12685! (holo. P).
Ic.: Notes R.B.G. Edinb. 32:4, fig.2 (1972).
MADAGASCAR. Massif of Andringitana, *Perrier de la Bâthie* 12685! (P). Massif of Kalambatitra, Mt. Analatsitendrika, *Humbert* 12014! (P). Massif of Ivakoany, *Humbert* 7035! (P).

b. subsp. **brevilabiata** Hedge in Notes R.B.G. Edinb. 32:3 (1972).
Type. Madagascar C–N: mountains to the north of Mangindrano, near the summit of Ambohimirahavavy, 1800 m, *Humbert & Capuron* 25084! (holo. P).

Only known from a single gathering, subsp. *brevilabiata*, except for the pronounced corolla difference given in the key, is virtually indistinguishable from the type subspecies. They are, however, widely separated geographically: the type subspecies growing at about 23° S and subsp. *brevilabiata* at c. 14° S, a gap, real or apparent, of almost 600 miles.

The Somali endemic *S. somalensis* shares several features in common with this Madagascar species and there is no doubt that they are quite closely related. *S. perrieri* is distinguished by the clearly bi-coloured leaf laminae, the rather longer pedicels and the triangular-campanulate calyces. The significance of the relationship between these geographically far separated species and possible connections with continental drift is briefly discussed in the geography section of the introduction.

26. S. somalensis Vatke in Linnaea 43:93 (1881).
Type. Somalia: near Meid in Mt. Serrut (Surat), 1500–1800 m, iv 1875, *Hildebrandt* 1419! (K,BM).
Ref.: Engler, Hochgebirgsflora 367 (1892); Thiselton-Dyer, Fl. Trop. Africa 5:457 (1900); Bull. Jard. Bot. Brux. 32:820 (1962).

Aromatic shrub, up to 2–2·5 m. *Stems* below with numerous eglandular hairs and oil globules, above with a dense indumentum of spreading flattened eglandular hairs, capitate glandular hairs and oil globules. *Leaves* simple, oblong to oblong-lanceolate, up to 9 × 2 cm, crenulate, above and below with a few short eglandular hairs and numerous oil globules, prominently reticulate-areolate below, sessile. *Inflorescence* simple or little branched. *Verticils* up to 14, 8–10-flowered, up to 2 cm apart below, closer above. *Floral leaves* ovate or elliptic, acuminate, up to 15 × 5 mm; bracts present. *Pedicels* erect-spreading, up to 5 mm. *Calyx* tubular-campanulate, c. 12 mm, 13-veined, with capitate glandular hairs, oil globules and with, ± entirely on the ribs, glandular flattened hairs; upper lip with lateral teeth c. 3 mm and a 4·5 mm median tooth; lower lip with narrow lanceolate, acuminate, 3–4·5 mm teeth. *Corolla* blue to violet, up to 22 mm; upper lip falcate, lower lip ± equal to or slightly longer than the upper; tube c. 10 mm, slightly pouched, annulate. *Staminal connectives* 12 mm; filaments c. 5 mm; lower thecae fertile. *Nutlets* 2·2 × 1·8 mm. *Fl.* Jul.–Jan.

Open glades in forest, valley beds, near forest margin, in *Juniperus procera* forest; sometimes a dominant undershrub near forest edge; 1500–2400 m Somalia. Fig. 17d.

SOMALIA. Daloh, 18 miles N of Erigavo, *Bally, B.* 10284! (EA). Erigavo escarpment, *Popov* 1155! (EA, K). Surat, Erigavo, *Peck* 274! (EA).

The closest and only obvious ally of *S. somalensis* is the Madagascar endemic *S. perrieri*. They are both tall shrubs with blue flowers, entire linear-lanceolate leaves and have a similar indumentum; they also are mesophytic plants growing in or near forests (see remarks under the previous species).

In Somalia *S. somalensis* is known by the vernacular name Siraad, Sifar or Sirad medu. Within its limited geographical and altitudinal range, *S. somalensis* is frequently a very common or abundant shrub.

Species-group K
(p. 15)

27. S. namaensis Schinz in Verh. Bot. Ver. Brandenb. 31:208 (1890).

Syn.: *S. runcinata* Linn. fil. var. *crispa* Benth. in Meyer, Comment. 1:237 (1837) p.p.
S. burchellii N.E. Brown in Kew Bull. 1901: 130 (1901).
S. burchellii var. *hispidula* Skan in Thiselton-Dyer, Fl. Cap. 5, 1:326 (1912).

Type. SW Africa (Namibia): Namaqualand, Tiras, *H. Schinz* 30! (K).

Ic.: Fig. 14.

Ref.: Thiselton-Dyer, Fl. Cap. 5, 1:325 (1912); Merxmüller, Prodr. Fl. Südwestafrika 123:28 (1969).

Aromatic shrub up to 1·2 m high and 1·3 m broad, yellow green or grey green. *Stems* much branched, leafy above and below with a ± dense indumentum of short, simple, eglandular curled hairs and oil globules; glabrous on old wood. *Leaves* very variable in size and shape, irregularly lyrate-pinnatifid, up to 4 × 2·3 cm, usually less, flat to revolute, rugose, with short eglandular curled hairs and oil globules above, denser below. *Verticils* up to 14, 2–4 (–6)-flowered, c. 1 cm apart below, approximating above. *Floral leaves* lanceolate, acuminate, up to 4 × 1·5 mm; bracts present. *Pedicels*

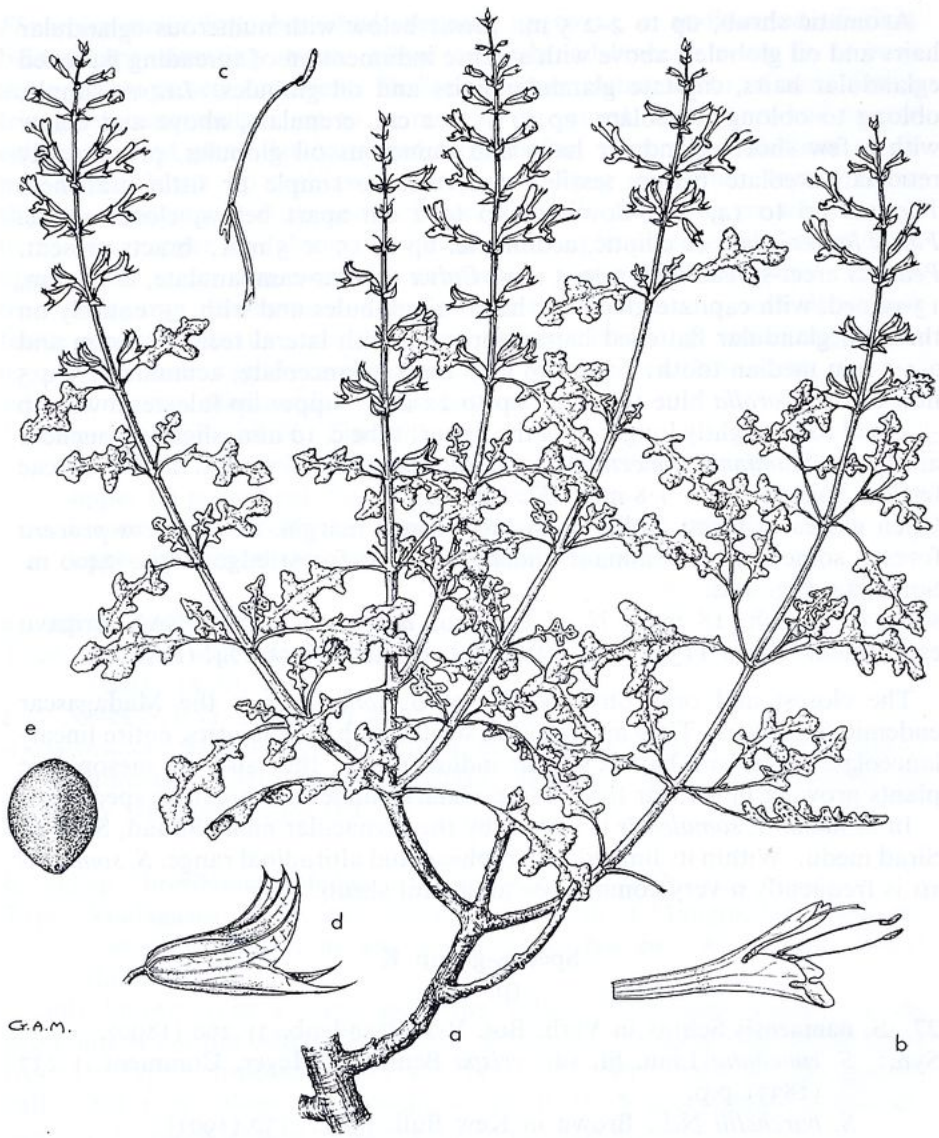

FIG. 14. *Salvia namaensis* Schinz: a, habit × $\frac{2}{3}$; b, corolla × $2\frac{2}{3}$; c, stamen × 4; d, fruiting calyx × $2\frac{2}{3}$; e, nutlet × 8. (*Willman* 2895).

erect-spreading, 2–4 (–6) mm. *Calyx* tubular, c. 6 mm in flower, becoming canpanulate in fruit and up to 8 mm, with an indumentum of short, straight and longer curled hairs, sessile glands and oil globules; upper lip with three ± equal, c. 1·2 mm teeth; lower lip with two c. 2 mm narrow lanceolate teeth. *Corolla* white, mauve or palish blue, c. 12 mm; upper lip straight, deeply bifid; lower lip longer than upper with a deeply bifid median lobe; tube c. 6–8 mm, exserted or not, slightly widened towards throat, annulate c. 3–4 mm from base. *Stamens* clearly exserted or not; staminal connectives c. 5·5 mm; filaments c. 3 mm; lower thecae sterile, ± dolabriform; fertile thecae blue. *Nutlets* round-trigonous, c. 2 × 1·5 mm, very mucilaginous on wetting. *Fl.* Sept.–May.

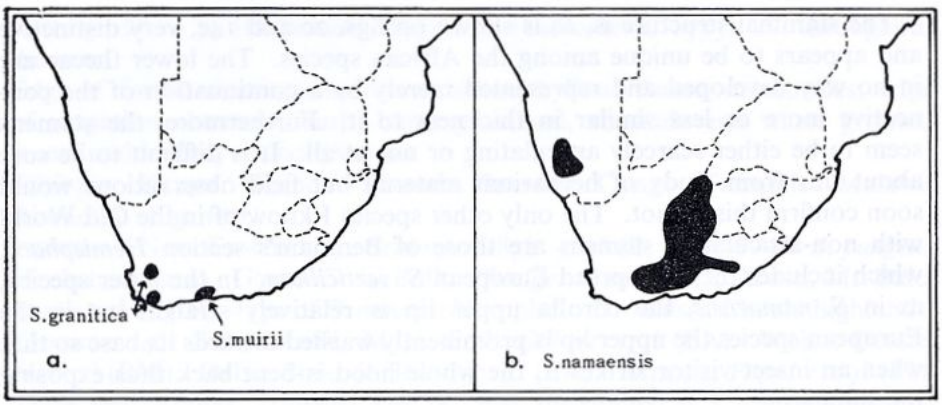

FIG. 15. Distribution of *Salvia* species in southern Africa: a, *S. granitica* Hochst. and *S. muirii* L. Bolus; b, *S. namaensis* Schinz.

Water courses, limestone krans, rocky slopes, sandy soil, karroo veld, shales, dolorite hills; 400–1700 m.

SW Africa (Namibia). S Africa: Cape SW, Orange Free State. Botswana. Fig. 15b.

SW AFRICA (NAMIBIA). Tiras mts., *Dinter* 8013! (K); Tigerberg at Garub, *Dinter* 4109 (this may be a mixed gathering—also cited as *S. garipensis*).

S AFRICA. Cape. Ladismith: Huis river mts. Little Karroo, *Compton* 4045! (K, BOL); Anysberg to Ladismith, *Esterhuysen* 17101! (BOL). Oudtshoorn: De Rust *Dahlstrand* 2092! (PRE). Laingsburg: SSE of Laingsburg, *Acocks* 20511! (K). Prince Albert: Zwartberg pass, *Bolus* 11622! (PRE, BOL); N side of Zwartberg pass, *Esterhuysen* 4519! (BOL). Willowmore: Baviaans Kloof, *Fourcade* 5180! (BOL). Prieska: Prieska, *Bryant* 1030! (PRE). Victoria west: Winterveld, between Nieuwjaars Fontein and Ezels Fontein, *Drège* 803! (K). Barkly west: Potfontein, *Leistner* 1558! (K); Kaap plateau, *Esterhuysen* 4558! (BOL, K). Hay: Kameelfontein, *Acocks* 2028! (K). Britstown: de Aar, *Esterhuysen* 1027! (BOL, K). Richmond: Rhenoster Poort, *Burchell* 2120! (K-type of *S. burchellii*). Queenstown: Hangklip mt., *Roberts* 2105! (PRE). Orange Free State. Fauresmith: SW of Luckhoff, *Acocks* 12597! (K); Blouboshoek, *Henrici* 3556! (PRE).

BOTSWANA. Taungs: Norlim, Blue Pool, *Rodin* 3645! (K); Buxton, *Brueckner* 1204! (BOL, K).

Variable in leaf shape and the degree of exsertion of the stamens but otherwise this is not a very polymorphic species. When N. E. Brown described *S. burchellii*, he was apparently unaware of Schinz's species, or at least did not mention it in his original description, but there is no doubt that the two species cannot be separated.

Although *S. namaensis* has generally been placed in Sect. *Heterosphace* Benth., the equivalent of species-group L in this revision, it is anomalous there on account of the woody habit and the leaf and calyx shape. It certainly has no clear morphological similarity with any of the closely allied members of that group. It has some general similarity with the otherwise unrelated *S. garipensis*, with which Merxmüller (28, 1969) has reported a putative hybrid, but seems to occupy an isolated taxonomic position in the genus.

The staminal structure is, as is shown on figs. 2c and 14c, very distinctive and appears to be unique among the African species. The lower thecae are in no way developed and represented merely by a continuation of the connective more or less similar in thickness to it. Furthermore, the stamens seem to be either scarcely articulating or not at all. It is difficult to be sure about this from study of herbarium material but field observations would soon confirm this or not. The only other species I know of in the Old World with non-articulating stamens are those of Bentham's section *Hemisphace*, which includes the widespread European *S. verticillata*. In the latter species, as in *S. namaensis*, the corolla upper lip is relatively straight but in the European species the upper lip is prominently waisted towards its base so that when an insect visitor strikes it, the whole hood is bent back thus exposing the stamens.

Species-group L
(p. 16)

28. S. nilotica [Juss. ex] Jacq., Hort. Vindob. 3: 48, t.92 (1776).

Syn.: *S. abyssinica* Jacq., Ic. Pl. Rar. 1:2, t.6 (1781) non Linn. fil., Suppl. (1781).
S. parviflora Salisb., Prodr. Stirp. Chapel Allerton 74 (1796)—nomen illegit.
S. hochstetteri Baker in Thiselton-Dyer, Fl. Trop. Africa 5:459 (1900).
S. macrorrhiza Chiov. in Nuov. Giorn. Bot. Ital. n.s. 36:369 (1929).

Type. Not indicated but cultivated in Hortus Vindobensis. No specimen has been traced. The original description and plate are, however, satisfactory for typification purposes.

Ic.: Jacq., Ic. Pl. Rar. 1:t.6 (1781)—sub *S. abyssinica*. Fig. 16.

Ref.: Murray in Comm. Phys. Götting. 1:88 (1778); Aiton, Hort. Kew. ed. 1, 1:43 (1789). Vahl, Enum. 1:258 (1804); Benth., Labiat. 303 (1833); DC., Prodr. 12: 350 (1848); Linnaea 37:329 (1871–73); Engler, Hochgebirgsflora 368 (1892); Thiselton-Dyer, Fl. Trop. Africa 5: 458 (1900); Robyns, Fl. Sperm. Parc. Nat. Albert 2:160 (1947).

Perennial, strongly aromatic or foetid, stoloniferous or rhizomatous. *Stems* erect, branched up to 1 m (or more), below with multicellular flattish eglandular hairs, shorter capitate glandular hairs and a few oil globules; above similar but denser. *Leaves* simple to lyrate, light green, often in basal rosettes, up to 17 × 6·5 cm, crenate, serrate or irregularly dentate; on both surfaces with a fairly sparse indumentum of simple, multicellular hairs, on lower surface mostly on veins and with oil globules. *Verticils* up to 15, 6–8-flowered, distinct below, approximating above. *Floral leaves* broad lanceolate, up to 12 × 7 mm, sometimes coloured; bracts present. *Pedicels* up to 5 mm, erect-spreading. *Calyx* campanulate up to 10 mm, sometimes brownish or purple, expanding slightly in fruit, 13-veined, with eglandular, glandular hairs and oil globules; upper lip with three subequal, 1·5–2 mm, cuspidate teeth; lower lip with two c. 4 mm cuspidate teeth. *Corolla* bluish, lilac, purple, violet, rose, greenish-white, or white, up to 12 mm; upper lip ± straight; lower lip as long as or shorter than upper; tube with a thin annulus c.3 mm from base. *Staminal connectives* c. 4 mm; filaments c. 3 mm; lower thecae fertile, free. *Nutlets* round-trigonous, c. 2 × 1·5 mm, mucilaginous on

wetting. 2n = 30 (Delestaing, 1954); 32 (Yakovleva, 1933). *Fl.* throughout the year.

Edge of forest, clearings in forest, sclerophyllous forest, streamsides, edge of irrigation channels, bush, burnt grassland, roadside and waste ground, forest understorey; 1000–3800 m.

Ethiopia. Kenya. Uganda. Rwanda, Burundi. Congo. Tanzania. Malawi. Rhodesia. Fig. 17b.

ETHIOPIA. Near Enschedcap, *Schimper* 1838: 565! (E, K, BM—as *S. pungens* Hochst., nomen). Gamo-Gofa, Bulki, *Thesiger* 1829! (BM). Arussi, Mt. Bale, *Basile* 174 (TUR—type of *S. macrorrhiza*, photo.!). Arussi, Chilalo highlands, *Hannson* 246! (EA). Kaffa, Magi, *E. F. Gilbert* 379! (EA). Wollo, Dessie, *Hall* 1! (BM). Debra Sina, *O. West* 5717! (EA). Asmara, *Pappi* 2109! (FI). Tigre, near Adowa, *Schimper* 276! (K, BM, distributed as *S. scabra* Thunb.—type of *S. hochstetteri*). Jem Jem forest, *Mooney* 6387! (BM).

KENYA. N of Maralal, *Mackinnon* 18! (EA). Sekerr Mt., *Agnew* et al. 10506! (EA); Trans Nzoia, Mt. Elgon, *Mwangangi* 371! (EA). Mt. Kenya forest reserve, *Bader* 242! (EA). Kericho dist., Arroket, *Kerfoot* 3101! (EA). Mt. Nyiru, *Kerfoot* 2066! (EA). Marang reserve, *Carmichael* 1337! (EA). Common throughout most of the country.

UGANDA. Kachwekano farm, Kigezi, *Purseglove, P.* 2746! (EA). E side of Mt. Elgon, *Wendelbo*! (E).

RWANDA. Shangugu, *Troupin* 11141! (EA).

BURUNDI. Muramvya, *Lewalle* 1618! (EA, K).

CONGO. Kalonpe, *Hendrickx* 3511! (EA). Kivu North, Virunga chain, Nyamuragira, *Stauffer* 327! (PRE, K). Kiondo, *Gille* 204! (BR).

TANZANIA. Kilimanjaro, Ngare Nairobi river N, *V. C. Gilbert* 3487! (EA). Meru, N of caldera wall, *Vesey-Fitzgerald* 5496! (K, EA). Lushoto distr., *Malima* 92! (EA). Mufundi, *Harris* 2367! (EA). Kitulo sheep project, *Prins* 252! (EA).

MALAWI. Rumpi, Chelinda, Nyika plateau, *Salubeni* 727! (K, SRGH). Nyika plateau valley, *Robson* 247! (K).

RHODESIA. Umtali, Engwa, *Exell* et al. 355! (BM). Inyanga, Pungwe, *Garley* 528! (K). Melsetter, Tarka forest reserve, *Goldsmith* 146/68! (K, SRGH). Salisbury, Uakabusi valley, *Eyles* 592! (K).

Variable in leaf shape and size but otherwise not unusually polymorphic, *S. nilotica* is widespread and common in the east African highlands and known from numerous collections. Although a fairly distinct species without any particularly close ally, its affinities are with the eastern Cape species of this species-group (sect. *Heterosphace* Benth.); they all have a similar calyx and corolla structure and share the rather unusual character of creeping rhizomes. It is a less variable species than *S. merjamie*, q.v., but has a similar distribution, altitudinal range and habitat.

Although the taxonomy of the species is quite straightforward there are aspects of its nomenclature that are not. There is apparently no herbarium specimen that can be directly linked with the original description and in the absence of such a type the species must be typified by the combination of the perfectly adequate original description and illustration. There are, however, several very early herbarium specimens of this species, which seems to have been in cultivation in several European gardens in the late 18th century;

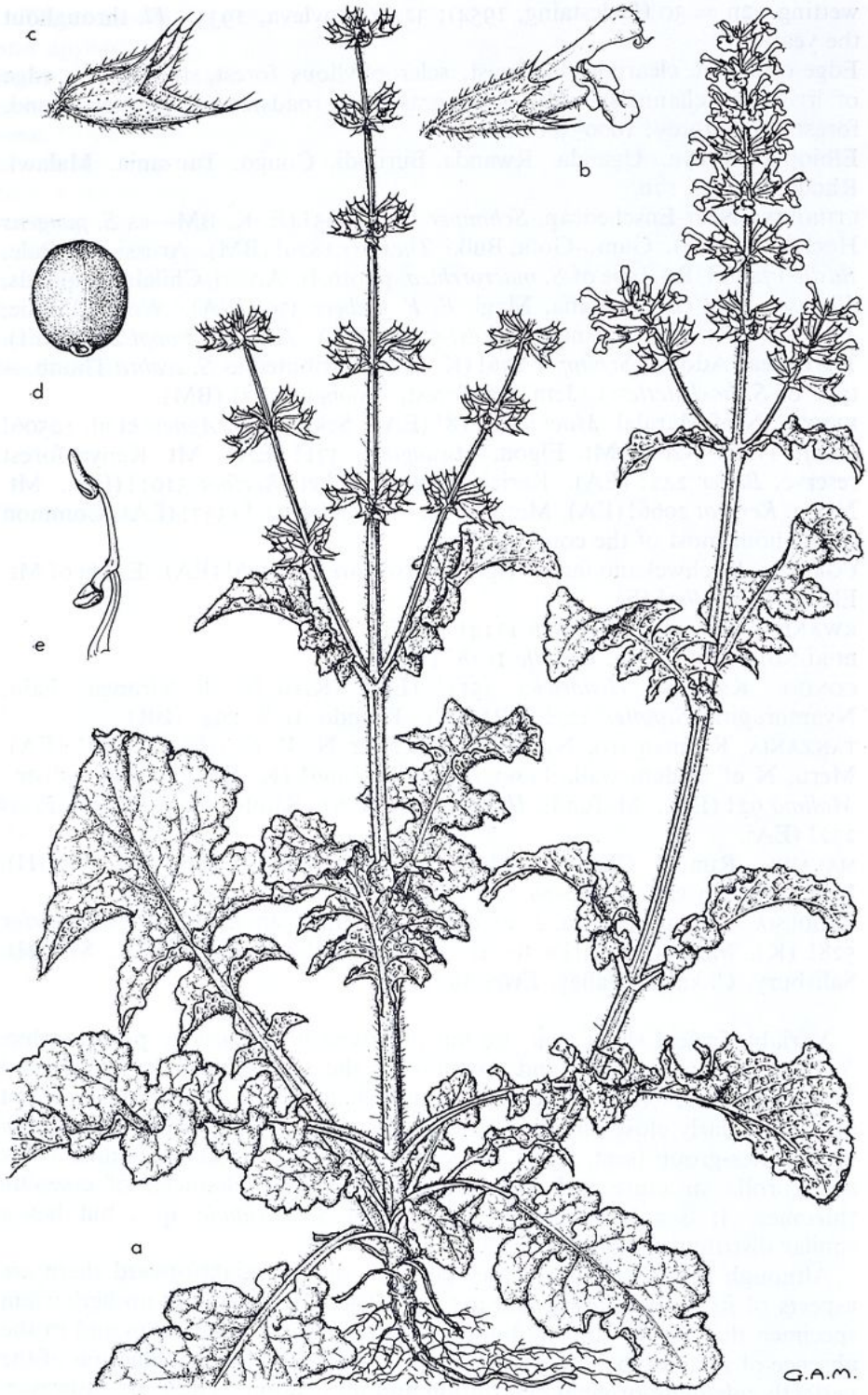

FIG. 16. *Salvia nilotica* [Juss. ex] Jacq.: a, habit × $\frac{2}{3}$; b, flower × 3; c, fruiting calyx × 3; d, nutlet × 10; e, stamen × 6. (*Wendelbo* s.n., Uganda 1967).

Aiton mentions, calling it *S. abyssinica*, that it was introduced from Abyssinia by James Bruce in 1775 and there is a specimen of this provenance in the British Museum (BM!). The other problem concerns *S. abyssinica*, described by the younger Linnaeus in 1781. From his less than adequate original description and specimen in the Linnaean herbarium (LINN—42/61!, apparently the type), it seems that he was dealing with *S. merjamie* q.v. but at the time of the late 1700s, plants were in cultivation in Europe under the name *S. abyssinica* which certainly were *S. nilotica*.

29. S. aurita Thunb., Prodr. Pl. Cap. 96 (1800).

Ref.: Vahl, Enum. 1:259 (1804); Thunb., Fl. Cap. ed. 2:451 (1823); Benth., Labiat. 305 (1833); Meyer, Comment. 1:237 (1837); DC., Prodr. 12:350 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:321, 322, 324, 331 (1910).

Perennial with ascending or straggling stems to 1·2 m. *Stems* above and below with long spreading eglandular hairs, denser above with some oil globules, rarely also with capitate glandular hairs. *Leaves* simple to lyrate or runcinate, ovate, with crenate to dentate margins up to 8 × 5·5 cm, aromatic; above and below with short simple eglandular hairs and oil globules, scattered to dense; petiole up to c. 2 cm. *Verticils* up to 15, 6–8(–12)-flowered, lowermost up to 3·5 cm apart, approximating above. *Floral leaves* ovate-lanceolate, up to 7·5 × 4 mm; bracts present. *Pedicels* erect-spreading, up to 5 mm. *Calyx* tubular campanulate, 6–9 mm in flower, broadening but scarcely lengthening in fruit, 10-veined, with short to long spreading eglandular, rarely glandular, hairs and numerous oil globules; upper lip with two c. 2·5 mm lateral teeth and a c. 1 mm median tooth, in fruit somewhat reflexed and ± clearly truncate; lower lip with two acuminate c. 3·5 mm teeth. *Corolla* pale blue, lilac, white or white flushed rose, 16–20 mm; upper lip short, straight; lower lip ± as long as upper; tube 10–15 mm, exserted, somewhat wider at throat, slightly annulate-pilose c.4 mm from base. *Staminal connectives* c. 3 mm; filaments c. 3·5 mm; lower thecae fertile, free; staminodes prominent. *Nutlets* ± round trigonous, red-brown, c. 2 × 1·7 mm, not mucilaginous on wetting. 2n = 18 (Delestaing, 1954). *Fl.* Oct.–June.

Moist places, grassy valleys, open hillsides, coastal rhenosterveld, streamsides and forest; 300–1500 m.

S Africa: Cape, SE; Natal; Transvaal. Fig. 19b.

1.	Leaves simple or with a tendency towards indistinct basal lobing, ovate	a, var. *aurita*
+	Leaves pinnatipartite with distinct basal lobes, broad oblong in outline	b, var. *galpinii*

a. var. **aurita**

Syn.: *S. sylvicola* [Burch. ex] Benth. in Benth., Labiat. 304 (1833).
S. lasiostachys Benth. in DC., Prodr. 12:350 (1848)?
S. pallidiflora Skan in Thiselton-Dyer, Fl. Cap. 5, 1:323 (1910).
S. peglerae Skan, l.c. 331.

Type. [S Africa, Cape] Without exact locality (UPS—herb. Thunberg 23/547—microfiche!)

S AFRICA. Cape. George: forest near George, *Burchell* 6052; Kaimans Gat, *Prior*. Knysna: Ruigte vallei, *Drège* 7941a; Zitzikamma, Poslpad, *Fourcade*

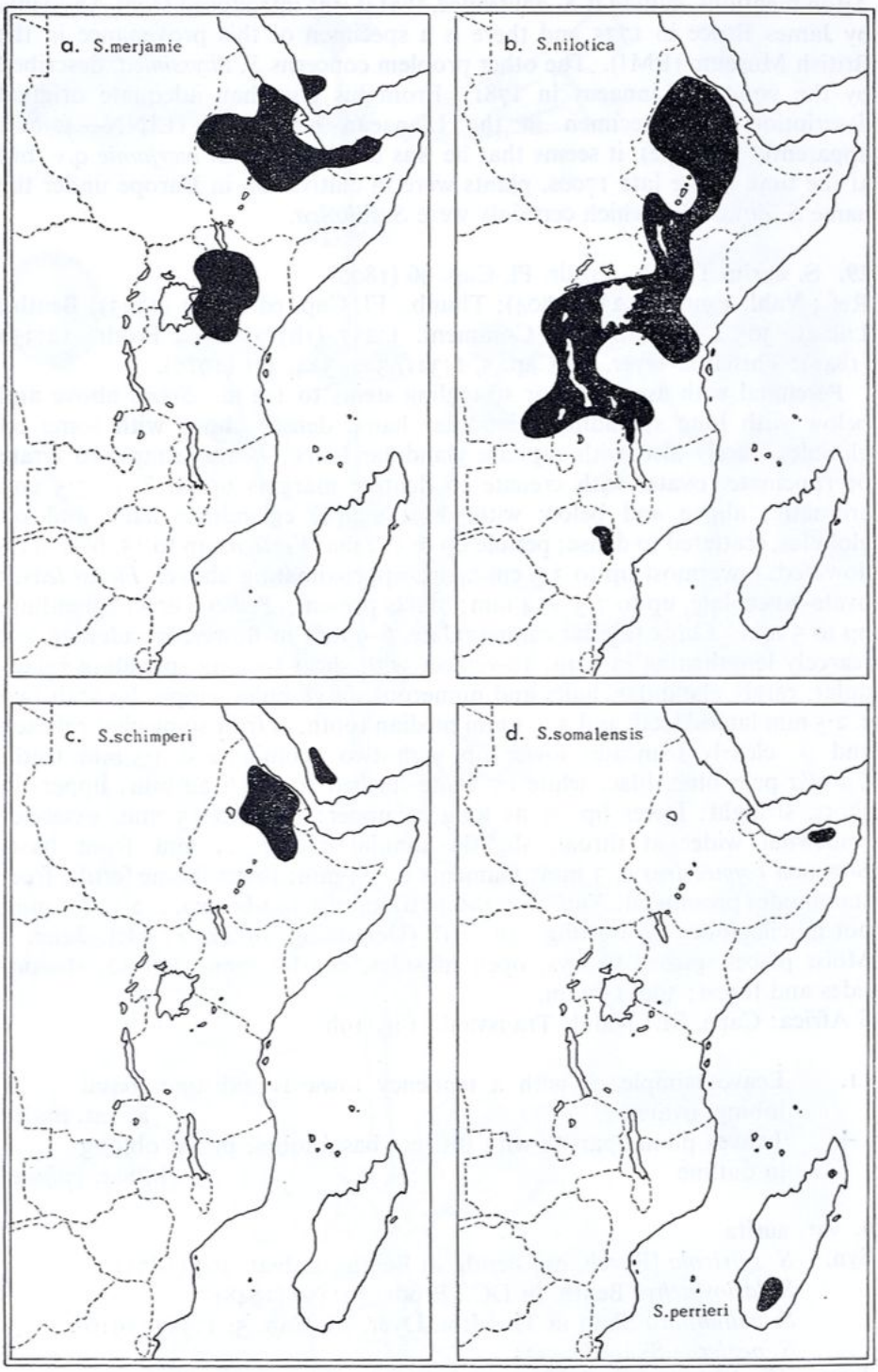

FIG. 17. Distribution of *Salvia* species in eastern Africa: a, *S. merjamie* Forssk.; b, *S. nilotica* Jacq.; c, *S. schimperi* Benth.; d, *S. somalensis* Vatke and *S. perrieri* Hedge.

211! (BOL). Humansdorp: near Canbrink, *Acocks* 13689! (K). Uitenhage: *Ecklon* 62! (K—type of *S. lasiostachys*). Albany: *Atherstone* 48. Somerset East: Boschberg, near Somerset East, *Burchell* 3165! (K—syntype of *S. pallidiflora*). Stockenstrom: Tyumie Berg. *Ecklon*. East London: Fort Pato, *Galpin* 7830! (K—syntype of *S. peglerae*). Kingwilliams Town: Keiskama Hoek, *Story* 3292! (PRE). Komgha: near Komgha, *Flanagan* 1288! (PRE, BOL). Kentani: Kentani, 300 m, *Pegler* 196! (K,BOL—syntype of *S. peglerae*); Kentani, 360 m, *Pegler* 913! (BOL, K). Transkei: Tabankulu, *Hilliard & Burtt*, B. 6505! (E); between Geau river and Bashee river, *Drège* 7941 b. Griqualand East: Umzimkulu, 10 km S of Umzimkulu, *Codd* 8567! (K, PRE).
Natal. Ixopo: 15 miles from High Flats on St Faiths road, *Burtt* 3018! (E).
Transvaal. Pietersburg: Letaba, Westfalia estate, *Scheepers* 1109! (PRE, K). Zoutpansberg: Louis Trichardt, *Breyer* 23412! (PRE).

b. var. **galpinii** (Skan) Hedge, **comb. et stat. nov.**
Syn.: *S. galpinii* Skan in Thiselton-Dyer, Fl. Cap. 5, 1:321 (1910).
Type. S Africa. Cape. Queenstown: mts. near Queenstown, *Galpin* 1956! (holo. BOL; iso. K).
S AFRICA. Cape. Albany: Zwaartkops, Zeyher 913! (BOL); Grahamstown, *McOwan* 1259! (BOL). Somerset East: edge of Boschberg plateau, *Acocks* 15708! (K). Stutterheim: Kabaku hills, *Acocks* 9248! (PRE); Fort Cunynghame, *Bolus* 10251! (BOL). Komgha: near Komgha, *Flanagan* 1213! (PRE).
Natal. Impendhle: 8 miles from Impendhle on Underberg road, *Edwards* 3089! (K). Underberg: 20 m SSW of Underberg, *Acocks* 22046! (K). Weenen: Griffins hill, *Acocks* 11409! (PRE). Kykoedie, *Acocks* 22395! (K).
Transvaal. Ermelo: Spitskop, *Pott* 15113! (PRE).

A previously much confused or fragmented species to which four new synonyms, regarded before as independent species, are now added. It seems that two varieties based on leaf shape and division are worth recognition. Their extremes are very distinct but intermediate conditions do occur.

S. aurita s.l. is a plant of rather mesophytic habitats, a somewhat sprawling herb or rarely somewhat shrubby below. It varies considerably, according to habitat, in habit, size, degree of leaf division and corolla length. There seems no doubt that *S. peglerae*, *S. galpinii*, *S. sylvicola* and *S. pallidiflora* should be united with *S. aurita*; *S. lasiostachys* is somewhat more anomalous but appears, from the inadequate type specimen, to belong here. By taking this wide view of *S. aurita*, it does not pose any taxonomic problems. It is related to various other S African species of this species-group such as *S. triangularis* and *S. scabra* but is distinguished by the leaf shape, indumentum, the long corolla and the calyx size and shape.

30. S. scabra Linn. fil., Suppl. Pl. 89 (1781).
Type. [S Africa] "In Cap. bonae spei", *Thunberg* (UPS–herb. Thunberg, 27/639 microfiche!).
Ic.: Fig. 18.
Ref.: Aiton, Hort. Kew. 1:41 (1789); Thunb., Prodr. Pl. Cap. 97 (1800); Vahl, Enum. 1:259 (1804); Thunb., Fl. Cap. ed. 2:452 (1823); Thiselton-Dyer, Fl. Cap. 5, 1:321 (1910).

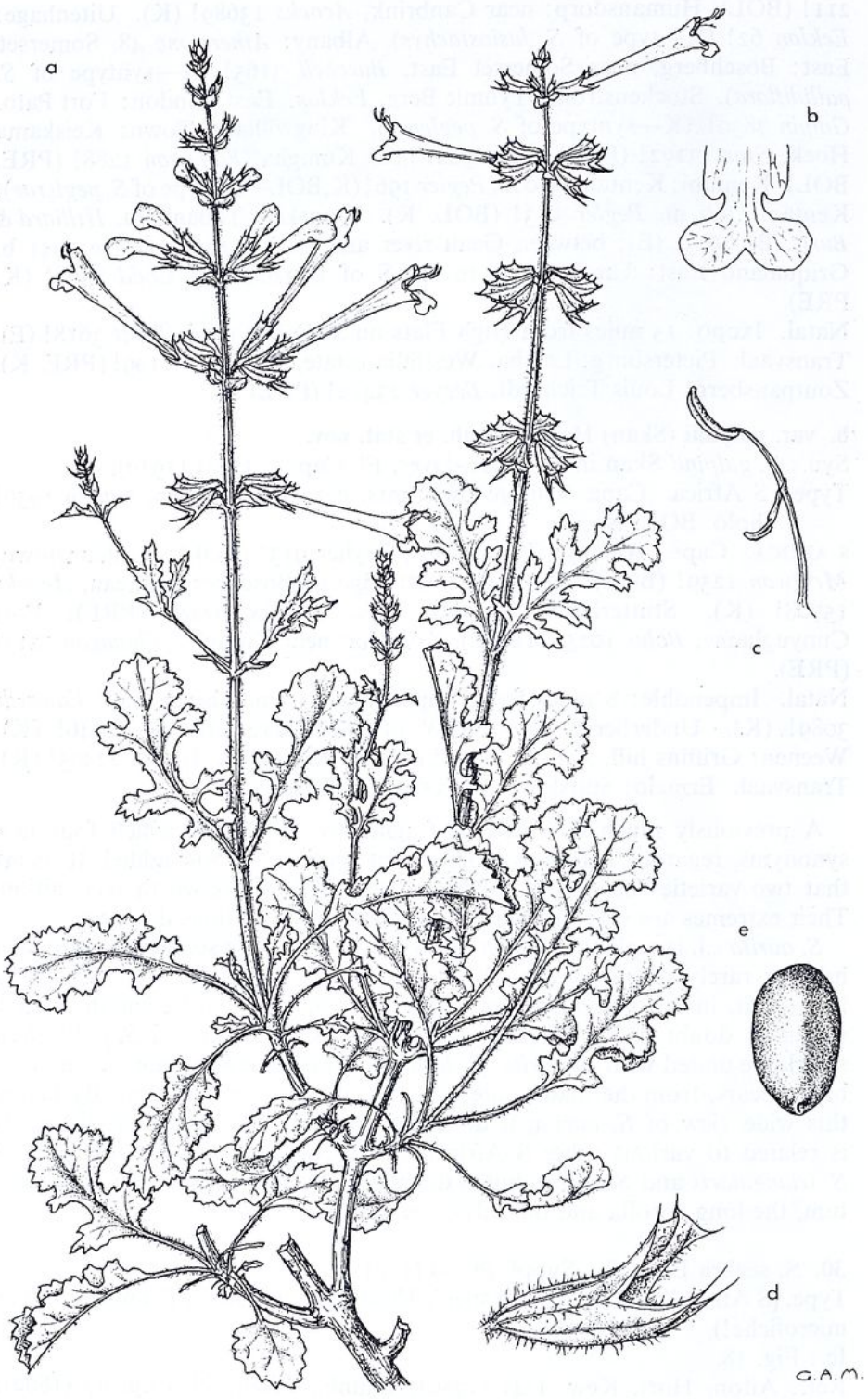

FIG. 18. *Salvia scabra* Linn. fil.: a, habit × $\frac{2}{3}$; b, lower lip of corolla × 2; c, stamen × 4; d, fruiting calyx × 3; e, nutlet × 7. (*Compton* 1515).

Perennial herb with a woody rootstock, or ± shrubby. *Stems* erect, branched up to 90 cm; above and below with a ± dense indumentum of long villous eglandular hairs and some shorter hairs. *Leaves* lyrate-pinnatifid, obovate in outline, up to 5 × 3 cm, with a large ovate terminal segment and smaller irregularly crenate or dentate lateral segments; indumentum of many eglandular hairs on both surfaces and some oil globules below; petiole up to 3·5 cm. *Inflorescence* simple or branched; verticils up to 12, 4–6-flowered, lowermost up to 3·5 cm apart ± approximating above. *Floral leaves* ovate, acuminate, up to 8 × 5 mm; bracts present. *Pedicels* erect-spreading, up to 5 mm. *Calyx* tubular, 10–12 mm, often tinged purple, 10-veined, with spreading eglandular long hairs mainly on veins, and oil globules; in fruit scarcely expanding in length but widening and becoming ovate-campanulate; upper lip with a truncate base and three subequal acuminate, subulate teeth c. 1·5 mm; lower lip with two acuminate, subulate teeth, c. 4 mm. *Corolla* 25–40 mm, mauve, lilac or purple; upper lip very short, straight; lower lip longer than upper; tube straight and narrow, slightly wider, c. 5 mm, at throat, glabrous within. *Staminal connectives* c. 5 mm; filaments c. 5 mm; lower thecae fertile, free; staminodes very small. *Nutlets* trigonous, dark reddish brown, c. 2·5 × 1·7 mm, mucilaginous on wetting. *Fl.* throughout the year.

Coastal bush, sandy shores, hill slopes, open ground in forest; from near sea level to 180 m.

S Africa: Cape, SE. Fig. 19a.

S AFRICA. Humansdorp: between Gamtoos and v. Stadens, *Bolus* s.n.! (BOL). Uitenhage: mouth of Zwartkop river, *Zeyher* 396! (BOL,K). Port Elizabeth: Humewood, *Paterson* 273! (BOL); Port Elizabeth, *Theron* 1365 (PRE). Alexandria: Bushman river mouth, *Barker* 1515! (BOL); in Alexandria forest, *Galpin* 10695! (PRE). Albany: Bushman river, *Compton* 19682! (BOL). Bathurst: in sea bush, *Fletcher* 24! (PRE); Port Alfred, *Schönland* 1553! (BOL). East London: without exact locality, *Thode* 10419! (STE).

As described and defined above, *S. scabra* is a distinct species recognised by the characters of habit, leaf shape and corolla length. It has a limited distribution near the coast in the southeast Cape.

Bentham confused the use of the name *S. scabra* in *Labiatarum* and the *Prodromus* by describing a mixture of species under this epithet. It appears that *S. aurita* sensu Benth. is *S. scabra* and that *S. scabra* sensu Benth. is a mixture of *S. namaensis*, *S. pallidiflora* (= *S. aurita*), *S. repens* and *S. runcinata*.

31. S. obtusata Thunb., Prodr. Pl. Cap. 97 (1800).

Syn.: *S. marginata* Benth. in Meyer, Comment. 1:236 (1837).

Type. [S Africa, Cape] Without exact locality (UPS—herb. Thunberg 26/615 microfiche!)

Ref.: Vahl, Enum. 1:259 (1804); Thunb., Fl. Cap. ed. 2:451 (1823); Benth., Labiat. 308 (1833); Meyer, Comment. 1:236 (1837); DC., Prodr. 12:351 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:324 (1910).

Perennial herb, somewhat woody at the base, with ascending stems up to 50 cm, or more, quadrangular, glabrous below, above with short, spreading

or antrorse eglandular hairs. *Leaves* broad-elliptic or ovate, up to 50 × 30 mm, subentire or lyrate-pinnatifid with a larger terminal segment and one or two pairs of small basal lobes, crenate, glabrous above or nearly so, below with eglandular hairs on the veins or margins, and oil globules; petiole up to 30 mm, glabrous or with long eglandular hairs. *Verticils* up to 10, 2–8-flowered, below c. 3 cm apart, slightly approximating above. *Floral leaves* ovate-acuminate; bracts present. *Pedicels* erect-spreading, 4–6 mm. *Calyx* tubular-campanulate, 6–10 mm, often purplish above, 10-veined, with short spreading eglandular hairs mostly on the veins and with oil globules, broadening in fruit, but scarcely lengthening; upper lip with a truncate base and three subequal teeth, c. 1 mm; lower lip with two acuminate subulate teeth c. 2·2 mm. *Corolla* 20–25 mm, mauve (?); tube c. 18 mm, slightly wider at throat, glabrous within; hood short, straight; lower lip longer than upper. *Staminal connectives* c. 5 mm; filaments c. 4 mm; lower thecae fertile, free. *Nutlets* ovate, trigonous, dark-brown, 2·8 × 1·5 mm, not mucilaginous.
S Africa: Cape.
S AFRICA. Cape. Uitenhage: between Kuga and Zondagrivier, *Drège* 7944a, and Ado, *Drège* 7944b! (K—syntypes of *S. marginata* Benth.). Albany: Grahamstown, in herb *Prior* s.n.! (K). Albert: sine loc., *Cooper* 592! (E,K,BM).

Very little material has been seen of this species and its range of variation is not known. It does, however, appear to be a distinct species nearest to *S. scabra* but with a sparse or almost absent indumentum and smaller corollas. The distributional area of *S. obtusata* lies within that of *S. scabra*.

The type specimen in the Thunberg herbarium is very similar to *Cooper* 592 cited above.

32. S. triangularis Thunb., Prodr. Pl. Cap. 96 (1800).
Syn.: *S. tenuifolia* Benth., Labiat. 304 (1833).
Type. [S Africa, Cape] Without exact locality (UPS—herb. Thunberg 28/652 microfiche!)
Ref.: Vahl, Enum. 1:269 (1804); Thunb., Fl. Cap. ed. 2:451 (1823); Benth., Labiat. 308 (1833); Meyer, Comment. 1:236 (1837); DC., Prodr. 12:351 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:323 (1910).

Perennial herb, scarcely woody at base. *Stems* slender, ascending or scrambling, up to 50 cm (–1 m), quadrangular, with long spreading eglandular hairs below and long glandular, rarely eglandular, hairs above. *Leaves* simple, ovate-triangular, c. 3 × 2 cm, cordate or truncate at base, crenate, pilose on both surfaces with eglandular hairs and oil globules below; petiole up to 2(–3) cm with long spreading hairs. *Inflorescence* simple or branched; verticils up to 10, 6-flowered, distant, c. 3 cm apart below, approximating above. *Floral leaves* ovate-lanceolate, acuminate; bracts present. *Pedicels* erect-spreading, up to 7 mm. *Calyx* tubular, 9–11 mm in flower, 11-veined, expanding to 12–16 mm in fruit and campanulate; indumentum of spreading eglandular and glandular hairs and oil globules; upper lip with a truncate base and three c. 2·5 mm acuminate, subulate teeth; lower lip with two c. 3·5 mm teeth. *Corolla* purple, mauve or pale blue, c. 15 mm; upper lip ± straight, fairly short; lower lip somewhat shorter than upper; tube c. 11 mm, glabrous within. *Staminal connectives* c. 3 mm; filaments c. 4·5 mm; lower

thecae fertile, free. *Nutlets* broad obovate-trigonous, dark brown, c. 2 × 1·5 mm, not (?) mucilaginous on wetting. *Fl.* Aug.–Oct.
Among bushes, near springs; sea level to 1200 m.
S Africa: Cape, E. Fig. 19c.
S AFRICA. Humansdorp: 12½ m NNE of Humansdorp, *Acocks* 13734! (K). Uitenhage: Uitenhage's waterworks, *Dahlstrand* 814! (PRE); Enon, *Thode* A 2740! (PRE). Port Elizabeth: Perseverance, *Long* 817! (PRE,K). Bathurst: Port Alfred, *sine coll.* 180! (BOL). Somerset: Blyde river, *Burchell* 2981. Stockenstrom: Katberg, *Shaw*! (K). Kingwilliamstown: Kingwilliamstown, ann. 1888, *Sim* s.n.! (PRE).

S. triangularis can be recognised by the softly pilose, relatively small triangular-ovate leaves and the longish spreading indumentum on the upper parts of the stem. It has affinities with *S. aurita* but has much smaller leaves and corollas; it is also allied to *S. scabra* but in *S. triangularis* the leaves are always entire and the corollas are much smaller.

33. S. tysonii Skan in Thiselton-Dyer, Fl. Cap. 5, 1:320 (1910).
Syntypes. S Africa [Cape]. Tembuland: near Emgwali river, *Bolus* 10249! (BOL,K). Griqualand East: banks of Umzimkulu river near Clydesdale, *Tyson* 2171! (BOL,K). [Natal] Near Charlestown, *Wood* 7883! (K). Zululand: Gudena, *Gerrard* 2031.

Perennial with a creeping woody rootstock. *Stems* erect, usually simple, branched above, sturdy, quadrangular, up to 1·4 m; above and below with a ± dense indumentum of short curled eglandular hairs and oil globules. *Leaves* runcinate, serrulate or irregularly serrate, up to 9·5 × 5 cm with a terminal segment of c. 6 × 6 cm; above with scattered short ± adpressed eglandular hairs, below with a dense short indumentum of curled eglandular hairs and oil globules; lower leaves petiolate, uppermost subsessile. *Inflorescence* usually much branched; verticils up to 12(–24), c. 8-flowered, below c. 3·5 cm apart closer above. *Floral leaves* broad ovate, long-acuminate, 7 × 4 mm; bracts present. *Pedicels* up to 3 mm. *Calyx* tubular, c. 8·5 mm, often tinged purple, 12-veined, with short spreading eglandular hairs, mostly on veins, and some oil globules, not or scarcely enlarging in fruit; upper lip ± truncate with lateral teeth c. 2·5 mm and median c. 1·5 mm; lower lip with two c. 3 mm triangular, acuminate teeth. *Corolla* reddish or blue, c. 14 mm; upper lip short, straight; lower lip longer than upper; tube straight, exannulate, c. 10 mm. *Staminal connectives* c. 3 mm; filaments c. 2·5 mm; lower thecae fertile, free. *Nutlets* light brown with a minutely tuberculate surface. *Fl.* Dec.–Mar.
Rocky slopes, streamsides; 760–1450 m.
S Africa: Cape, E; Natal. Fig. 19h.
S AFRICA. Cape: Maclear: Pomona, Ugie, *Gill* 165! (BOL).
Natal: Mooi river, *Halcro Johnston* 440! (E), 574! (E).

Apparently a distinct species, at least among this very polymorphic group, on account of the rather coarse foliage, the erect sturdy stems and the dense or many-flowered verticils. But as with all the species in this complex, better field notes are needed in order to amplify the description and to understand better the range of variation.

34. S. repens [Burch. ex] Benth. in Benth., Labiat. 306 (1833).
Ref.: Meyer, Comment. 1:235 (1837); DC., Prodr. 12:350, 352, 353 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:328, 330-332 (1910).

Perennial herb (or rarely a semi-shrub?) with a woody creeping rhizome. *Stems* ascending to erect, branched, up to 80 cm, quadrangular, above and below with spreading or antrorse long or short eglandular hairs, rarely glandular, and oil globules. *Leaves* simple to sublyrate, oblong to broad obovate, with few eglandular lucid hairs, mainly on veins below, and oil globules. *Inflorescence* simple or branched. *Verticils* up to 14, 6-8-flowered, up to 3 cm apart below, scarcely approximating above. *Floral leaves* ovate-lanceolate, c. 4 × 3 mm; bracts present. *Pedicels* erect-spreading, 2–4 mm. *Calyx* tubular-campanulate, 5–10(–13) mm in flower, somewhat expanding in fruit, 10-veined, with short eglandular hairs on veins and oil globules; upper lip with a truncate base and three 0·5–1·5 mm teeth; lower lip with two 2·5–4 mm teeth. *Corolla* pale blue, lilac, mauve, purple, deep blue or white, 10–26 mm; upper lip ± straight; lower lip equal to, shorter or longer than upper; tube 5·5–15 mm, with an annulus 1·5–6 mm from base. *Staminal connectives* c. 4.5–6·5 mm; filaments 3·5–5 mm; lower thecae fertile, free. *Nutlets* ± round-trigonous, c. 2 × 1·5 mm, with oil globules at apex, slightly mucilaginous on wetting. *Fl.* Oct.–May.
Bush, grass, karroid veld, grassy slopes, shale and earth banks; 460–2440 m. S Africa: Cape, mostly E; Natal; Transvaal; Orange Free State. Lesotho. Fig. 19f.

An extremely variable species to which I have added six new specific synonyms. These were all maintained or described by Skan in *Flora Capensis* but I have found it quite impossible to recognise or define them at specific, or in most cases at any level. The key to this group of species in *Flora Capensis* is patently unsatisfactory with, or even without, the additional material at hand since Skan's time. However, the range of variation in this group as a whole (i.e. not just *S. repens* s.l.) is so great that it is inevitably difficult to formulate any kind of really satisfactory key. Certainly, herbarium studies alone are never going to give a proper understanding of the variation of such characters as indumentum, leaf shape and size, calyx and corolla length. Field observations should at least help in answering some of these problems and could result in the recognition of additional taxa; they could also determine whether specific limits are being obscured by hybridisation and introgression with related species such as *S. runcinata* and *S. stenophylla*, which are certainly closely allied to *S. repens*, *S. triangularis* and *S. tysonii*. Until such information is available, the wisest course seems to be to recognise one unusually variable species with three relatively distinct varieties.

1. Corolla 20–26 mm; leaves up to 10 × 4·5 cm . . b, var. *keiensis*
\+ Corolla less than 20 mm; leaves less than 10 × 3·5 cm . . . 2
2. Leaves narrow oblong, 3 × 0·8–5 × 1·8 cm, simple, densely covered with numerous oil globules; stems erect, much branched; corolla 10–15 mm . . . . . c, var. *transvaalensis*
\+ Leaves elliptic to obovate with simple to runcinate, larger leaves and fewer oil globules; stems ascending, much or little branched; corolla 15–19 mm . . . . . a, var. *repens*

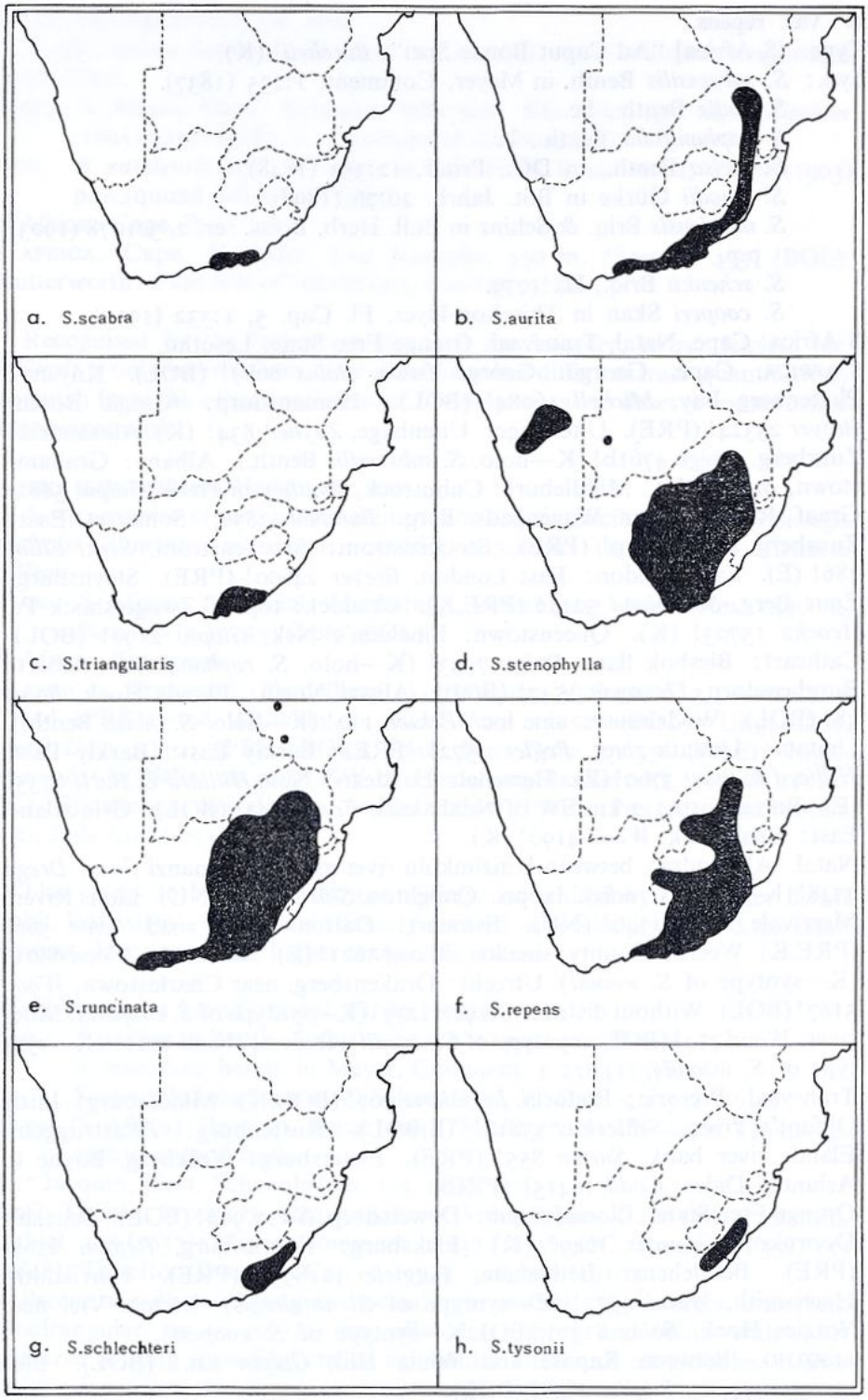

FIG. 19. Distribution of *Salvia* species in southern Africa: a, *S. scabra* Linn. fil.; b, *S. aurita* Thunb.; c, *S. triangularis* Thunb.; d, *S. stenophylla* Benth.; e, *S. runcinata* Linn. fil.; f, *S. repens* Benth.; g, *S. schlechteri* Briq.; h, *S. tysonii* Skan.

a. var. **repens**

Type. [S Africa] "Ad Caput Bonae Spei", *Burchell*! (K).

Syn.: *S. subsessilis* Benth. in Meyer, Comment. 1:235 (1837).
S. rudis Benth., l.c.
S. raphanifolia Benth., l.c.
S. incisa Benth., in DC., Prodr. 12:352 (1848).
S. woodii Gürke in Bot. Jahrb. 26:76 (1898).
S. natalensis Briq. & Schinz in Bull. Herb. Boiss. ser. 2, 3:1078 (1903) p.p.
S. schenkii Briq., l.c. 1079.
S. cooperi Skan in Thiselton-Dyer, Fl. Cap. 5, 1:332 (1910).

S Africa: Cape, Natal, Transvaal, Orange Free State. Lesotho.

S AFRICA. Cape. George: George Town, *Bolus* 8687! (BOL). Knysna: Plettenberg Bay, *Michell* 16084! (BOL). Humansdorp: Assegai Bosch, *Breyer* 23324! (PRE). Uitenhage: Uitenhage, *Zeyher* 834! (K). Alexandria: Zuurberg, *Drège* 4761b! (K—holo. *S. subsessilis* Benth.). Albany: Grahamstown, *Burke*! (K). Middleburg: Culmstock, *Southey* in Herb. *Galpin* 5882. Graaf Reinet: near Wagenpads Berg, *Burchell* 2830. Somerset East: Zuurberg, *Sidey* 3119! (PRE). Stockenstrom: Stockenstrom, *Scott Elliot* 286! (E). East London: East London, *Breyer* 24600! (PRE). Steynsburg: Zuur Berg, *Schönland* 3211! (PRE,K). Cradock: top of Zwagershock P., *Acocks* 15703! (K). Queenstown: Fincham's Nek, *Galpin* 2196! (BOL). Cathcart: Blesbok flats, *Drège* 7943! (K—holo. *S. raphanifolia*). Albert: Burghersdorp, *Flanagan* 1547! (BOL). Aliwal North: Elands Hoek, *Bolus* 48! (BOL). Wodehouse: sine loc., *Ecklon* 112! (K—holo. *S. incisa* Benth.). Umtata: Umtata river, *Pegler* 1572! (PRE). Barkly East: Barkly Pass, *Hilliard & Burtt* 3760! (E). Herschel: Lundean's Nek, *Hilliard & Burtt* 6735! (E). Butterworth: 2 km SW of Ndabakazi, *Codd* 9243! (BOL). Griqualand East: Vaal Bank, *Wood* 4190! (K).

Natal. Alexandra: between Umzimkulu river and Umkomanzi river, *Drège* 4748! (K—holo. *S. rudis*). Ixopo: Creighton, *Shirley* s.n.! (NU). Lions River: Merrivale, *Moll* 1340! (NU). Estcourt: Dalton bridge road, *Pentz* 566! (PRE,K). Weenen County: sine loc., *Wood* 3621! (E). Newcastle: *Wood* 6801! (K—syntype of *S. woodii*). Utrecht: Drakensberg, near Charlestown, *Wood* 5187! (BOL). Without district: *Cooper* 1279! (K—syntype of *S. cooperi*); Mooi river, *Wood* 772! (BOL—syntype of *S. woodii*); ibidem, *Wood* 3621! (K—syntype of *S. woodii*).

Transvaal. Pretoria: Pretoria, *Leendertz* 967! (BOL,K). Middleburg: Little Olifant's river, *Schlechter* 3818! (E,BOL). Rustenburg: Zwartruggens, Elands river bank, *Sutton* 855! (PRE). Pietersburg: Volkberg, Boyne to Ashmole Dales, *Codd* 10415! (PRE).

Orange Free State. Bloemfontein: Dewetsdorp, *Steyn* 902! (BOL). Senekal: Doornkop, *Goosens* 1049! (K). Ficksburg: Fouriesburg, *Repton* 6260! (PRE). Bethlehem: Bethlehem, *Potgieter* 21895! (PRE). Harrismith: Harrismith, *Wood* 4972! (Z—syntype of *S. natalensis*); Besters Vlei near Witzies Hoek, *Bolus* 8237! (BOL,K—syntype of *S. cooperi*).

LESOTHO. Between Rapase and White Hill, *Galpin* s.n.! (BOL). Blue mountain pass, *Bayliss* 2628! (PRE).

An extremely variable and widespread variety.

b. var. **keiensis** Hedge, **var. nov.**

A var. *repente* floribus maioribus (20–26 mm), foliis latioribus longioribus bene differt.

Type. S Africa, Cape: Komgha, hills near Kei river, 450 m, *Schlechter* 1895: 6232! (holo. Z — syntype of *S. natalensis*).

Syn.: *S. natalensis* Briq. & Schinz in Bull. Herb. Boiss. ser. 2, 3:1078 (1903) p.p. (quoad *Schlechter* 6232).

S Africa. Cape, E.

S AFRICA. Cape. Komgha; near Komgha, 550 m, *Flanagan* 475! (BOL). Butterworth: 2 km SW of Ndabakezi, *Codd* 9243! (K).

Recognised by the larger corollas and the broader, longer leaves, var. *keiensis* is only known from three gatherings but differs at least quantitatively so much from the other specimens of *S. repens* s.l. as to deserve some formal taxonomic rank.

c. var. **transvaalensis** Hedge, **var. nov.**

A var. *repente* et var. *keiensi* foliis minoribus simplicibus anguste oblongis globulis punctatis numerosis, corollis minoribus (10–15 mm) distincte differt.

Type. S Africa. Transvaal: Heidelberg, Vereeniging, Burttholm, 1470 m, *Burtt-Davy* 17135! (holo. BOL).

S Africa. Transvaal.

S AFRICA. Transvaal. Heidelberg: Vereeniging, Vyffontein 3, *Burtt-Davy* 7780! (PRE); ibid, Hutchinson, *Burtt-Davy* 15052! (BOL); Uitgevallen, *Burtt-Davy* 9110! (PRE, BOL); ibid, *Burtt-Davy* 13655! (PRE); Nigel, *Louw* 816! (PRE); 20 miles SW of Heidelberg-Bankerveld, *Acocks* 21023! (K). Standerton: Standerton, *Jenkins* 10695! (PRE). Pretoria: Kaalfontein vlei, *Pole-Evans* 653! (PRE).

This seems to be a very distinct variety, recognised by the rather dwarf habit, leafy stems, small leaves densely covered with oil globules and the small flowers. It may warrant higher taxonomic status.

35. S. runcinata Linn.f., Suppl. Pl. 89 (1781).

Syn.: *S. scabra* in Benth., Labiat. 305 (1833) p.p. non Thunb.
S. monticola Benth. in Meyer, Comment. 1:238 (1837);
S. sisymbrifolia Skan in Thiselton-Dyer, Fl. Cap. 5, 1:328 (1910).

Type. [S Africa] "In Cap. bonae spei, *Thunberg*". (UPS- herb. Thunberg. 26/636 microfiche!).

Ic.: Jacquin, Hort. Schoenbrunn. 1:5, t.8 (1797).

Ref.: Thunb., Prodr. Pl. Cap. 97 (1800); Vahl, Enum. 1:260 (1804); Benth., Labiat. 305 (1833); Meyer, Comment. 1:237 (1837); DC., Prodr. 12: 352, 353 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:327, 328, 329 (1910).

Perennial with a creeping or descending rootstock. *Stems* erect, branched, quadrangular, up to 40(–70) cm, often less, above and below with short antrorse to long spreading curled eglandular hairs and oil globules. *Leaves* oblong-lanceolate to obovate, runcinate-pinnatipartite to ± lyrate, up to c. 8 × 2·5 cm, aromatic, lobes rounded to triangular, pubescent on both surfaces or ± glabrous above, with numerous oil globules below. *Verticils*

up to 20, 4–8-flowered, up to 3 cm apart below, scarcely approximating above. *Floral leaves* ovate-acuminate, c. 5 × 3 mm; bracts present. *Pedicels* suberect, 3–4 mm. *Calyx* ovate-campanulate, 5–7 mm, broadening but scarcely elongating in fruit and ± adpressed to axis, 10-veined, with short to long eglandular hairs and oil globules; upper lip with a truncate base and three subequal c. 1 mm teeth; lower lip with two 2·5 mm lanceolate-acuminate teeth. *Corolla* pale blue to lilac, white or mauve, 7–14 mm; upper lip ± straight; lower lip equal to or slightly longer than upper; tube 4·5–9 mm long, c. 3 mm wide at throat, with an annulus c. 2·5 mm from base. *Staminal connectives* c. 3 mm; filaments c. 2·5 mm; lower thecae fertile, free. *Nutlets* round-trigonous, brown, mucilaginous on wetting. *Fl.* Oct.–Apr.

Stony slopes, damp grassland, cultivated or waste ground, black soil, irrigation furrows, vlei; 50–1800 m.

S Africa: Cape, E; Natal; Transvaal; Orange Free State. Lesotho. Botswana. Rhodesia. Fig. 19e.

S AFRICA. Cape. Caledon: Caledon, *Prior*. Bredasdorp: Nachtwacht, *Smith* 3039! (PRE). Swellendam: Malagas, *Esterhuysen* 5034! (BOL). Riversdale: near Riversdale, *Schlechter* 1866! (G). Knysna: near Plettenberg Bay, *Leipoldt* 17083! (BOL). Victoria West: Nieuwveld, *Drège* 4750c. Barkly West: Hongerdoorn, *Esterhuysen* 1019! (K). Humansdorp: 45 miles N of Humansdorp, *Fourcade* 5195! (K). Uitenhage: Zwartkops river, *Zeyher* 397. Albany: Bothas hill, 10 miles from Grahamstown, *Dyer* 1457! (PRE). Middelburg: Noortgedag, *Watt & Brandwyk* 1718! (PRE-atypical and similar in facies to *S. repens* s.l.). Queenstown: Zwartkei, *sine coll.*! (E). Cathcart: Blesbok flats, near Windvogel mt., *Drège* 7946a! (K-syntype of *S. monticola*). Stutterheim: Fort Cunynghame, *Sim* 20079! (PRE). Albert: New Hantam, *Drège* 7945! (K—syntype of *S. runcinata* var. *grandiflora* Skan). Transkei: between Geau and Bashee rivers, *Drège* 7946c! (K,M—syntype of *S. monticola*).

Natal. Weenen: Grantleigh, *King* 13! (PRE); Colenso, *Wood* 4042! (K—syntype of *S. sisymbrifolia*). Dundee: Townlands, *Shirley* s.n.! (NU). Newcastle: Newcastle, *Wood* 5883! (E). Utrecht: near Charlestown, *Wood* 6245! (E—approaching *S. repens* s.l.). Zululand: Ingoma, *Gerrard* 1227.

Transvaal. Wolmaransstad: Boskuil, *Sutton* 90! (PRE—atypical). Potchefstroom: E of Potchefstroom, *Theron* 1155! (PRE). Heidelberg: Vereeniging, *Leendertz* 10916! (PRE). Standerton: Standerton, *Jenkins* 10044! (PRE—form with small corollas, poorly developed anthers and dwarf habit). Wakkerstroom: Volksrust, *Jenkins* 10041! (PRE). Johannesburg: Johannesburg, *Leendertz* 6095! (PRE). Bethal: Bethal, *Leendertz* 12736! (PRE). Ermelo: Nooitgedacht, *Henrici* 231! (PRE). Marico: Zeerust, *Thode* A1490! (PRE). Pretoria: near Pretoria, *Schlechter* 3691! (E); Pretoria, *Burtt-Davy* 7079! (K—syntype of *S. sisymbrifolia*). Middleburg: Bangor Farm, *Bolus* 14123! (BOL). Carolina: Carolina, *Rademacher* 7267! (PRE). Rustenburg: Zwartruggens, *Sutton* 1118! (PRE). Lydenburg: Lydenburg, *Wilms* 1109! (E,K). Waterberg: Waterberg, *Galpin* M601! (PRE).

Orange Free State. Bethulie: Tussen die riviere Wildtuin, *Roberts* 5408! (PRE). Bloemfontein: Trompsberg, *Potts* 3886! (PRE). Senekal: Willem Pretorius Wildtuin, *Kok* 21! (PRE). Bethlehem: Bethlehem, *Saayman* 9! (PRE). Kroonstad: Kroonstad, *Chennells* 141! (BOL). Heilbron: Heilbron, *de Villiers* 42B! (PRE)—apparently a gynodioecious form).

LESOTHO. Maseru: *Schmitz* 218! (PRE); Mokhotlong, *Liebenberg* 5829! (PRE).
BOTSWANA. Mahalapye, *Mansergh* 1145! (BOL). Near Mafeking, *Bolus* 6410! (PRE—entire leaved form). Vryburg: Vryburg, *Mogg* 8507! (PRE).
RHODESIA. Matopos, *Kolbe* 4076! (BOL). Shangani, *Feiertag* 45552! (K).

A most variable species represented by apparently innumerable intergrading forms none of which seems to warrant taxonomic recognition. Its specific limits are far from clear. On one hand, it has close links with *S. stenophylla* and on the other with *S. repens*. Although no factual information is at hand, the range of variation suggests that hybridisation and introgression may be a factor in the confusion.

Skan (in Thiselton-Dyer, Fl. Cap. 5, 1:327, 1910) recognised two varieties within his circumscription of *S. runcinata*—var. *nana* Skan, dwarf plants with leaves often purplish above, and var. *grandiflora* Skan with corollas c. 12 mm long. The latter forms with large corollas are difficult to distinguish satisfactorily from *S. repens*. However, the closest ally of *S. runcinata* is certainly *S. stenophylla* which at least in its most typical form can usually be distinguished by the narrower leaves with narrower segments and the almost glabrous stems but extreme forms of each approach each other very closely.

I find it impossible to maintain Skan's independent species *S. sisymbrifolia* at any rank and there is no reason to doubt that it is just another of the leaf variants of *S. runcinata*.

36. S. stenophylla [Burch. ex] Benth., Labiat. 306 (1833).
Syn.: *S. xerobia* Briq. in Bull. Herb. Boiss. ser. 2, 3:1076 (1903).
S. chlorophylla Briq., l.c. 1080.
Type. [S Africa, Cape] "Ad Caput Bonae Spei", (Griqualand West: at Griqua Town, Dec. 1811), *Burchell* 1881! (K).
Ic.: Fig. 20.
Ref.: Meyer, Comment. 1:238 (1837); DC., Prodr. 12:353 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:326 (1910).

Perennial, much-branched, erect bushy aromatic herb. *Stems* quadrangular up to 60 cm, often less, above and below with scattered very short stiff eglandular hairs and some oil globules, mostly above. *Leaves* narrow linear-oblong to oblong-lanceolate in outline, c. 5 × 1 cm, pinnatified to pinnate to almost simple, with up to 10 pairs of narrow serrate segments or lobes; indumentum of very short eglandular hairs, mostly on nerves below, and numerous oil globules. *Verticils* up to 10, 6(–8)-flowered, c. 15–20 mm apart below, scarcely closer above. *Floral leaves* ovate-acuminate, c. 4 × 2 mm; bracts present. *Pedicels* suberect, 2–3 mm. *Calyx* ovate, 4–5 mm in flower, broadening but scarcely elongating in fruit and ± adpressed to axis, 11-veined, with very short eglandular hairs on veins and numerous oil globules; upper lip with a truncate base and three short triangular mucronate teeth, outer c. 1 mm, median c. 0.5 mm; lower lip with two lanceolate triangular teeth c. 2·3 mm. *Corolla* pale blue or pinkish, c. 12 mm; upper lip ± straight, bifid; lower lip equal to or slightly longer than upper; tube c. 7 mm long, c.4 mm broad at throat, annulate c .2 mm from base. *Staminal connectives*

FIG. 20. *Salvia stenophylla* [Burch. ex] Benth.: a, habit × $\frac{2}{3}$; b, T.S. of corolla × $2\frac{2}{3}$; c, stamen × $6\frac{2}{3}$; d, fruiting calyx × 4; e, nutlet × $6\frac{2}{3}$. (*Sidey* 346).

c.3·5 mm; filaments c. 2·5 mm; lower thecae fertile, free. *Nutlets* ± round-trigonous, c. 1·5 × 1·7 mm, lightish brown, mucilaginous on wetting. *Fl.* Oct.–Apr. (—throughout the summer months).
Sandy and limestone soil, roadside, river banks, damp places, grass steppe, brak areas; 400–2300 m.
SW Africa (Namibia). S Africa: Cape E, Natal, Transvaal, Orange Free State. Lesotho. Botswana. Fig. 19d.
SW AFRICA (NAMIBIA). Windhoek, *Dinter* 1899: 316! (Z—type of *S. chlorophylla*). 12 miles from Windhoek, *Tolken & Hardy* 715! (K—form with simple leaves). Nauchas, banks of Kam river, *Pearson* 9044! (BOL,K). Krumhoek, Aus, *Streg* 2431! (PRE).
S AFRICA. Cape. Prieska: Prieska to Kuruman, *Bryant* 873! (PRE). Beaufort West: between Beaufort West and Rhenoster Kop, *Drège* 7946a. Barkly West: Daniels Kuil, *Esterhuysen* 2025! (BOL). Griqualand West: Kimberley, *Esterhuysen* 1017! (BOL). Richmond: Rhenosterfontein, S of Richmond, *Acocks* 15832! (K). Humansdorp: Humansdorp, *Kennedy* 995! (PRE). Uitenhage: hills in Uitenhage Karroo, *Prior* s.n. Albany: Koonap heights, *Britten* 2037! (PRE). Middelburg: Rovispruit, *Esterhuysen* 19741! (PRE). Graaf Reinet: near Graaf Reinet, *Bolus* 130! (BOL). Bedford: Ledford, *Bayliss* 2446! (PRE). Fort Beaufort: Kat River Poort, *Drège* 7946b. King Williams Town: Green river, *Sim* 2533! (E). East London: Keiskama, *Schlechter* 1894:6115! (Z—type of *S. xerobia*). Colesberg: Colesberg, *Shaw* s.n. Cradock: mountain zebra park, *Liebenberg* 7636! (PRE). Queenstown: Queenstown, *Cooper* 2893. Albert: Stormberg Spruit, *Burke*. Barkly East: 5 miles east of Belmore on road from Belmore to Rhodes, *Hilliard & Burtt* 3771! (E). Maclear: below Naude's Nek, *Hilliard & Burtt* 6633! (E). Griqualand East: around Kokstad, *Tyson* 1893! (E).
Natal. Weenan: near Gourton, *Wood* 3631. Vryheid: Vryheid, *Galpin* 9693! (PRE,K).
Transvaal. Bloemhof: Kameelpan, Christiana, *Theron* S571! (PRE) Potchefstroom: Elandsfontein, *Theron* 814! (PRE). Woolmaransstad: Maquassie, *Morris & Boucher* 233a! (PRE). Lichtenburg: Grasfontein, *Sutton* 383! (PRE). Carolina: Leeuwpoort, *Burtt-Davy* 7357! (PRE). Lydenburg: Sukukunie, *Barnard* 342! (PRE). Pietersburg: near Pietersburg, *Junod* 1753! (G).
Orange Free State. Fauresmith: Luckhoff, *Sidey* 346! (PRE). Bloemfontein: Bloemfontein, *Bouwer* 2201! (PRE). Senekal: Doornkop, *Goosens* 656! (PRE,K). Bethlehem: Bethlehem, *von Ginkel* 264! (PRE). Harrismith, *Sankey* 229. Kroonstad: ten miles north of Kroonstad, *Scheepers* 1342! (K, PRE). Brakput: Brakput, *Henrici* 5190! (PRE).
LESOTHO. Berea/Leribe border, *Guillarmod* 4790! (PRE). Bechuanaland SE, Takatshwane Pan, *Wild* 4994; 22 miles SW of Takatswane on road to Lehututu, *de Winter* 7432! (K).
BOTSWANA. Vryburg: Armoedsvlakte, *Mogg* 8666! (CGE), *Mogg* 8078! (STE). Basutoland: Léribé, *Dieterlen* 196c! (K); Bushmanspass, *Werdermann & Oberdieck* 1547! (K).

In its most typical form, as shown in fig. 20, *S. stenophylla* is recognised by the narrow linear-oblong, pinnatifid leaves and the small calyces which in fruit are more or less adpressed to the axis. Most of the specimens cited above

come into this category but there are several which do not and show some features of the allied *S. runcinata* and *S. repens*; hybridisation between the three species seems one of the possible reasons for these anomalous specimens.

In South-West Africa (Namibia), many of the specimens have almost simple leaves (such as the type of *S. chlorophylla* cited above) and morphologically are somewhat transitional to *S. repens*. As is true for this whole species-complex, only observations in the field are going to give a clear picture of the range of variation. In this particular instance, population studies in Namibia are needed to determine whether or not there is a continuous range from the typical form of *S. stenophylla* with narrow pinnatifid leaves to that with entire leaves similar, at least in leaf shape, to *S. repens*.

37. S. schlechteri Briq. in Bull. Herb. Boiss. ser. 2, 3:1077 (1903).
Syn.: *S. monticola* Benth. var. *angustifolia* Skan in Thiselton-Dyer, Fl. Cap. 5, 1:330 (1910).
Type. S Africa, Cape. Umtata; Umtata, *Schlechter* 6330! (Z—holo.).
Ref.: Thiselton-Dyer, Fl. Cap. 5, 1:330 (1910).

Perennial, woody at base. *Stems* erect or ascending, up to 30 cm, simple or branched, ± sturdy, densely leafy, quadrangular, with scattered short and longer, thickish eglandular hairs and some oil globules. *Leaves* pinnatifid to pinnatisect, narrow oblong-elliptic in outline, with 4–6 pairs of short irregularly dentate lateral segments and a slightly larger terminal segment; on both surfaces with numerous oil globules and some scattered short eglandular hairs. *Inflorescence* short, not or somewhat branched. *Verticils* up to 7, 4–6-flowered, lowermost up to 2 cm apart, closer above. *Floral leaves* lanceolate, long acuminate, up to 6·5 × 2·5 mm; bracts present. *Pedicels* c. 3 mm. *Calyx* ovate-campanulate, c. 9 mm, 10-veined, with an indumentum of short thickish eglandular hairs, mostly on veins and margins; upper lip truncate, lateral teeth c. 1·5 mm, median tooth c. 0·5 mm; lower lip with two lanceolate subulate c. 3·5 mm teeth. *Corolla* pale blue and white, up to 25 mm, pilose, gradually widening from the base to the c. 8 mm wide throat; upper lip ± straight; lower lip ± equal to upper, with a very broad median lobe; tube c. 14 mm, annulate c. 5 mm from base. *Staminal connectives* c. 6 mm; filaments c. 5 mm; lower thecae fertile, free. *Fl.* Jan.–Feb.
Escarpments; c. 1000 m.
S Africa, Cape, E. Fig. 19g.
S AFRICA. Cape. Idutywa: Xobo valley, *Van Breda* 865A! (K). Between Geau and Bashee rivers, *Drège* 4751! (K—type of *S. monticola* var. *angustifolia* Skan).

Although relatively few specimens of this taxon have been seen, it appears to be a distinct species on account of the rather short leafy stems, the pinnatifid or pinnatisect leaves with short lateral segments and the broad-throated corollas. Skan (Fl. Cap. 5, 1:330, 1910) included it as a variety of *S. monticola* Benth. but I find it impossible to separate this species from *S. runcinata*. However, his variety, which undoubtedly is the same as Briquet's species, is outwith the considerable variation range of *S. runcinata* and, at least with the material at hand, merits independent specific status.

Species-group M
(p. 16)

38. S. granitica Hochst. in Flora 28:65 (1845).

Type. S Africa, Cape: Caledon, in solo granitaceo ad rad. mont. Babiloonse Toorn (Babylon's Tower), prope Caledon, Dec. 1838, *Krauss* 1120! (MB. W, BAS).

Ic.: Fig. 21.

Ref.: DC., Prodr. 12:358 (1848); Thiselton-Dyer, Fl. Cap, 5, 1:333 (1910).

Stoloniferous perennial with a woody rootstock. *Stems* erect-ascending up to 60 cm, not or little branched, quadrangular, below subglabrous or with a few up to 3 mm eglandular white spreading hairs, above with very short simple hairs and few glandular hairs. *Leaves* simple, linear to linear-oblanceolate, 30–50 × 3–6 (–10) mm, subentire or rarely irregularly dentate, ± glabrous above or ciliate on margins, below with a scattered indumentum of very long white eglandular hairs, a few shorter eglandular hairs and oil globules; leaves sessile or lamina narrowed into a short petiole. *Inflorescence axis* usually unbranched; verticils 5–9, 2-flowered, c. 2 cm distant below, scarcely approximating above. *Floral leaves* ovate-acuminate, c. 4 × 2 mm, tardily deciduous; bracts present, very small. *Pedicels* erect-spreading, up to 6 mm. *Calyx* narrow tubular-campanulate, 10–12 mm, not or scarcely expanding in fruit, 9-veined, villose or villulose with long spreading eglandular hairs, shorter capitate glandular hairs and oil globules; upper lip ± truncate, outer teeth c. 2 mm, acuminate-cuspidate, median tooth c. 1 mm; lower lip with two c. 5 mm teeth. *Corolla* mauve-pink, c. 20 mm; hood falcate; lower lip subequalling upper; tube slightly exserted, annulate c. 5 mm from base. *Staminal connectives* c. 11 mm; filaments c. 5 mm; lower thecae with a fertile portion. *Nutlets* not known. *Fl.* Nov.–Dec.

Stony slopes.

S Africa, Cape: Clanwilliam and Caledon. Fig. 15a.

S AFRICA. Clanwilliam: middle east slope of Grasruggens Mt., *Pillans* 8712! (BOL); lower slope of Cold Bokkeweld Mts. above Olifant's river at Keerom, *Esterhuysen* 17911! (BOL); hills a mile SE of Keerom, *Pillans* 8694! (BOL, K).

Although *S. granitica* was first collected as long ago as 1838, exactly 100 years were to pass before it was re-collected, not this time from the type locality but more than a hundred miles to the north. Krauss made the original gathering on the mountain Babylon's Tower in Caledon and, in 1938, Pillans the second one from Clanwilliam division. The latter collection remained undetermined until during the course of this study I was able to see a specimen of the Hochstetter species and identify the Clanwilliam plant. To both Bentham in the *Prodromus* and Skan in *Flora Capensis*, *S. granitica* was "an imperfectly known species" both because the original description was so scanty and because they never saw the type specimen. Although I have now seen four separate gatherings of it, all of which are virtually identical, and there is no doubt that it is an extremely distinct and interesting species, no clear answer can be given to the question of its affinities. It appears, as does the unrelated *S. muirii*, to occupy a very isolated position among the southwest Cape species with no connection at all with the shrubby species, more or less confined to this region, and very little affinity with any of the several species of the previous species-group L which are unrepresented

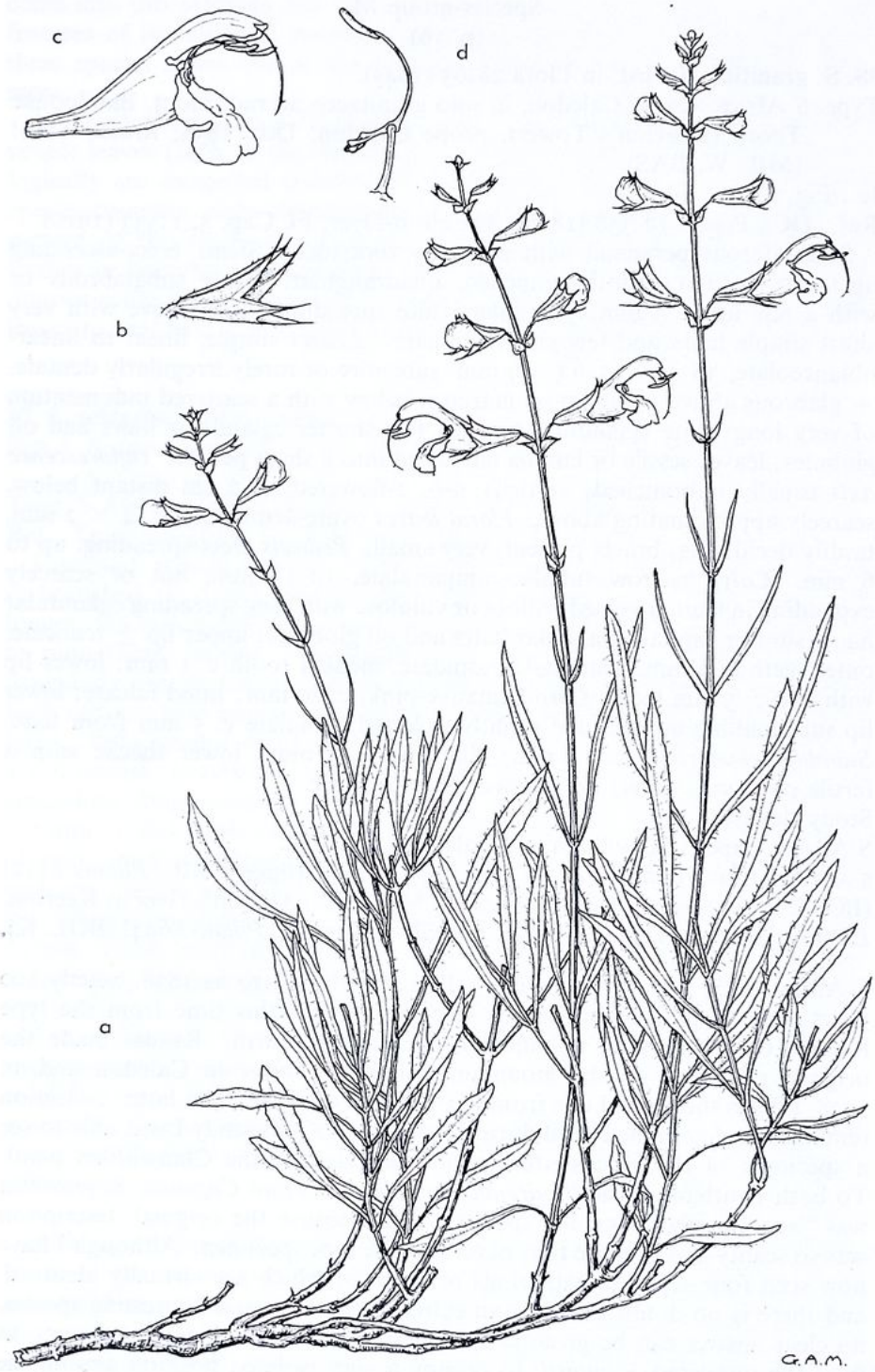

FIG. 21. *Salvia granitica* Hochst.: a, habit × $\frac{2}{3}$; b, calyx × $1\frac{1}{3}$; c, corolla × $1\frac{1}{2}$; d, stamen × 3. (*Esterhuysen* 17911).

within the area of *S. granitica* or, for the most part, within the southwest Cape at all. Although in floral characters, *S. granitica* is unlike any of the species of species-group L, it does share with many species of that group the character of a creeping rootstock.

Species-group N
(p. 16)

39. S. broussonetii Benth., Labiat. 227 (1833).
Syn.: *S. bolleana* de Noé in Bonplandia 8:284 (1860).
Type. Canary Islands: Tenerife, *Broussonet*! (BM—in herb. Lambert).
Ic.: Webb & Berthelot, Hist. Nat. Isles Canar. t. 166 (1846).
Ref.: l.c. 3:90 (1845); DC., Prodr. 12:285 (1848); Bonplandia 8:284 (1860); Pitard & Proust, Fl. des Iles Canaries 307 (1909); Lindinger, Beitr. Fl. kanar. Ins. 223 (1920); Publ. Fac. Pharm. Paris 16:40 (1930); Sarracenia 5:52 (1960); Lid, Contrib. Fl. Canar. 153 (1967).

Shrubby perennial, *Stems* up to 60 cm, above and below with numerous long and short spreading glandular hairs. *Leaves* simple, broad ovate, thick-textured, up to 13 × 11 cm, cordate at base, irregularly crenate-erose, white pannose beneath with glandular hairs densely covering the nervature, above with long glandular and eglandular hairs; petiole c. 5 cm. *Inflorescence* paniculate, racemose; verticils 2–6 flowered, ± condensed. *Floral leaves* ovate, acuminate, c. 8 × 5 mm; bracts present. *Pedicels* c. 2 mm. *Calyx* ovate, c. 8 mm, 13-veined, densely viscid with long spreading glandular hairs; upper lip with lateral teeth c. 2·5 mm and the median tooth c. 1 mm; lower lip with two lanceolate, acuminate, c. 4 mm teeth. *Corolla* c. 15 mm, white, pilose, glandular; upper lip falcate, compressed; tube c. 6 mm, glabrous within, ± straight, not invaginated; lower lip with a broad median lobe and small oblong lateral lobes. *Staminal connectives* c. 8 mm; filaments c. 3 mm; lower thecae sterile, dolabriform. *Nutlets* not known. 2n = 22, 44 (Larsen, 1960). *Fl.* Feb.–Jul.
Basalt maritime cliffs; c. 100 m.
Canary Islands: Tenerife, W and NE; Lanzarote.
CANARY ISLANDS. Tenerife: Igueste de San Andres, *Bramwell* 1727! (RNG); Taganana, *Bourgeau* 1493! (K, CGE, BM). Lanzarote: Magne, towards Magne, *Stone* 87.

Although Bentham was uncertain about the provenance of this species when he described it and implied from his remark "Hab. in Teneriffa ? vel in Africa boreali" that it might be a north African plant, there is no doubt that it is a Canary Island species. *S. broussonetii* has no close allies and must be considered as an isolated relict. It is characterised by the shrubby habit, broad ovate leaves and rather small falcate white corollas.

Species-group O
(p. 16)

40. S. balansae de Noé in Bull. Soc. Bot. France 2:581 (1855).
Type. Algeria: Oran, near Mostaganem, *Balansa* 98! (K).
Ic.: Battandier & Trabut, Atlas Fl. Alger. 2: t.22 (1896). Fig. 22.
Ref.: Battandier & Trabut, Fl. Alger. 1:687 (1890); Quezel & Santa, Nouv. Fl. Algér. 2:793 (1963).

Suffruticose herb up to 70 cm. *Stems* numerous, little branched, arachnoid-eglandular below, above with short glandular and eglandular hairs. *Leaves* simple, narrow linear or oblong-linear, up to 7·5 × 0.7 cm, revolute, crenulate, bullate, ± white lanate below with oil globules, above with scattered eglandular hairs; lowermost leaves narrowed into a short petiole, upper sessile. *Verticils* up to 8, c. 6-flowered, lowermost up to 4·5 cm apart, approximating above. *Floral leaves* broad-ovate, acuminate, up to 11 × 7 mm, reflexed in fruit; bracts absent. *Pedicels* erect-spreading up to 4·5 mm. *Calyx* campanulate, up to 13 mm, slightly enlarging in fruit and with a concave upper lip, 13-veined, with an indumentum of glandular and eglandular hairs; upper lip with short incurving teeth, outer c. 0·5 mm and median c. 0·3 mm; lower lip with two c. 2·3 mm lanceolate, acuminate teeth. *Corolla* white or bluish, up to 24 mm; upper lip clearly falcate, longer than lower lip with a large suborbicular median lobe; tube glabrous within, widening near throat, invaginated near base. *Staminal connectives* c. 16 mm; filaments c. 3 mm; lower thecae dolabriform, sterile, adhering. *Nutlets* round-trigonous, russet-brown, c. 3 × 2 mm, mucilaginous on wetting. *Fl.* Mar.–June, or ± throughout the year.

Garigue, calcareous fields; near sea level to ? m.

Algeria, NW & SE.

ALGERIA. Mostaganem, Djebel Diss, 1 vi 1936, *Faure* s.n.! (E). Near Oran, Pont-du-Cheliff, *Warion* 77! (E,K). Valley of l'oued-Abdi, at Heydous (Aurès), *Balansa* 829! (E, BM—var. floribus coeruleis). Cheliff river, *Davis* 51768! (E).

Although somewhat variable in leaf shape, indumentum and flower colour, this is a very distinct species without obvious relations. It is easily recognised by its suffruticose habit, linear leaves and strongly falcate white or bluish corollas.

Battandier & Trabut (Fl. Alger. 2:688, 1890) mention a var. *aurasiaca* de Noé with narrower leaves than normal and blue flowers; I have not been able to trace if this was formally published elsewhere.

Species-group P
(p. 16)

41. S. jaminiana de Noé in Bull. Soc. Bot. France 2:581 (1855).

Type. Algeria: near Biskra, *Jamin*.

Ic.: Coss., Fl. Atlant. 2: t.159 (1897).

Ref.: Battandier & Trabut, Fl. Alger. 1:686 (1890); Bonnet & Barratte, Cat. Pl. Tunis. 333 (1896); Quezel & Santa, Nouv. Fl. Algér. 2:794 (1963).

Caespitose suffruticose perennial. *Stems* little branched, erect-ascending, up to 40 cm, glabrous below or with very short capitate glandular hairs, above with multicellular eglandular hairs and a few capitate glandular hairs. *Leaves* 1 (–2)-pinnate, linear-elliptic in outline, up to 6·5 × 2·5 cm, segments narrow linear, glabrous or with a few short eglandular hairs and oil globules; petiole up to 2 cm. *Verticils* up to 15, 6–8-flowered, up to 3 cm apart below, approximating above. *Floral leaves* broad ovate, acuminate, c. 10 × 7 mm; bracts absent. *Pedicels* c. 3 mm. *Calyx* broad campanulate, up to 14 mm, 13-veined, very densely covered with very long spreading eglandular hairs

FIG. 22. *Salvia balansae* de Noé: a, habit × ⅔; b, corolla × 1; c, lower lip of corolla × 1⅓; d, stamen × 1⅔; e, fruiting calyx × 1½; f, nutlet × 7. (*Davis* 51768).

and shorter capitate glandular hairs; inside throat with a ring of hairs; upper lip with two 5·5 mm lateral teeth and a 3·5 mm median tooth; lower lip with two c. 7·5 mm acuminate teeth. *Corolla* white (?), up to 18 mm; upper lip slightly falcate, longer than lower lip; tube c. 12 mm, glabrous within. *Staminal connectives* 15 mm; filaments c. 2·5 mm; lower thecae fertile. *Nutlets* not known. *Fl.* Mar.–Jun.
Rocky slopes, desert pastures, rock fissures.
Algeria, Tunisia.
ALGERIA. l'Oued-Biskra, Biskra, *Balansa* 998! (E,K). Mengoub, Ouled Sidi Cheikh, *Paris* 132! (K).
TUNISIA. N from Chott El-Djerid, Oued Zitourn, *Letourneux*. (Bonnet & Barratte 333, 1896).

A very distinct species easily recognised by the pinnate leaves, the more or less glabrous stems and leaves and the very long calyx teeth; without any near allies.

Species-group Q
(p. 17)

42. S. phlomoides Asso, Intr. Oryctogr. Arag. 158 (1784) non Cav. (1797).
Syn.: *S. montana* Salisb., Prodr. Stirp. Chapel Allerton 74 (1796)—nomen illegit.
S. arachnoidea [de Noé ex] Walp. in Ann. Bot. Syst. 3:256 (1852).
Type. Spain: Aragon, Puerto de Daroca, *Asso* (P?).
Ref.: Vahl, Enum. 1:278 (1804); Benth., Labiat. 229 (1833); DC., Prodr. 12:287 (1848); Bonnet & Barratte, Cat. Pl. Tunis. 332 (1896); Jahandiez & Maire, Cat. Pl. Maroc 3:641 (1934); Emberger & Maire, op. cit. 4:1114 (1941); Quezel & Santa, Nouv. Fl. Algér. 2:794 (1963).
Tuft-forming perennial with a woody rootstock. *Stems* often simple, sturdy, up to 50 cm, arachnoid-lanate near base; above with numerous long spreading capitate glandular and eglandular hairs. *Leaves* simple, oblong-spathulate, entire or widely crenulate-dentate, up to 8 × 2·5 mm, lanate, sessile, mostly basal and rosette-forming. *Verticils* c. 5, up to 8-flowered, distinct. *Floral leaves* enfolding calyces, broad-ovate, acuminate, lanate-floccose, up to 2·5 × 2 cm; bracts absent. *Pedicels* suberect, up to 5 mm. *Calyx* tubular, up to 20 mm, 14-veined, with long simple eglandular hairs and shorter capitate glandular hairs; upper lip ± truncate at base with three subequal c. 1·5 mm teeth; lower lip with two spinulose 7 mm teeth. *Corolla* violet with white markings, c.30 mm; upper lip slightly falcate; lower lip shorter than upper, tube ± straight, exannulate. *Staminal connectives* up to 20 mm; filaments c.5 mm; lower thecae dolabriform, sterile, not cohering. *Nutlets* round-trigonous, reticulately veined, c. 2·7 × 3 mm, mucilaginous on wetting. *Fl.* May–June.
Spain, NW Africa.

In Africa, *S. phlomoides* generally differs from its Spanish forms in having more densely white-lanate leaves with entire margins and intense violet corollas. Recently the NW African plant has been given independent specific rank but as some Spanish specimens are virtually indistinguishable from those

of Africa, I prefer to agree with Maire in giving it merely varietal rank and distinguishing it from the type variety, restricted to Spain, on the characters mentioned above.

var. **africana** Maire in Bull. Soc. Hist. Nat. Afr. Nord. 26:222 (1933).
Syn.: *S. botschantzevii* Tschern. in Bot. Zhurn. 57:101 (1972).
Type. Not indicated.
Clearings in forest, pastureland, rocky limestone slopes; 850–2100 m.
Morocco, Algeria, Tunisia.
MOROCCO. Middle Atlas, Doüet Achlef, *Jahandiez* 1923: 374! (E). Iminin Tizi, Demnat to Ait Tontlin, *Balls* 3033! (K). Near Fez, *Trethewy* 351! (K). High Atlas, Mikdane, 12 miles SW Midelt, *Lawrence* 25! (BM).
ALGERIA. 5–8 mm W of Ain Mobed, NE of Djelfa, *Davis* 53408! (E). Saharan Atlas near Zenina, 10 vii 1968, *Botschantzev* 784 (LE—holo. *S. botschantzevii*).
TUNISIA. Recorded by Bonnet & Barratte (332, 1896) from the high plateau of W Tunisia.

S. phlomoides (i.e. including its two varieties) is very closely related to two SW Asiatic species: *S. hypargeia* Fisch. & Mey. from C Anatolia and *S. montbretii* Benth. from Turkish Mesopotamia, N Iraq and N Syria. The three species are very closely allied, almost meriting subspecific rather than specific status, and provide an excellent example of NW African-SW Asiatic vicariads; their distributions are mapped in Ann. Naturhist. Mus. Wien 75: 53, fig. 6 (1971). Further to the east, *S. canescens* C.A. Meyer from the Caucasus and *S. lanata* Roxb. from the Himalayas are also within this broad species group and clearly related to *S. phlomoides*.

43. S. gattefossei Emberger in Bull. Soc. Sc. Nat. Maroc 15:182 (1935).
Type. Morocco: between Bou-Mallem and Djebel Sagho, 1700–2000 m, 15 v 1933, *Emberger*! (MPU).
Ref.: Emberger & Maire, Cat. Pl. Maroc 4:1114 (1941).

Caespitose perennial with a woody rootstock. *Stems* unbranched up to 20 cm with a dense indumentum of spreading long and short capitate glandular hairs. *Leaves* all basal, ovate, c. 3·5 × 3 cm, erose, with numerous glandular hairs on both surfaces; petiole c. 3 cm. *Verticils* c. 6, starting near base of stem, c. 5-flowered, all distinct, lowermost, c. 4 cm apart. *Floral leaves* ovate, c. 8 × 6 mm; bracts present. *Pedicels* erect-spreading, c. 4 mm. *Calyx* tubular, c. 13 mm, 13-veined, densely viscid with long spreading glandular hairs and oil globules; upper lip 3-toothed, outer c. 1·8 mm, inner one c. 0·7 mm; lower lip with two c. 4–5 mm acuminate-spinulose teeth. *Corolla* 28 mm, purple (e descr.); upper lip falcate; lower lip ± equal to upper; tube straight, glabrous and exannulate within ± exserted. *Staminal connectives* 18 mm; filaments c. 2·3 mm; lower thecae dolabriform, sterile, not cohering. *Nutlets* light brown, subtrigonous, 3 × 2 mm, mucilaginous on wetting. *Fl.* May.
Deserts and uncultivated land with *Stipa tenuissima*; 1700–2000 m.
Morocco, SW (Anti Atlas).

Apparently only known from the single, less than completely adequate gathering, more material is essential before the status of *S. gattefossei* can be assessed. Emberger in the original description created a new monotypic

section, *Briquetia* Emberger, to accommodate it. Although the reasons he gave, based on relatively unimportant characters of the staminal connectives and the upper lip of the calyx, are insufficient to merit a new section, it is nevertheless not entirely clear what the affinities of this Moroccan endemic are. Its closest specific ally appears to be *S. palaestina* which in Africa is known only from a few stations in SE Egypt, but is quite widely distributed in east Mediterranean countries. Both species have similar calyces and flowers, both in structure and dimensions and are quite alike in general appearance, even though the solitary specimen of *S. gattefossei* has all its leaves basal and bears verticils from near ground level and may well be a rather anomalous specimen. It is of interest to note that some plants of *S. palaestina* from unfavourable habitats can also look like this. The two species, which certainly seem to be quite distinct from each other, have a clearly different calyx indumentum. In *S. gattefossei*, the calyces are very densely covered with long spreading glandular hairs whereas in *S. palaestina* the calyx indumentum is rather scattered, comprising long flat white multicellular eglandular hairs and much shorter glandular hairs; the floral leaves in *S. palaestina*, which often are coloured, are relatively larger than in *S. gattefossei*.

44. S. palaestina Benth., Labiat. 718 (1835).
Type. [Israel] "In Palaestinae arvis, *Bové*"! (K).
Ref.: DC., Prodr. 12:282 (1848); Täckholm, Students Fl. Egypt 147 (1956).

Perennial herb. *Stems* erect, up to c. 50 m, sturdy, quadrangular, branched above, below with a very dense indumentum of long, flat, eglandular multicellular hairs and very short eglandular hairs; above with shorter eglandular hairs and capitate glandular hairs. *Leaves* oblong in outline, pinnatifid or lyrate, irregularly crenate or serrate, rugose-colliculate, up to 12 × 5 cm, with short eglandular white hairs on both surfaces and oil globules below. *Verticils* up to 10, 4–6-flowered, lowermost up to 2 cm apart, less above. *Floral leaves* prominent, slightly shorter than calyces, broad ovate, acuminate-cuspidate, often coloured, c. 20 × 14 mm; bracts present. *Pedicels* suberect, c. 2 mm. *Calyx* tubular, 10–14 mm in flower, expanding to c.17 mm often purplish, with long eglandular and shorter glandular hairs, 13-veined; upper lip with three closely connivent teeth, the median c. 2 mm, the outer c. 3 mm; lower lip with two narrow triangular acuminate c. 7·5 mm teeth. *Corolla* lilac to whitish, c. 28 mm; upper lip falcate; lower lip shorter than upper; tube c. 15 mm somewhat pouched above, slightly exserted, ventricose, glabrous within. *Staminal connectives* c. 17 mm; filaments c. 2·7 mm; lower thecae dolabriform, sterile, cohering. *Nutlets* c. 2·5 × 2·3 mm, ± round-trigonous, pale brown with darker venation, mucilaginous on wetting.
Fields and waste ground.
Egypt, Sinai, Palestine, Syria, Turkey, Iraq, Iran.
EGYPT. W Ashur, S of Galala, ann. 1887, *Schweinfurth* s.n.! (BM).

Only one specimen from Egypt has been seen but the species is also recorded by Täckholm (1956), further south from the cited locality, in the 'Arabian desert' between Wadi Tumilat to Qena-Qossier road where it is said to be very rare. As is the case with *S. spinosa*, *S. palaestina* is essentially a SW Asiatic species which just reaches into Africa.

45. S. spinosa Linn., Mantissa Alt. 511 (1771).
Type. Egypt, *Forskål*! (LINN—42/44)—originally labelled as "*S. aegyptiaca*".
Ic.: Jacquin, Ic. Pl. Rar. 1: t.7 (1781).
Ref.: Etlinger, Salvia 35 (1777); Vahl, Enum. 1:276 (1804); Benth., Labiat. 224, 718 (1835); DC., Prodr. 12:281 (1848); Durand & Barratte, Fl. Libycae Prodr. 187 (1910); Pampanini, Fl. Cirenaica 395 (1931); Täckholm, Students Fl. Egypt 147 (1956); Publ. Cairo Univ. Herb. 4:64 (1971).

Herbaceous perennial. *Stems* sturdy, quadrangular, much branched above, up to 60 cm, with glandular and eglandular hairs, denser above and more glandular. *Leaves* simple, broadly ovate, slightly cordate at base, irregularly crenate or erose, up to 16 × 11 mm, colliculate, above and below with a thin to fairly thick indumentum of eglandular hairs. *Inflorescence* much branched, ± candelabriform; verticils c. 10, c. 4-flowered, lowermost c. 3 cm apart, approximating above. *Floral leaves* broad ovate, large, up to 2·5 × 1.8 cm subulate; bracts present. *Pedicels* erect-spreading, up to 2·5 mm. *Calyx* tubular up to 20 mm, enlarging in fruit with spinose teeth to 25 mm, 13-veined, with long eglandular and shorter glandular hairs; upper lip with two lateral c. 4·5 mm teeth and a c. 3·8 mm median tooth; lower lip with two c. 9 mm subulate teeth. *Corolla* white, up to 2·3 cm; upper lip slightly falcate; lower lip ± shorter than upper; tube ± straight, exannulate. *Staminal connective* c. 8 mm; filaments c. 2·5 mm; lower thecae dolabriform, sterile, cohering. *Nutlets* broad ovate, trigonous, c. 3 × 2·5 mm, mucilaginous on wetting. 2n = 20 (Yakovleva, 1933). *Fl.* Mar.–May.
Fields, sandy ground, roadsides; c. 300 m.
Libya, Egypt, S Turkey, Transcaucasus, Iraq, Syria, Lebanon, Israel, Arabia, Iran, Afghanistan, Transcaspia.
LIBYA. Cyrenaica: around El Abiar, E of Benghazi, *Davis* 49916! (E); Benghazi, *Ruhmer* 266! (E,MPU); 21 km S of Gemines, *Maire & Weiller* 1219! (MPU); Gemines to Agedabia, *Guichard* CYR/129/58! (BM).
EGYPT. Recorded by Täckholm (1956) from the Mediterranean coastal strip between El-Sollum and Rafah.

S. spinosa is primarily a species of SW Asia, where it is fairly common and widespread; it reaches its westernmost geographical range in Cyrenaica. Its closest allies are such SW Asiatic species as *S. macrosiphon* Boiss. and *S. moorcroftiana* Benth.; the former is in Persia and Afghanistan, the latter from Afghanistan and Pakistan.

46. S. schimperi Benth. in DC., Prodr. 12:282 (1848).
Type. [Ethiopia] Mountains of Abyssinia, Tigre, Hazabo near Axum, 7–8000 ped., 17 x, *Schimper* ser. 3 n. 1916! (K,G,TUB).
Ic.: Bot. Mag. 103: t.6300 (1877).
Ref.: Linnaea 37:329 (1871–73); Engler, Hochgebirgsflora 367 (1892); Thiselton-Dyer, Fl. Trop. Africa 5:457 (1900); Schwartz, Fl. Trop. Arab. 227 (1939); Bull. Jard. Bot. Brux. 32:820 (1962); Publ. Cairo Univ. Herb. 4:64 (1971).

Herbaceous aromatic perennial with a thick woody rootstock. *Stems* stout, usually simple below, branched above, up to 1 m; below arachnoid-tomentose with some short capitate glandular hairs, above with numerous thick-stalked capitate glandular hairs, eglandular hairs and oil globules.

Leaves ovate-elliptic to ovate, up to 20 × 10 cm, crenulate, cuneate-rounded at base, arachnoid to lanate on both surfaces, or less dense above, and below with oil globules; lower leaves petiolate, upper sessile. *Verticils* up to 8, 4–5-flowered, distinct. *Floral leaves* broad-ovate, cordate, acuminate, ± enclosing the verticils up to 2·5 × 2 cm, white with green margins; bracts c. 2 × 0·5 cm. *Pedicels* erect-spreading, up to 6 mm. *Calyx* tubular campanulate, 20 mm, 13-veined, with multicellular eglandular hairs, mainly on ribs, very short glandular hairs and a few oil globules; teeth of upper lip c. 4 mm; lower lip with two c. 8 mm spinulose teeth. *Corolla* up to 40 mm, white flushed pale purple or violet; hood slightly falcate; tube clearly exserted, glabrous within, lower lip with an orbicular median lobe. Staminal connectives c. 15 mm; filaments c. 2 mm; lower thecae dolabriform, sterile cohering. *Nutlets* not known. *Fl.* Sept.–.

Roadside, near cultivation; 2100–3200 m.

Ethiopia, N Yemen. Fig. 17c.

ETHIOPIA. Near Asmara, *Hemming* 1004! (EA). Samen, Doqua, *Steudner* 1394. Shoa, Aliu Amba near Ankober, *Roth* 526. Begember, Semyen mts., 1 km W of Mildekapsa Mariam, *Sebald* 1004 (STU).

S. schimperi is similar to *S. sclarea* Linn. on account of the large floral leaves, often enclosing the calyces or even the corollas, but the Ethiopian species is a perennial with clearly exserted corolla tubes and only slightly falcate upper lip. Its relationship to the fairly widespread SW Asiatic *S. spinosa*, which Bentham stressed in the original description, is considerably closer but *S. schimperi* can be separated by the thicker, less dentate leaves and denser indumentum.

In some parts of Ethiopia, it is a troublesome weed; its native names are 'abbadera' (Asmara) and 'mai-sendedo'.

The manuscript name *S. hypoleuca* Hochst. refers to this plant.

Species-group R
(p. 17)

47. S. argentea Linn, Sp. Pl. ed. 2:38 (1762).

Syn.: *Sclarea argentea* Miller, Gard. Dict. ed. 8, Sclarea no. 15, (1768).
Salvia patula Desf., Fl. Atlant. 1:25 (1798).
S. atlantica Pers., Syn. 1:29 (1805).
S. aurasiaca Pomel, Nouv. Mat. Fl. Atlant. 306 (1874).
S. suaveolens Pomel, l.c.
S. argentea Linn. ssp. *patula* (Desf.) Maire, in Mém. Soc. Sc. Nat. Maroc 7: 194 (1924).
S. argentea ssp. *patula* var. *pomelii* Maire in Bull. Soc. Hist. Nat. Afr. Nord 15:90 (1924).
S. argentea ssp. *patula* var. *fontanesiana* Maire in Jahandiez & Maire, Cat. Pl. Maroc 3:642 (1934).
S. argentea ssp. *patula* var. *mesatlantica* Maire in Mém. Soc. Sci. Nat. Maroc 21–22: 13 (1929).
S. argentea ssp. *patula* var. *aurasiaca* (Pomel) Maire–nomen?

Type. [Crete] "Habitat in Creta". No possible type specimen has been traced.

Ic.: Sibth & Sm., Fl. Graeca 1:t.27 (1806).

Ref.: Miller, Gard. Dict. ed. 8, Sclarea no. 15 (1768); Etlinger, Salvia 37 (1777); Aiton, Hort. Kew. 1:46 (1789); Vahl, Enum. 1: 278 (1804); Benth., Labiat. 226 (1833); DC., Prodr. 12:284 (1848); Battandier & Trabut, Fl. Alger 1:685, 686 (1890); Bonnet & Barratte, Cat. Pl. Tunis. 332 (1896); Lunds Univ. Arsskr. n.f. 2, 19, 1:30 (1923); Mém. Soc. Sc. Nat. Maroc 7:194 (1924); l.c. 21–22:13 (1929); Jahandiez & Maire, Cat. Pl. Maroc 3:641 (1934); Quezel & Santa, Nouv. Fl. Algér. 2:796 (1963); Tutin et al., Fl. Europaea 3:190 (1972).

Perennial or biennial herb. *Stems* erect, branched above, up to 60 (–100) cm, sturdy, quadrangular, above and below with a dense indumentum of long spreading capitate glandular and shorter eglandular hairs. *Leaves* simple, mostly basal broad ovate, up to 20 × 15 cm (or more), margins subentire to irregularly crenate, erose; petiole up to 12 cm; indumentum very variable from densely lanate, especially when young, to loosely villous. *Inflorescence* widely paniculate; verticils up to 10, 6–8-flowered, distant. *Floral leaves* broad-ovate, acuminate, up to 12 × 8 mm; bracts absent. *Pedicels* erect-spreading, up to 3 mm. *Calyx* campanulate, up to 11 mm, 13-veined, striate, with a very dense indumentum of glandular and eglandular hairs and oil globules; upper lip with lateral teeth c. 2 mm and median tooth c. 0·5 mm; lower lip with two acuminate-mucronate 4 mm teeth. *Corolla* white or cream or tinged with rose or violet, up to 22 mm; upper lip prominently falcate; lower lip shorter than upper; tube ventricose, invaginated with a plate of sterile tissue, exannulate. *Staminal connectives* c. 20 mm; filaments c. 6 mm; lower thecae dolabriform, sterile, cohering. *Nutlets* c. 3 × 2 mm, ± trigonous, buff coloured with darker veining, slight mucilaginous on wetting. 2n = 22 (Scheel, 1931); 18 (Delestaing 1954, as *S. patula*). *Fl.* Apr.–Jul.

Fallow fields, steppe, edge of cultivation, banks, rocky slopes; 100–1800 m.

S Europe eastwards to Bulgaria and Turkey. Morocco, Algeria, Tunisia.

MOROCCO. Middle Atlas, *Jahandiez* 1924: 600! (E). Dar Oulad Atlafi, *Pitard* 1669! (K). Ber Rechid, *Pitard* 1667! (K). Sidi Abdullah, *Easton* 30! (K). Beni Mtir, *Garnett* 17/8! (BM). High Atlas, Cirque de Jaffarm Jebel Ayachi, *Lambert & Thorp* 127! (BM). Targuist, *Font Quer* 1927: 546! (BM). Azgour to Amizmiz, *Balls* 2850! (BM).

Widespread throughout most of Morocco except the Pre-Sahara.

ALGERIA. Oran to Misserghin, *Davis* 51676! (E—form with unusually long spreading indumentum on stem and inflorescence). Mt. Babors, *Reverchon* 1897:306! (E, BM). Bossuet, *Faure* s.n.! (E). 20 km from Batna to Constantine, *Davis* 52308! (E). Ras-Pharaoun, among cedars, *Pomel* (type of *S. aurasiaca*). Mascara, Nazereg, *Pomel* (type of *S. suaveolens*). Djebel Magris, *Reverchon* 1898:306! (E,BM).

Common in the High Plateau of central Algeria.

TUNISIA. Recorded from several localities (Bonnet & Barratte 332, 1896).

A very polymorphic species which has been accorded varying taxonomic treatments at subspecific or varietal rank. There is need for a review of the species throughout its area; it is an especially problematic plant in the east Mediterranean, especially Turkey, and accordingly a broad provisional view has been taken with the N African material.

The uppermost verticils are sometimes sterile and represented only by

floral leaves; this was one of the features used to distinguish ssp. *patula* (Desf.) Maire. Two other characters that show a great range of variation are firstly, the density and type of indumentum on the stem and inflorescence axis and secondly the length and shape of the floral leaves. In addition, the length of the corolla varies greatly although gynodioecism may be one of the factors responsible for this.

The species, in the wide sense, is largely a lowland to montane plant of Mediterranean habitats.

48. S. tingitana Etlinger, Salvia 35 (1777).
Syn.: *S. foetida* Lam., Illustr. Gen. 1:69 (1791).
Type. 'Africa'. No suitable type specimen has been traced.
Ref.: Desf., Fl. Atlant. 1:24 (1798); Vahl, Enum. 1:274 (1804); Benth., Labiat. 225 (1833); DC., Prodr. 12:282 (1848); Journ. Linn. Soc. Bot 16:616 (1878); Bonnet & Barratte, Cat. Pl. Tunis. 333 (1896); Quezel & Santa, Nouv. Fl. Algér. 2:796 (1963).

Herbaceous perennial. *Stems* sturdy, quadrangular, branched above, to 70 cm or more; indumentum below of spreading glandular and eglandular hairs, above with mostly glandular hairs and some scattered long white spreading eglandular hairs up to 3 mm. *Leaves* simple, ovate, subcordate, crenate, above and below with glandular and eglandular hairs, mostly on veins, and oil globules below; lower leaves petiolate, upper sessile. *Inflorescence* much branched; verticils up to 10, c. 6-flowered, c. 2·5 cm apart below, less above. *Floral leaves* broad ovate, acuminate, slightly shorter than calyces; bracts present. *Pedicels* erect-spreading, up to 4 mm. *Calyx* triangular-campanulate, c. 12 mm long, 13-veined, with a dense indumentum of short capitate glandular hairs and long spreading white eglandular hairs; upper lip with lateral teeth c. 1·4 mm, inner 1·2 mm; lower lip with c. 5·5 mm teeth. *Corolla* white, c. 20 mm; upper lip falcate; lower lip shorter than upper; tube ventricose at throat, exannulate. *Staminal connectives* c.10 mm; filaments c. 3 mm; lower thecae sterile, cohering. *Nutlets* not known. 2n=38 (Yakovleva, 1933; Delestaing, 1954—both as *S. foetida*).
N Africa?
MOROCCO. Orin Seba (spelling uncertain), 19 iv 1939, *Gattefossé* s.n.! (MPU).

A very inadequately known and doubtful species. Most of the specimens that I have seen are of cultivated origin and date from the 18th or early 19th century; the only recent gathering is cited above and it too is said to be cultivated. *S. tingitana* has, in addition to its supposed N African distribution, been recorded from the Cadiz region of S Spain (Willkomm & Lange, Fl. Hispan. 2:423, 1870) but I have seen no specimens from there labelled as such nor any that correspond with Etlinger's plant.

The affinities of *S. tingitana* are with *S. argentea*, *S. spinosa* and *S. sclarea* but it differs from all of them in the long spreading white hairs on the stems and calyces, the floral leaves shorter than calyces and in the broad triangular-campanulate calyx. *S. sclarea* may be its closest relative but in it the floral leaves are clearly longer than the calyces and are coloured.

Although no specimens known to have been seen by Etlinger have been found, there are a considerable number of more or less contemporary herbarium specimens in existence. In the Linnean herbarium (LINN), sheets 42/59 and 42/60 are both *S. tingitana*; the former was originally labelled *S. graveolens*, the latter *S. foetidissima*, and on both J. E. Smith had written *S. tingitana*. Among several other sheets that have been seen, mention should be made of one in the Smith herbarium (LINN) from the Chelsea Garden, dated May 26th 1799. All these cited specimens are remarkably uniform and give every indication of a distinct discrete species. However, it does seem to be significant that none of the herbarium specimens gives any indication of wild provenance.

Bonnet & Barratte (333, 1896) discussed the problem of this species in some detail without being able to come to any conclusion about its status; they had searched for it in vain throughout Tunisia. It is also, despite its specific epithet, unknown from the region of Tangiers. So, until new wild gatherings are made, *S. tingitana* must remain a problem species. On the one hand, it may have been a cultivated form of a European species, such as *S. sclarea*, now no longer known in cultivation; on the other hand, it may have been a N African species now extinct.

49. S. sclarea Linn., Sp. Pl. 27 (1753).

Type. "In Syria, Italia". No suitable type specimen has been traced.

Ic.: Hegi, Ill. Fl. Mittel Europa 5, 4:2490, 2491 (1927).

Ref.: Etlinger, Salvia 33 (1777); Aiton, Hort. Kew. 1:45 (1789); Benth., Labiat. 224 (1833); DC., Prodr. 12:281 (1848); Briquet, Lab. Alpes Maritimes 505 (1891); Bonnet & Barratte, Cat. Pl. Tunis. 333 (1896); Quezel & Santa, Nouv. Fl. Algér. 2:796 (1963).

Biennial or perennial. *Stems* erect, sturdy, quadrangular, much branched above, with villous flat white eglandular hairs in lower parts, densely glandular above with oil globules, capitate glandular hairs and eglandular hairs. *Leaves* simple, ovate, up to 20 × 15 cm or more, cordate, crenate to serrate, pubescent below with numerous oil globules; lower leaves with up to 15 cm petioles; upper leaves ± sessile. *Verticils* numerous, 2-6-flowered, distant below, approximating above. *Floral leaves* very prominent, larger than calyces, membranous, often lilac or white, persistent; bracts absent. *Pedicels* erect-spreading, 2–3 mm. *Calyx* c. 10 mm, tubular campanulate, 13-veined, expanding somewhat in fruit, with a dense indumentum of short eglandular hairs, capitate glandular hairs and oil globules; upper lip with three spinose teeth, median much shorter; lower lip with two 5·7 mm spinose teeth. *Corolla* lilac or pale blue, 20–30 mm; upper lip falcate; lower lip ± as long as upper; tube 7–10 mm, ventricose, with a plate of tissue within. *Staminal connectives* c. 18 mm; filaments c. 3 mm; lower thecae dolabriform, sterile, cohering. *Nutlets* 2 × 2·5 mm, light brown, mucilaginous. 2n=22 (Scheel, 1931; Afzal-Rafii, 1972). *Fl.* May–July.

Fields.

Throughout S Europe, SW and C Asia; apparently, in N Africa, only in Algeria and Tunisia.

ALGERIA (Tell). Constantine, Beni Bou-Alem, 27 vi 1880, *Cosson* s.n.!

TUNISIA. Recorded from N Tunisia (Bonnet & Barratte 333, 1896).

A widespread and often common plant in Europe and SW Asia but only known from a limited area of N Africa. It is normally easily recognised by the coarse habit, widely branched inflorescences and the large, often violet-coloured floral leaves exceeding the calcyes or even the flowers.

Sometimes it is cultivated in Kenya and elsewhere as an ornamental or culinary sage.

Species-group S
(p. 17)

50. S. viridis Linn., Sp. Pl. 24 (1753).

Syn.: *S. horminum* L., l.c.
Horminum sativum Miller, Gard. Dict. ed. 8, Horminum no. 5 (1768).
Salvia comosa Salisb., Prodr. Stirp. Chapel Allerton 73 (1796)—nomen illegit.
S. horminum Linn. var. *viridis* (L.) Briquet, Lab. Alpes Maritimes 503 (1891).
S. dolichorrhiza Caballero in Bull. Soc. Esp. Hist. Nat. 13:238 (1913).

Type. Without locality or provenance (LINN—42/11!).

Ic.: Hegi, Ill. Fl. Mittel Europa 5, 4:2488, 2489 (1927).

Ref.: Etlinger, Salvia 27 (1777); Aiton, Hort. Kew. 1:39 (1789); Desf., Fl. Atlant. 1:20 (1798); Vahl, Enum. 1:254, 255 (1804); Benth., Labiat. 220 (1833); DC., Prodr. 12: 277 (1848); Briquet, Lab. Alpes Maritimes 500 (1891); Bonnet & Barratte, Cat. Pl. Tunis. 332 (1896); Hegi, Ill. Fl. Mittel Europa 5, 4:2487 (1927); Jahandiez & Maire, Cat. Pl. Maroc 3:641 (1934); Emberger & Maire, Cat. Pl. Maroc 4:1114 (1941); Pal. Journ. Bot. Jerus. ser. 4:36 (1947); Quezel & Santa, Nouv. Fl. Algér. 2:795 (1963).

Annual (or biennial). *Stems* simple or branched up to 50 cm, above and below with short to long spreading eglandular and capitate glandular hairs. *Leaves* simple, ovate to elliptic, up to 5 × 2·5 cm, regularly crenate, rounded or cordate at base, with short eglandular hairs above and below and oil globules below; petiole up to 3 cm. *Inflorescence* of up to ten verticils, c. 6-flowered, lowermost up to 7 cm apart less above, elongating in fruit; with or without a coma of violet, green, pink or white sterile leaves; bracts linear, up to 15 × 0·5 mm. *Pedicels* erect-spreading up to 4 mm, flattened and deflexed in fruit. *Calyx* tubular, c. 7 mm, elongating and deflexed in fruit to 10 mm, with 13 prominent veins; indumentum of long glandular and eglandular hairs and punctate glands; upper lip with two c. 1·5 mm lateral teeth and a cusp-like median tooth; lower lip with two acuminate c. 3 mm teeth. *Corolla* violet or rose, up to 14 mm; upper lip straight or slightly falcate; lower lip shorter than upper; tube c. 9 mm, glabrous, exannulate. *Staminal connectives* c. 5 mm; filaments 2 mm; lower thecae dolabriform, sterile, free. *Nutlets* oblong-trigonous, 3 × 1·5 mm, pale orange-brown, mucilaginous on wetting. 2n=16 (Scheel, 1931; Afzal-Rafii, 1972 as *S. horminum*). *Fl.* Mar.–May.

Fieldsides, rocky slopes, plains; 400–1000 m.

Morocco, Algeria, Tunisia, S Europe eastwards to the Levant, Transcaucasus and NW Iran.

MOROCCO. Middle Atlas, El Hamman, *Jahandiez* 1927: 184! (E). Neknes, *Jahandiez* 1929: 160! (E). Martimprey-du-Kiss, *Faure* s.n.! (E, K). Xauen,

Font Quer 345! (BM). Segangen and Mazuza, *Sennen & Mauricio* 7969! (BM).

Widespread throughout Morocco.

ALGERIA. Oran, Nemours, *Bourgeau* 132! (E, K). Kerrata, *Reverchon* 1897: 217! (E, BM). Algiers, ann. 1873, *Joad* s.n.! (K). Sidi-Mecid, near Constantine. *Choulette* 81! (K, BM).

Apparently restricted to the Tell.

TUNISIA. Tunis, *Desfontaines*. Widespread in N Tunisia.

A distinctive annual species only occurring in our area in the Mediterranean region of NW Africa. Although *S. viridis* and *S. horminum* have frequently been given separate independent specific status, numerous transitional forms occur between them and there is little doubt that on general morphological evidence, only one species should be recognised. On characters of fruit anatomy however, Wojciechowska (26–28,1958) pointed out that there were small differences between the two which she considered were sufficient to maintain two species.

The extremes of the variation range are very distinctive and it is not surprising that initially they were given separate specific rank: at one end of the range are plants with a prominent showy coma of usually violet bracts; at the other, plants without a coma. *S. viridis* and *S. horminum* were both described by Linnaeus in the first edition of the *Species Plantarum* but because Battandier & Trabut (Fl. Alger. 2:685, 1890) appear to have been the first authors to unite the two species under the name *S. viridis*, this seems to be the correct epithet to use. In the area under discussion, plants without a coma are much more frequent than those with one; in other parts of the species range, as in the E Mediterranean, the situation is often reversed and comose plants are the rule rather than the exception. The first combination at varietal rank for plants with a coma is probably var. *horminum* (L.) Batt. & Trab., Fl. Alger. 2:685, 1890; intermediates between it and the type variety have been recognised as var. *intermedia* Briq. under *S. horminum* L.

S. viridis is a very prominently hygrochastic species: the deflexed fruiting calyces are soon brought up to a horizontal plane on soaking in water. It also has very markedly mucilaginous nutlets on wetting.

Species-group T
(p. 17)

51. S. verbenaca Linn., Sp. Pl. 25 (1753).

Syn.: *S. clandestina* Linn., Sp. Pl. ed. 2:36 (1762).
Horminum verbenacea Miller, Gard. Dict. ed. 8, Horminum no. 1 (1768).
Salvia horminoides Pourr. in Mém. Acad. Toul. 3:327 (1788).
S. verbenaefolia Salisb., Prodr. Stirp. Chapel Allerton 73 (1796)—nomen illegit.
S. oblongata Vahl, Enum. 1:256 (1804).
S. multifida Sibth. & Sm., Fl. Graec. Prodr. 1–16 (1806).
S. verbenacoides Brot., Fl. Lusit. 1:17 (1817).
S. controversa Ten., Syll. Fl. Neap. 18 (1831).
S. collina Lowe in Trans. Camb. Phil. Soc. 4:18 (1831) non H.B. & K.
S. verbenaca var. *serotina* Boiss., Voy. Bot. Hispan. 484 (1841).

S. verbenaca var. *vernalis* Boiss., l.c.
S. clandestina Linn. var. *angustifolia* Benth. in DC., Prodr. 12:295 (1848).
S. cleistogama de Bary & Paul, Ind. Sem. Hort. Halens. (Halle) 6 (1867): Bot. Zeit. 29:555 (1871).
S. ochroleuca Coss. & Bal. in Bull. Soc. Bot. France 20:254 (1873).
S. sabulicola Pomel, Nouv. Mat. Fl. Atlant. 121 (1874).
S. verbenaca L. var. *oblongata* (Vahl) Briquet, Lab. Alpes Maritimes 516 (1891).
S. verbenaca ssp. *clandestina* (Linn.) Briquet, l.c. 518 (1891).
S. verbenaca ssp. *clandestina* (Linn.) Briquet var. *clandestina* (Linn.) Briquet, l.c.
S. verbenaca var. *horminoides* (Pourr.) Briquet, l.c. 519 (1891).
S. verbenaca var. *controversa* (Ten.) Briquet, l.c. 520 (1891).
S. verbenaca ssp. *foetens* Maire in Bull. Soc. Hist. Nat. Afr. Nord. 20:197 (1929).
S. verbenaca ssp. *verbenacoides* (Brot.) Pugsley var. *bicolor* Maire in Mém. Soc. Sc. Nat. Maroc. 21, 2:14 (1929).
S. verbenaca subsp. *battandieri* Maire—apparently a 'nomen'; the name first appears in Cavanillesia 4:18 (1931).
S. verbenaca subsp. *ochroleuca* (Coss. & Bal.) Maire in Jahandiez & Maire, Cat. Pl. Maroc. 3:643 (1934).

Type. [Europe] "In Europae pascuis"! (LINN 42/20).
Ic.: Ross-Craig, Draw. Brit. Plants 24:t.17 (1967).
Ref.: Miller, Gard. Dict. ed. 8, Horminum 1, (1768); Etlinger, Salvia 28 (1777); Desf., Fl. Atlant. 1:21 (1798); Vahl, Enum. 1:255 (1804); Benth., Labiat. 239 (1833); Meyer, Comment. 1:235 (1837); DC., Prodr. 12:294 (1848); Battandier & Trabut, Fl. Alger. 1:688 (1890); Briquet, Lab. Alpes Maritimes 510 (1891); Bonnet & Barratte, Cat. Pl. Tunis. 334 (1896); Journ. Bot. 46:97–106; 141–151 (1908); Durand & Barratte, Fl. Libycae Prodr. 187 (1910); Thiselton-Dyer, Fl. Cap. 5, 1:319 (1912); Lunds Univ. Arsskr. n.f. 2, 19, 1:30 (1923); Mém. Soc. Sc. Nat. Maroc 7:194 (1924); Lindinger, Beitr. Fl. kanar. Ins. 224 (1926); Hegi, Ill. Fl. Mittel Europa 5, 4:2495 (1927); Journ. Bot. 65:185–195 (1927); Pampanini, Fl. Cirenaica 395 (1931); Mém. Soc. Hist. Nat. Afr. Nord 3:186 (1933); Jahandiez & Maire, Cat. Pl. Maroc 3:643 (1934); Emberger & Maire, Cat. Pl. Maroc 4:1114 (1941); Täckholm, Students Fl. Egypt 146 (1956); Ozenda, Fl. Sahara 405 (1958); Sarracenia 5:53 (1960); Quezel & Santa, Nouv. Fl. Algér. 2:795 (1963); Publ. Cairo Univ. Herb. 4:64 (1971).

Perennial, short or long-lived, with a woody rootstock. *Stems* erect, up to 50 cm, or more, usually simple, below with a short or long eglandular or glandular indumentum, above densely glandular. *Leaves* mostly basal or not, very variable, narrow oblong to ovate, subentire to deeply pinnatifid, up to 13 × 6 cm, with a variable indumentum of eglandular and glandular hairs, petiolate, or subsessile above. *Inflorescence* of distinct or condensed verticils up to 10, c. 6-flowered. *Floral leaves* broad ovate, up to 8 × 8 mm; bracts present. *Pedicels* up to 4 mm. *Calyx* tubular-campanulate in flower with long white, eglandular and glandular hairs, 14-veined, expanding in fruit to c. 8 mm and spreading to deflexed; generally with a prominent ring of long white exserted eglandular hairs in throat; upper lip prominently

bisulcate-concave in fruit with three subequal teeth c. 0·5 mm; lower lip with two c. 4 mm teeth. *Corolla* violet-blue to lavender, variable in size and shape, c. 13 (–20) mm; upper lip ± straight to somewhat falcate; lower lip equal to or shorter than upper; tube straight or curved, glabrous. *Staminal connectives* c. 9 mm; filaments c. 2·5 mm; lower thecae sterile, free. *Nutlets* round-trigonous, c. 1·5 × 2 mm, mucilaginous on wetting. 2n=16 (Delestaing 1954, as *S. cleistogama*); 32 (Linnert 1955, as *S. cleistogama*); 42 (Reese, 1957); 48 (Delestaing 1954, as *S. horminoides*); 54 (Benoist, 1937); 64 (Yakovleva, 1933); 64 (Scheel 1931, as *S. cleistogama*). *Fl.* Jan.–Jul.
Forest clearings, sandy plains, open plantations, stony pastures, rocky limestone or granitic slopes, fieldsides, rock fissures, heavy clay, *Stipa-Artemisia* steppe, roadsides, fallow fields, wadi beds; near sea level to 3000 m.
Canary Islands, Madeira, Morocco, Algeria, Tunisia, Libya, Egypt, S Europe, N to Britain, Balkans, Cyprus, Turkey, Transcaucasus, Iran.
Naturalised in SW Africa, S Africa and Lesotho; and in N America and Australia.

CANARY ISLANDS. Tenerife: Sierra Anaga, *Bramwell* 1507! (E); Coenobium San Diego, *Bourgeau* 1845: 550! (E,K). Hierro: above Valverde, *Brooke* 704! (BM). Fuerteventura: Casillos del Angel, *Brooke* 343! (BM). Lanzarote: Femes, *Montagu-Pollock* 144! (BM).

Also recorded from Gran Canaria, Gomera, Palma, (Lems, 1960). A constant species in the Canary Islands.

MADEIRA. Porto Santo, in herb. *Moniz*! (BM).

MOROCCO. Between Fez and Azrou, *Alexander & Kupicha* 306! (E). Tisi n Ait Ourra, *Alexander & Kupicha* 424! (E). Between Ifrane and Azrou, Ras el Mar, *Alexander & Kupicha* 365! (E). Azilal, *Jahandiez* 1923: 15! (E). Between Ait Abdallah and Azoura, *Davis* 48836! (E). Middle Atlas, N of Immouzer-du-Kandar, *Archibald* 831! (E,K). Tafraoute to Souk Tleta de Tasserirt, *Davis* 48794! (E). Tachoksht, *Balls* 2694! (E,K). Imouzzer-des-Ida-Outanae, *Davis* 48481! (E). Near junction of Nador-al Hoceima and Aknoul road, *Davis* 51284! (E). Sous plain, c. 30 km from Taroudannt to Aoulouz, *Davis* 49016! (E). Essaouira to Smimou, *Davis* 48406A! (E). Marrakesh, *Trethewy* 135! (K).

Widespread throughout almost all regions of Morocco except the Sahara.

ALGERIA. Oran, 7 ii 1937, *Faure* s.n. Ain Oussera, *Davis* 53255! (E). Cascades E of Temclen, *Davis* 51471! (E). Dj. Aures, 20 miles from Batna to Arris, *Davis* 52348! (E). Constantine to Setif, *Davis* 52075! (E). Oran, Sidi-bel-Abbes, *Warion* 1800! (K).

Widespread and common throughout Algeria.

TUNISIA. Bulla Reggia, *Mather* 9A! (K). Throughout Tunisia.

LIBYA. Cyrenaica, E of Derna, *Archibald* 962! (E). Wadi Derna, *Davis* 50336! (E,K). Benghasi, *Ruhmer* 267! (E). Atlag, Fueihat, *Keith* 696! (K). Between Cyrene and Apollonia, *Sandwith* 2366! (K).

In S Africa, *S. verbenaca* is an introduced, widespread, and often common, species. Its altitudinal range and habitats are listed separately below. Sandveld, karroid type veld, ploughed land, alluvial ground, railway-sides, riverbanks, flats, hillsides, as a weed near buildings; 750–1550 m. Fl. almost throughout the year. The flower colour varies from blue, deep purplish blue, purple, lilac to white.

SW AFRICA (NAMIBIA). 5 km E of Weissenfels, *Dinter* 8040! (BOL, K—with the unpublished manuscript name *S. cryptantha* Dinter on the label—a cleistogamous form). Windhoek, Avis, *Seydel* 4022! (BM).
S AFRICA. Cape. Cape peninsula, Wynberg hill, *Bolus* 15821! (BOL). Calvinia: Nieuwoudtville, Klip Koppies, *Lavis* 20691! (BOL); Ekerdam, *Taylor* 2738! (BOL). Uniondale: lower slopes of Zuurberg, *Fourcade* 4400! (K). Fraserburg: near Fraserburg, *Bolus* 10402! (BOL). Sutherland: Houthoek, *Hanekom* 1576! (STE). Prieska: sine loc., *Bryant* J.56! (NU). Beaufort West: sine. loc., *Wilken* 2804! (NU). Hay: sine loc., *Bryant* 3. 56! (PRE). Kimberley: Big Hole, *Badenhorst* 5! (PRE); Picardi, *Brueckner* 898! (BOL). Britstown: S of Britstown, *Taylor* 908! (BOL). Richmond: near Stylkloof, *Drège* 806d. Middleburg: Grootfontein, *Theron* 304! (PRE). Graaf Reinet: Graaf Reinet, *Bolus* 142! (BOL). Somerset East: Somerset East, *MacOwan* s.n.! (E). Colesberg: sine loc., *Botha* 3539! (PRE). Cradock: Karreebosch, *Long* 771! (PRE). Aliwal North: Oorlogsfontein, *Ingpen* 11! (PRE).
Orange Free State. Bethulie: Tussen die Riviere Wildtuin, *Roberts* 5399! (PRE). Fauresmith: Fauresmith, *Henrici* 2770! (PRE). Bloemfontein: Landboukollege, Glen, *Berg* 3941! (PRE). Kroonstad: sine loc., *Pont* 572! (PRE).
LESOTHO. Near Berea, *Dieterlen* 979! (K).

S. verbenaca is an extremely variable and frequent species in N Africa and Europe with a difficult, extensive and not yet fully resolved synonomy. Most of the synonyms result from local treatments in Floras and floristic accounts; the more specimens one examines the more difficult it becomes to recognise subspecies or even varieties. Fairly detailed consideration of several characters in a large quantity of material throughout the total range of the species has led me to the belief that it is impossible, at least with our present knowledge, to define satisfactorily or key out any subspecific taxa.

The variant in Africa which appears to be the most distinct, and may eventually warrant formal taxonomic rank, is that represented by *Balls* 2694 cited above, and several other gatherings from Morocco. Generally growing at high altitudes, c. 2500 m, it has very woody rootstocks, leaves almost all basal, long-tubed clearly exserted corollas and often exserted stamens. It seems that this is the variant to which Maire gave the name subsp. *battandieri* (Cavanillesia 4:18, 1931) but as far as can be traced no description was ever attached to the epithet and it should remain a 'nomen'. Throughout the range of *S. verbenaca*, it is clear that the general facies of the plant is much influenced by its habitat and these long-lived perennials from relatively high altitudes may merely be extreme ecotypes from extreme habitats.

In S Africa, where it is a widespread and completely naturalised adventive, it is, relative to the enormous morphological variation it exhibits in Europe and N Africa, a surprisingly constant species. It does vary however in corolla shape and size with cleistogamous and gynodioecious flowers occurring not infrequently. In the past, it has generally been called *S. clandestina* L. var. *angustifolia* on account of the fairly regularly oblong, rarely oblong-ovate, leaves; it is also characterised by the densely villous or pilose inner surfaces of the calyces. The name *S. cleistogama* de Bary & Paul has also been applied to the S African plant. It was described on cultivated material grown from

seed of southern African provenance. Forms with these features are commonly found in the coastal regions of S France and in fairly desertic habitats of southern Morocco but it is not possible to propose with any accuracy that these could be the sources of the S African plant. It is also not possible to estimate the time of its introduction or establishment in S Africa; the first records of it date from the early 1800s but it could well have arrived with European settlers or traders long before then.

In more recent times, *S. verbenaca* has established itself as an alien in New South Wales and South Australia and in some of the western and south-eastern states of the USA. Even in Europe and SW Asia, the present-day distribution of *S. verbenaca* may have been influenced by man's activities over many centuries. To the Romans, 'verbenaca' was a medicinal plant held in high esteem and presumably cultivated throughout their Empire. There is no certain proof that *S. verbenaca* is the Roman 'verbenaca', indeed several species may have been given this name, but it is a possibility that this *Salvia* was a cultivated plant and became more widely distributed for this reason.

On a world basis, both as a native and adventive, *S. verbenaca* is one of the most widely distributed and successful of all Salvias. It has, as previously mentioned, an unusually variable number of chromosomes and obviously is an extremely adaptable species in widely different habitats. It would repay a broad-based detailed cytotaxonomic study.

52. S. lanigera Poir. in Lamarck, Encyclop. Méthod. Suppl. 5:49 (1817).

Syn.: *S. lanigera* Desf., Tabl. l'école Mus. Hist. Nat. ed. 3:95, 394 (1829).
S. controversa auctt. non Ten., Syll. Fl. Neap. (1831).
S. verbenaca Linn. subsp. *clandestina* auctt. non (L). Briq. (1891).

Type. "Cette plante croît en Perse et dans l'Egypte". No possible type specimen has been traced.

Ic.: Bouloumoy, Fl. Liban et Syrie t.322 (1930)—as *S. controversa* Ten.

Ref.: Benth., Labiat. 241 (1833); DC., Prodr. 12:295 (1848); Briquet, Lab. Alpes Maritimes 510 (1891); Bonnet & Barratte, Cat. Pl. Tunis. 334 (1896); Journ. Bot. 46:97–106, 141–151 (1908); Durand & Barratte, Fl. Libycae Prodr. 187 (1910); Journ. Bot. 65:185–195 (1927); *l.c.* 320; Pampanini, Fl. Cirenaica 396 (1931); Jahandiez & Maire, Cat. Pl. Maroc 3:643 (1934); Täckholm, Students Fl. Egypt 146 (1956); Quezel & Santa, Nouv. Fl. Algér. 2:795 (1963).

Perennial with a short woody rootstock. *Stems* erect, simple or branched, below with numerous long or short white spreading eglandular hairs, above similar with some short capitate glands. *Leaves* deeply pinnatisect, oblong in outline, with irregularly lobed linear bullate segments, up to 9 × 3·5 cm; above and below with eglandular hairs and oil globules. *Verticils* up to 12, c. 5-flowered, distinct. *Floral leaves* broad-ovate, acuminate, c. 4·5 × 4 mm; bracts absent. *Pedicels* erect-spreading, c. 3 mm. *Calyx* tubular-campanulate, expanding slightly in fruit to c. 8 mm, with a dense indumentum of long and short eglandular hairs, short capitate glandular hairs and some oil globules; inside of tube with a ring of long eglandular hairs; teeth of upper lip subequal, c. 0·3 mm; teeth of lower lip c. 3·5 mm. *Corolla* deep violet blue to purple, variable in length, up to 17 mm; upper lip somewhat falcate; lower lip shorter than upper; tube c. 10 mm, glabrous within. *Staminal connectives*

c. 10 mm; filaments c. 2·5 mm; lower thecae dolabriform, sterile, adhering. *Nutlets* round-trigonous, c. 1·5 × 2·5 mm, mucilaginous on wetting. *Fl.* Jan.–Apr.

Stony and sandy desert, sandy plains, fields, clay and loam soils; sea level to c. 1400 m.

Morocco, Algeria, Tunisia, Libya, Egypt, Sinai, Cyprus, Iraq, Israel, Jordan, Syria, Lebanon?, Iran and Arabia.

MOROCCO. Between Fez and Matmata, *Romieux* 1430! (G). El Ardja, *Pitard* 3679! (K). Also in the Pre-Sahara.

ALGERIA. Oued-Biskra, near Biskra, *Balansa* 831! (K). Throughout the Sahara region.

TUNISIA. Gabès, *Pitard* 231! (K). Gafsa, *Pitard* 458! (K). Widespread in C & S Tunisia.

LIBYA. Benghasi, *Ruhmer* 268! (E). Tripolitania: W of Ben Giawad, *Archibald* 926! (E); W of Tripoli, *Archibald* 898! (E); Tripoli, near University, *Davis* 49503! (E); Gebel Nefoussa, at Ain Zarga, *Davis* 49659! (E); gulf of Sirte, *Davis* 49855! (E). Matmata, Kebira, *Pitard* 892! (K). SE of Garian, *Mitchell* 1966! (K). Sabratha, *Sandwith* 2023! (K).

EGYPT. Mariut Abu Sit, *Davis* 6489B! (E). Burg el Arab, *Meinertzagen* s.n.! (BM). Thaliba, Gattaret el Diyura, *Murray* s.n.! (BM).

Also in the coastal strip of the Libyan and Arabian desert.

Most recent Floras of NW Africa reduce this taxon to a subspecies of *S. verbenaca*, to which undoubtedly it is very closely related, but the characters of leaf and calyx given in the specific key are generally distinct enough to give it separate specific status. Hybridisation and introgression may well occur between these two species.

Although only one straight synonym is cited above, *S. lanigera* has had a fairly chequered nomenclatural history. In most of the recent floristic accounts of N Africa, this plant has been called *S. verbenaca* subsp. *clandestina* (L.) Briq. but in my opinion the basionym *S. clandestina* as Linnaeus meant it is merely one of the innumerable forms of *S. verbenaca*. Likewise, *S. controversa*, which has been used as the name for our plant, is also within the complex species that is *S. verbenaca*. Tenore gave "in pascius siccis Calabriae, Monteleone" as the habitat for his species, indicating that he was dealing with an Italian plant. Because *S. lanigera* is restricted to more or less desertic regions of N Africa, Cyprus and SW Asia, Tenore's epithet cannot come into consideration as a name for our plant, which does not grow in Italy, but presumably is referable to some of the more deeply divided leaf forms of *S. verbenaca* that occur in S Europe and the E Mediterranean (which correspond to *S. multifida* Sibth. & Sm.).

53. S. pseudojaminiana Chevall. in Bull. Herb. Boiss. sér. 2,5:442 (1905).

Syn.: *S. verbenaca* Linn. ssp. *pseudojaminiana* (Chevall.) Maire–nomen?

Type. Algeria. Sahara, inter El-Goléa et Ghardaia, in arenosis ad orient. loc. dict. "Hadadra", 10 iv 1904, *Chevallier* 602! (K-iso).

Ic.: Battandier & Trabut, Atlas Fl. Alger. 3: t.38 (1913); Ozenda, Fl. Sahara f.148 (1958).

Ref.: Jahandiez & Maire, Cat. Pl. Maroc 3:643 (1934); Ozenda, Fl. Sahara 405 (1958); Quezel & Santa, Nouv. Fl. Algér. 2:795 (1963).

Perennial, woody at base. *Stems* erect, up to 30 cm, below with an indumentum of short glandular-hairs, and oil globules; above, similar but with denser and longer eglandular hairs. *Leaves* deeply pinnatifid, narrow-oblong, or narrow oblong-lanceolate in outline, up to 5·5 × 1·2 cm, indumentum above and below, of very short spiky eglandular hairs, longer on midrib, and numerous oil globules especially below, margin revolute; petiole up to c. 2 cm. *Inflorescence* of up to 8 ± distinct verticils, approximating above, c. 4–6-flowered. *Floral leaves* broad, ovate, acuminate up to 4·5 × 5 mm; bracts present. *Pedicels* up to 4 mm. *Calyx* tubular c. 1 cm, with very long, white spreading eglandular hairs and a few oil globules, 14-veined; upper lip with 3 short, subequal teeth c. 0·5 mm; lower lip with two c. 4·5 mm teeth. *Corolla* white or pale blue, c. 1·5–2 cm, hood very slightly falcate, bifid; tube slightly curved, c. 1–1·3 cm long, glabrous; lower lip with broad median lobe. *Stamens and style* long-exserted; *Staminal connectives* c. 15 mm *filaments* c. 2·5 mm; lower thecae sterile, cohering; staminodes present. *Stylar arms*, unequal c. 2·5 and 3·5 mm. *Nutlets* not known. 2n = 40 (Reese, 1957). Morocco, E desert. Algeria, Saharan Atlas (Aurès), Sahara, S.
ALGERIA. W of Beni-Abbès oasis, *Maire* 1947: 203! (K).

Although the authors of recent NW African Floras have regarded this taxon as a subspecies of *S. verbenaca*, I prefer to give it independent status. The very narrow pinnatipartite leaves with linear segments, the almost plumose calyces, the white or pale blue flowers with long exserted tubes distinguish it from the innumerable forms of *S. verbenaca*. Its closest relative is undoubtedly *S. lanigera* which, under the epithet subsp. *clandestina* (Linn.) Briq., has also been regarded by French botanists as a subspecies of *S. verbenaca*. The three species, i.e. *verbenaca*, *lanigera* and *pseudojaminiana*, are certainly very closely related to each other but there are few specimens which cannot readily be assigned to one of them; that is, intermediates are uncommon throughout their ranges. In general terms, *S. verbenaca* is a mesophytic, ± Mediterranean plant, *S. lanigera* semi-desertic, and Saharo-Sindian, whereas *S. pseudojaminiana* inhabits the most xerophytic localities in the Sahara.

54. S. merjamie Forssk., Fl. Aegypt.-Arab. 10 (1775).
Syn.: *S. nubia* [Juss. ex] Murray in Comm. Phys. Gött. 1:90 (1778).
S. abyssinica Linn. fil., Suppl. 88 (1781) non auct.
S. ambigua Salisb., Prodr. Stirp. Chapel Allerton 74 (1796)—nomen illegit.
S. nudicaulis Vahl, Enum. 1:266 (1804)—nomen illegit.
S. nudicaulis var. *pubescens* Benth. in DC., Prodr. 12:294 (1848).
S. congesta A. Rich., Tent. Fl. Abyss. 2:194 (1851).
S. nudicaulis Vahl var. *congesta* (A. Rich.) Engler, Hochgebirgsflora 367 (1892).
S. nudicaulis var. *nubia* Baker in Thiselton-Dyer, Fl. Trop. Africa 5:458 (1900).
Type. Yemen: Kurma, *Forsskahl* (C—herb. Forssk.—photo!)
Ref.: Vahl, Enum. 1: 259, 266 (1804); Benth., Labiat. 239, 242 (1833); DC., Prodr. 12:294, 295 (1848); Linnaea 37:329 (1871–73); Engler, Hochgebirgsflora 367 (1892); Thiselton-Dyer, Fl. Trop. Africa 5: 458 (1900); Schwartz,

Fl. Trop. Arab. 227 (1939); Symb. Bot. Ups. 15:159, 317 (1957); Bull. Jard. Bot. Brux. 32:819 (1962).

Herbaceous aromatic perennial (or biennial?). *Stems* erect, very variable in size, degree of branching and indumentum, from 5 cm–1 m or more; below generally with short eglandular hairs and oil globules; above densely glandular with long and short capitate glandular hairs, eglandular hairs and oil globules, occasionally eglandular throughout. *Leaves* simple, oblong-linear to ovate, variable in size, shape and indumentum, either mostly basal or distributed over stem, up to 18 × 6·5 cm, irregularly crenate or serrate, subcordate or cuneate at base, above with a sparse indumentum of eglandular hairs or glabrous, below with a denser eglandular indumentum, mostly on veins, and punctate glands. *Verticils* up to 11, up to 6-flowered, distinct below, approximating or condensed above. *Floral leaves* broad-ovate, acuminate, up to 9 × 9 mm, often violet-purple; bracts absent. *Pedicels* erect-spreading, up to 2 mm. *Calyx* campanulate, up to 9 mm, often violet-purple coloured, 13-veined, expanding slightly in fruit; indumentum variable in density, villose-viscid with long slender glandular and eglandular hairs and oil globules, occasionally without glandular hairs; upper lip with three very short incurved 0·3–0·5 mm teeth; lower lip with two lanceolate-acuminate 3·5 mm teeth. *Corolla* blue, purple, lilac-blue or white up to 14 mm; upper lip falcate; lower lip usually equal to or shorter than upper, with a broad-ovate, pouched median lobe; tube with a panel of hairs from base of lower lip to half-way down tube. *Staminal connectives* 10 mm; filaments c. 2 mm; lower thecae dolabriform, adhering, sterile. *Nutlets* trigonous, c. 2·2 × 1·5 mm, russet-brown, mucilaginous on wetting. *Fl.* throughout the year.

Grassland, open bush, roadside, *Erica arborea* scrub, forest edge, rocky outcrops, plains, basalt slopes, weed of waysides, waste lands, fallow-fields; 1900–4200 m.

Yemen, Ethiopia, Somalia, Kenya, Uganda (?), Tanzania. Fig. 17a.

ETHIOPIA. Shoa: Tarema-bere near Debre-Sina, *Gebre-Selassie* 854! (EA). Managasha forest, Wachacha, *E. F. Gilbert* 472! (EA, K). Arussi, Chilalo highlands near Asella, *Hannson* 420! (EA). Semyen mts., *Sebald* 1107 (STU). Rira, SW of Goba, *Mooney* 7179! (K). Addis Ababa, *Mooney* 4715! (K). Mt. Bachit and fields near Enjedcap, *Schimper* 1838:541! (K, BM—syntype of *S. nudicaulis* var. *nubia*). Asmara to Arbaroba, *Scott* 207! (K). Adoam, *Schimper* 1837:160! (K, BM—as *S abyssinica* Hochst., nomen—type of *S. nudicaulis* var *pubescens*). Without exact locality: *Quartin Dillon & Petit* 21! (K—type of *S. congesta*).

SOMALIA. 6 miles W of tunnel on Erigavo-Mait road, *Boaler*, B.81! (K). Serrut mts., *Hildebrandt* 1420! (BM).

KENYA. Mt. Elgon, Trans Nzoia distr., *Mwangangi* 347! (EA). Mt. Elgon, near Koitoboss peak, *Lye* 1457! (EA). Mt. Kenya: Sirimon track, *Agnew* 7020! (EA). Above Powy's farm, *Bally, B.* 2765! (K, EA). Narok distr., Toboti, edge of Mau forest, *Glover* et al. 1475! (K, EA).

TANZANIA. Masai distr., Embagai crater rim, *Greenway* 9141! (EA,K). Moshi, Shira plateau, Kilimanjaro, *Richards* 24007! (K).

A most variable species with regard to height, leaf size and shape, indumentum and corolla length. It has a similar distribution to *S. nilotica* (cf. figs.

17a & b). Both are frequent species from the upper part of the montane forest belt up to alpine regions although *S. merjamie* generally grows up to higher altitudes than *S. nilotica* and of the numerous specimens examined of the latter, only a few were gathered above 3000 m. *S. merjamie* exhibits a particularly bewildering range of corolla size and shape at least part of which is connected with cleistogamy or gynodioecism. Although sexual variation among African Salvias is not a frequent phenomenon—less so probably than amongst SW Asiatic species—it seems to be fairly common in *S. merjamie*. The most extreme case is that recorded by Sebald (Stuttg. Beitr. Naturk. 244:14, 1972) on the basis of his Ethiopian gathering no. 1107 in which the cleistogamous corollas were only c. 2 mm long.

It is in Ethiopia, and particularly in the region previously known as Eritrea, that *S. merjamie* is especially variable. Here grow forms with entirely basal leaves, very dwarf in stature, leaves narrow oblong to deeply pinnatilobed, tall growing plants with a ± eglandular indumentum, large corollas, small corollas, etc. South of Ethiopia, it is much less variable and generally the plants are tall growing with large flowers and clearly glandular-pilose. Further field observations in Ethiopia and the Yemen are needed to determine whether more than one taxon is involved; judging solely by herbarium material, Ethiopian specimens with a short indumentum on stem and leaves, mostly basal leaves, small floral leaves, a calyx indumentum of eglandular hairs with oil globules and the calyces pilose within might be worth the varietal rank—var. *pubescens*—that Bentham gave them. Likewise, field work is needed to determine whether the distributional gap in south Ethiopia shown on figure 17a is one of reality or merely lack of collecting.

Although *S. merjamie* and *S. nilotica* are the only widespread species in the East African highlands, similar in their distributions and habitats, they are not closely related to each other. *S. merjamie* has affinities with the S European and SW Asiatic *S. verbenaca* whereas *S. nilotica* has obvious links with southern African species particularly those of species-group L (sect. *Heterosphace*) from the eastern Cape.

The specific epithet 'merjamie' apparently derives from the Arabian common name of the plant; certainly preferable to the native Masai name 'Naingungundeu' which indicates that the plant smells of rats! However, Muschler (Fl. Egypt 2:827, 1912) records that the local Egyptian name for *S. lanigera* Poir.—a fairly distant relative of *S. merjamie* but in the same general alliance—is the similar sounding 'meryamîye', so this common name in fact may be used for several species and not be particular to *S. merjamie*.

Species-group U
(page 17)

55. S. barrelieri Etlinger, Salvia 46 (1777).

Syn.: *S. bicolor* Lam., Illustr. Gen. 1:69 (1791) non Sessé & Moq. (1892).
S. pyrenaica Vahl, Enum. 1:263 (1804).
S. inamoena Vahl, Enum. 1:269 (1804).
S. crassifolia Jacq., Fragm. Bot. 47, t.60 (1800–1809).
S. dichroa Hook. fil., Bot. Mag. 98:6004 (1872).

S. pseudobicolor Battandier & Pitard in Pitard, Contrib. l'étude Fl. du Maroc 30 (1918).

S. bicolor Desf. subsp. *pseudobicolor* (Battandier & Pitard) Maire in Mém. Soc. Sc. Nat. Maroc 7:194 (1924).

S. pluripartita Pau in Mem. Real Soc. Esp. Hist. Nat. 12:374 (1924).

S. bicolor Desf. var. *dichroa* (Hook. fil.) Maire in Bull. Soc. Hist. Nat. Afr. Nord 19:62 (1928).

S. bicolor var. *barrelieri* (Etlinger) Maire in Mém. Soc. Sc. Nat. Maroc 21, 2:13 (1929).

S. bicolor var. *pluripartita* (Pau) Maire, l.c. 13 (1929).

S. bicolor var. *pallida* Maire, l.c. 13 (1929).

S. barrelieri Etlinger subsp. *pseudobicolor* (Battandier & Pitard) Maire in Jahandiez & Maire, Cat. Pl. Maroc 3:642 (1934).

Type. "Hab. in Hispania, *Barrelier*". No possible herbarium type specimen has been traced; see comments below.

Ic.: Desf., Fl. Atlant. t.2 (1798); Bot. Mag. 43:t.1774 (1916); Bot. Mag. 98:t.6004 (1872).

Ref.: Barrelier, Obs. 25, no. 237 (1714); Desf., Fl. Atlant. 1:22 (1798); Vahl, Enum. 1:269 (1804); Benth., Labiat. 230, 243 (1833); DC., Prodr.12:288, 296 (1848); Bonnet & Barratte, Cat. Pl. Tunis. 334 (1896); Mém. Soc. Sc. Nat. Maroc 7:193 (1924); Jahandiez & Maire, Cat. Pl. Maroc 3:642 (1934); Quezel & Santa, Nouv. Fl. Algér. 2:798 (1963).

Perennial. *Stems* erect, sturdy, branched above, quadrangular, up to 1 m, below with short curled eglandular hairs sometimes also with glandular hairs, similar above but indumentum denser and with capitate glandular hairs. *Leaves* ovate-triangular, variable, simple, subentire to deeply laciniate, up to 30 × 25 cm, slightly cordate to rounded at base with an indumentum of scattered simple eglandular hairs sometimes also with glandular hairs. *Inflorescence* much branched, showy. *Verticils* numerous up to 30, c. 6-flowered, below up to 3 cm apart, approximating above. *Floral leaves* ovate-acuminate, up to 3 × 1 cm; bracts absent. *Pedicels* erect-spreading, up to 13 mm. *Calyx* ovate-campanulate, up to 14 mm, often purplish coloured, 13-veined, with numerous capitate glandular hairs, a few eglandular hairs and oil globules, ± deflexed in fruit; upper lip with two c. 1·7 mm teeth and a very short median tooth; lower lip with two c. 3·7 mm teeth. *Corolla* up to 35 mm, variable in colour, violet blue or lilac with a white marked lower lip soon fading brown, or corolla ± concolorous; upper lip falcate, bifid; lower lip equal to or slightly shorter than the upper; tube c. 1 cm long, ± straight, invaginated c. 6 mm from base, with a small tuft of hairs there. *Staminal connectives* c. 25 mm; filaments c. 3 mm; lower thecae sterile, dolabriform, cohering. *Nutlets* c. 3 × 2·5 mm, rounded, trigonous, dark brown, mucilaginous on wetting. 2n = 38 (Benoist, 1937). *Fl.* May–Jul.

Edge of fields, grassy slopes, limestone slopes, oak woods, scrub; 150–1200 m. Morocco, Algeria, Tunisia, Spain SW.

MOROCCO. Tangier, *Salzmann* s.n.! (E). Middle Atlas: Ouaouizert, *Jahandiez* 1927: 252! (E); Khenifra, *Jahandiez* 1925:347! (E) Oulmès, El-Harcha, *Paunero* et al. 1969: 1890! (E). Chauia, Boulhaut, *Gattefossé* 963! (K). Oued Cherrat, *Pitard* 1670! (K). Xauen, *Font Quer* 344! (BM). Beni Hosmar, above Tetauen, *Font Quer* 570! (BM—as *S. pluripartita* Pau). Barbary, *Desfontaines* (P–LA—type of *S. bicolor*—microfiche 521!).

ALGERIA. Oran, Oued-Imbert, 4 vi 1911, *Faure* s.n.! (E). Tlemcen, *Bourgeau* 33! (MPU,K). Tiaret, 28 vii 1937, *Faure* s.n.! (E). Azazga to Tizi Ouzou, *Davis* 53029! (E). Kerrata, *Reverchon* 1897:218! (E,BM). Nedroma, 4 vi 1937, *Faure*! (E, MPU). Mts at Magris, vi 1898 *Reverchon*! (E). Lamoricière, 26 v 1933, *Maire*. Near Marguerritta, NE of Miliana, *Alston & Simpson* 37704! (BM). Magris, *Reverchon* 1898:218! (BM).
Tunisia, N. (Bonnet & Barratte 334, 1896).

Although very variable in the size and division of the leaves and in the size of the corollas, *S. barrelieri* is not as polymorphic a species as might be expected from the considerable number of subspecific taxa that have been recognised.

It is placed in a monotypic species-group in this account but it may have some affinities with some Spanish species.

No type specimen of *S. barrelieri* has been traced, nor indeed have any specimens of Etlinger, but the reference given by Etlinger in the original description to the pre-Linnaean Barrelier, Plantae per Galliam, Hispaniam . . . observatae (1714) leads one to an illustration of it, t.186, which, although not ideal, could serve as a type.

Species-group V
(page 18)

56. S. disermas Linn., Sp. Pl. ed. 2:36 (1762).
Syn.: *S. rugosa* Thunb., Prodr. Pl. Cap, 97 (1800).
S. rugosa var. *angustifolia* Benth. in DC., Prodr. 12:291 (1848).
S. fleckii Gürke in Bull. Herb. Boiss. 6:551 (1898).
Type. [S Africa] In Herb. Linn. 42/26! (LINN—but habitat not 'Syria' as given in the original description).
Ic.: Letty, Wild Fls. of Transvaal t.144 (1962).
Ref.: Linn., Mantissa alt. 318 (1771); Etlinger, Salvia 36 (1777); Aiton, Hort. Kew. 1:42 (1789); Thunb., Prodr. Pl. Cap. 97 (1800); Vahl, Enum. 1:259, 266 (1804); Thunb., Fl. Cap. ed. 2:451 (1823); Benth., Labiat. 236 (1833); Meyer, Comment. 1:235 (1837); DC., Prodr. 12:291 (1848); Thiselton-Dyer, Fl. Cap. 5, 1:319 (1910).

Perennial with a woody rootstock or ± shrubby. *Stems* herbaceous, sturdy, erect or ascending. up to 1·2 m; above and below with a dense indumentum of long and short spreading glandular and eglandular hairs. *Leaves* simple, ovate to linear-elliptic, truncate to cordate at base, up to 14 cm long, irregularly crenate to erose-dentate; above and below with a ± dense indumentum of short and longer eglandular hairs, capitate glandular hairs and oil globules; petiole up to 6 cm. *Inflorescence* elongated, of up to 20 verticils, c. 6-flowered, lowermost up to 4 cm apart, approximating above. *Floral leaves* broad-ovate, acuminate, up to 12 × 7 mm; bracts present. *Pedicels* erect-spreading, c. 3 mm. *Calyx* tubular-campanulate, c. 12 mm, 13-veined, somewhat expanding in fruit, glandular pilose as on stem and with oil globules; upper lip concave, shortly 3-dentate with lateral teeth c. 1·2 mm and inner 0·5 mm; lower lip with two lanceolate acuminate teeth c. 4·5 mm.

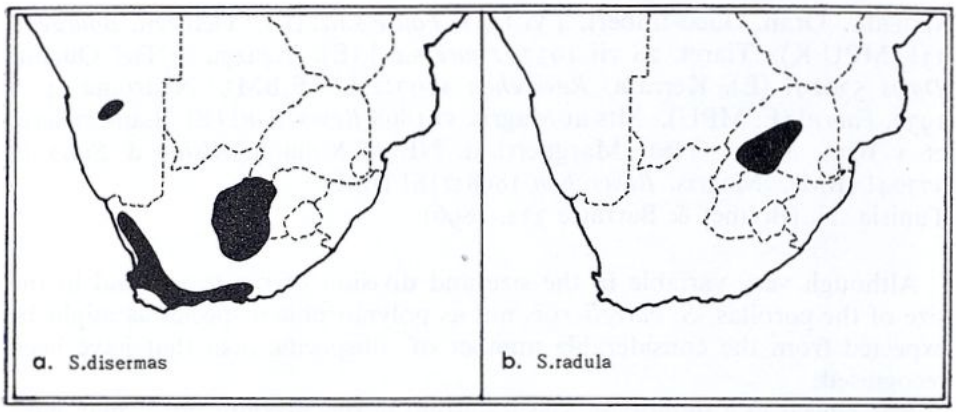

FIG. 23. Distribution of *Salvia* species in southern Africa: a, *S. disermas* Linn.; b, *S. radula* Benth.

Corolla whitish blue or pale mauve with bluish markings up to 25(–30) mm; upper lip falcate; lower lip shorter than, rarely subequal to, upper; tube slightly pouched above, minutely pilose at base of pouch. *Staminal connectives* c. 15 mm; filaments c. 3·5 mm; lower thecae sterile, dolabriform, cohering. *Nutlets* round trigonous, reddish brown, c. 2·5 × 1·5 mm, mucilaginous on wetting. *Fl.* Aug.–May.

Stream beds, sandy veld, damp ground among trees, fallow ground, rocky slopes, grassland and river banks; 650–1550 m.

SW Africa (Namibia). S Africa: Cape, Transvaal, Orange Free State. Botswana. Fig. 23a.

SW AFRICA (NAMIBIA). Hakos mtns., *Dinter* 7958! (K). Between Nauchas and Areb, *Pearson* 9015! (BOL, K).

S AFRICA. Cape, Little Namaqualand: between Koperberg and Kook Fontein, *Drège* 806a; near Kook Fontein, *Bolus* 9435. Clanwilliam: Pakhuis to Nieuwoudtville, *Hardy* 783! (E, K). Calvinia: Onder Bokkeveld, Matjesfontein, *Schlechter* 10926! (E, PRE, BOL); between the Doorn river and Calvinia, *Levyns* 5081! (PRE). Swellendam: *Zeyher*. Ceres: Ongeluks river, *Burchell* 1228. Uniondale: Uniondale, *Paterson* 25858! (PRE). Fraserburg: Layton, *Shearing* 43! (PRE). Prince Albert: *Drège* 806b. Barkly West: Newlands, *Wiman*! (K). Griqualand West: Postmasburg, *Coetsee* 89! (PRE); Koopmansfontein, Kaap plateau, *Marloth* 14064! (STE). Kimberley: Kimberley, *Esterhuysen* 1021! (BOL, K). Herbert: near Douglas, *Kotze* 789! (PRE). Hopetown: near Hopetown, *Bolus* 2032. Richmond: Winterveld, between Nieuwjaars Fontein and Ezels Fontein, *Drège* 806c. Middelburg: Middelburg, *Southey* 10! (PRE).

Transvaal. Bloemhof: Kameelpan, Christiana, *Theron* 502! (PRE).

Orange Free State. Philippolis: Philippolis to Luckhoff, *Werger* 232! (EA). Bethulie: near Bethulie, *Flanagan* 1495! (BOL). Fauresmith: Jagersfontein, *Gerstner* 120! (PRE). Jacobsdal; *Goosaens* s.n.! (NU). Kroonstad: 15 miles W of Bothaville, *Schweickerdt* 1081! (PRE, K).

BOTSWANA. Vryburg: Armoedsvlakte, *Mogg* 8678! (PRE, STE).

This is a very variable species with regard to the size and shape of the leaves and the size of the plant and flowers. It is generally restricted to mesophytic habitats.

Although *S. rugosa* is the name that has generally been applied to this species, *S. disermas*, which cannot be separated from it, is the earlier name. The two were previously recognised as independent species, *S. disermas* on account of the smaller corollas, but there is complete intergradation between them, although by far the commoner form has large corollas. Possibly some of the small-flowered forms may be gynodioecious but field studies are needed.

Nomenclaturally, *S. disermas* presents some problems. It was described as being a Syrian plant but there is no doubt that the type specimen (LINN—42/26), which agrees reasonably well with the original description, is S African in origin and quite unlike anything in Syria or SW Asia. Furthermore, the only synonym given by Linnaeus "Horminum sylvestre majus, flore albo integris foliis. Barr. Ic. 187—bona" does not apply to the African species but apparently refers to the long-racemed *S. virgata* Ait., which is widespread in SW Asia. It would therefore appear that Linnaeus was dealing with two separate species, one European and SW Asian, the other S African, in his original description. Subsequent authors continued this confusion. For example, Vahl (Enum. 1:266, 1804) gives a full description of the S African plant but gives its distribution as Syrian. Bentham, however, realising the previous confusion gives, in the *Labiatarum* and the *Prodromus*, 'Cap. bon. Spei' as its distribution. It is of interest that at Edinburgh (E) there are two late 18th Century (or early 19th) specimens labelled *S. disermas*, one of which is that species whereas the other is *S. virgata*. Both are members of sect. *Plethiosphace* but are not closely related.

Linnaeus knew *S. disermas* as a cultivated plant, as is evident from his phrase 'grato gravi odore', and it is possible that the small flowers of the earliest herbarium specimens owe their size to deficiencies of cultivation in northern climes.

57. S. radula Benth. in DC., Prodr. 12:291 (1848).

Type. [S Africa. Transvaal, Rustenburg?] Macilisberg (Magaliesberg), *Burke*! (holo. K).

Ic.: Fig. 24.

Ref.: Thiselton Dyer, Fl. Cap. 5, 1:318 (1910).

Herbaceous perennial with a woody rootstock. *Stems* branched erect or ascending, up to 50 cm sturdy, ± quadrangular; below thinly to densely lanate with a few oil globules; above with spreading capitate glandular and a few longer eglandular hairs. *Leaves* simple, oblong-elliptic to ovate, up to 13 × 8 cm, truncate or cordate at base, irregularly crenate to erose, rugose-colliculate above with short eglandular hairs, below more or less densely white lanate with a few oil globules; petiole up to 9 cm. *Inflorescence* branched; verticils up to 15 (or more), c. 6-flowered, lowermost c. 3 cm apart, closer above. *Floral leaves* ovate, acuminate, c. 12 × 8 mm; bracts present. *Pedicels* up to 4 mm, erect-spreading. *Calyx* tubular campanulate, c.12 mm, expanding to c. 15 mm in fruit, 13-veined, with a fairly dense indumentum of capitate glandular hairs, eglandular hairs and oil globules; upper lip obovate, recurved with 3 ± connivent small teeth up to 1 mm; lower lip with two c. 5 mm lanceolate, acuminate pungent teeth. *Corolla* white, pale pink to blue, up to 25 mm; upper lip falcate; lower lip with a cucullate median lobe, equal to or shorter than the upper lip; tube c. 10 mm slightly

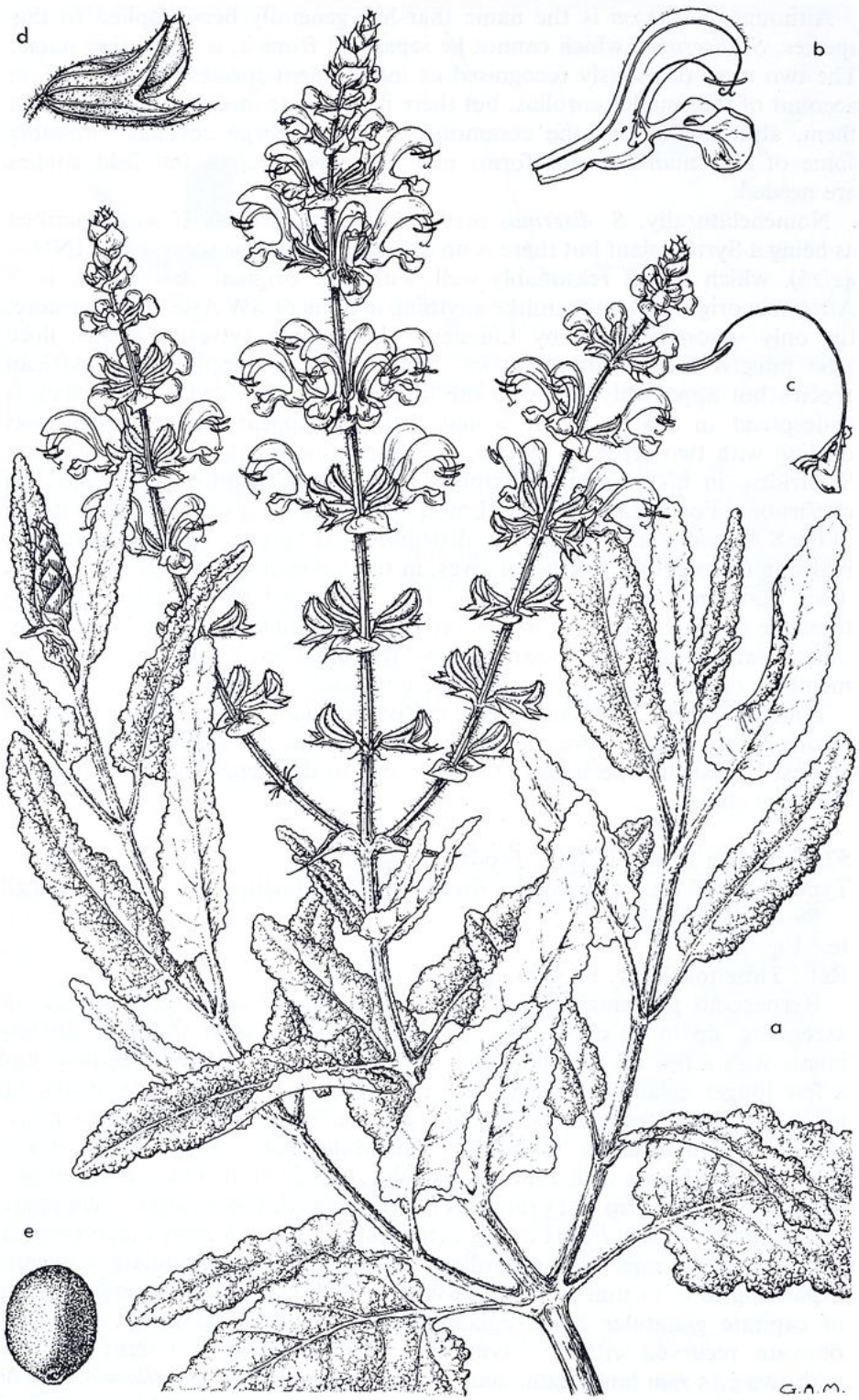

FIG. 24. *Salvia radula* Benth.: a, habit × $\frac{2}{3}$; b, L.S. of corolla × $1\frac{1}{3}$; c, stamen × $2\frac{1}{3}$; d, fruiting calyx × 2; e, nutlet × $6\frac{2}{3}$. (*Murray* 776).

exserted, ventricose at throat. *Staminal connectives* c. 15 mm; filaments c. 4 mm; lower thecae dolabriform, sterile, free. *Nutlets* round trigonous, c. 2·5 × 1·8 mm, mucilaginous on wetting. *Fl.* Oct.–Feb.
Dry slopes roadside, riverbanks; 1000–1500 m.
S Africa. Transvaal. Fig. 23b.
S AFRICA. Transvaal. Potchefstroom: Klington, *Goossens* 1648! (PRE); Potchefstroom, *Murray* 776! (PRE). Lichtenburg: Tower Lands, Klipveld, *coll. illeg.* 73! (PRE). Pietersburg: western slopes Iron Crown near Haenertsburg, *Prosser* 1912! (K). Rustenburg: Rustenburg, *Kassner* 338! (BR). Without locality, *Zeyher* 1333! (CGE, OXF).

S. radula is closely related to *S. disermas* but differs in the denser lanate indumentum on lower stems and leaves. Although Bentham's original description mentions differences of narrower leaves and larger flowers in *S. radula*, these do not hold true with the material now at hand. As figs. 23 a & b show there is a geographical gap between the two species. Further material might show that subspecific status would be preferable for *S. radula* but in the meantime they just merit separate specific rank.

Species-group W
(p. 18)

58. S. algeriensis Desf., Fl. Atlant. 1:23, t.3 (1798).
Syn.: *S. latifolia* Vahl, Enum. 1:271 (1804).
S. algeriensis Desf. var. *mariae* Maire & Sennen in Bull. Soc. Hist. Nat. Afr. Nord. 26:223 (1935).
S. mariae Sennen, Diagn. Nouv. Pl. Espagne et Maroc 1928–35: 199 (1936).
Type. [Algeria] "In Atlante prope Maiane". (P—Desfontaine-microfiche!)
Ic.: Fig. 25.
Ref.: Vahl, Enum. 1:271 (1804); Benth., Labiat. 231 (1833); DC., Prodr. 12: 288 (1848); Jahandiez & Maire, Cat. Pl. Maroc 3:642 (1934); Quezel & Santa, Nouv. Fl. Algér. 2:798 (1963).

Annual with erect branched stems up to 50 cm; below with numerous prominent, spreading capitate glandular and eglandular hairs; above with a similar indumentum but ± retrorse and very few glandular hairs. *Leaves* ovate to linear-ovate, up to 11 × 4 cm, subentire to crenulate, narrowed at base into a petiole up to 4 cm or ± sessile; above and below with few short eglandular hairs or glabrous. *Inflorescence axis* usually branched; verticils up to 14, c. 6-flowered, distinct up to 4 cm apart below, less above. *Floral leaves* ovate-acuminate, up to 8 × 4 mm, reflexed; bracts absent. *Pedicels* erect-spreading, up to 1 cm, recurved in fruit, *Calyx* tubular-campanulate up to c. 10 mm, expanding in fruit to c. 15 mm and reflexed, 13-veined, with capitate glandular hairs, eglandular hairs, mainly at base, and oil globules; upper lip with an almost obsolete median tooth and two lateral c. 2 mm teeth, concave in fruit; lower lip with two c. 4 mm long, acuminate-spinose teeth. *Corolla* uniformly blue (coerulea) or bright violet with white markings, up to 28 mm; upper lip prominently falcate, up to 9 mm deep; lower lip with a prominently cucullate median lobe; tube straight, glabrous within. *Staminal connectives* c. 20 mm; filaments 3·5 mm; lower thecae sterile, dolabriform,

cohering. *Nutlets* round-trigonous, reddish brown, 2·7 × 1·8 mm, mucilaginous on wetting. 2n = 36 (Yakovleva, 1933); 38 (Benoist, 1937); 40 (Hruby, 1935–36). *Fl.* Apr.–Jun.
Fields, among shrubs, cultivated ground, clay plains, lower mountain slopes; near sea level to 500 m.
Morocco, NE. Algeria, NW.
MOROCCO. Beni-Said, à Dar-Kebdani, *Sennen & Mauricio* 8882! (MPU). Sidi Sliman, *Trethewy* 78! (K). Seed from Dar-Kedani, cultivated Alger, 28 iv 1934! (MPU – holo. *S. mouretii* var *mariae*). Beni-Said, Dar Kebdani, *Sennen & Mauricio* 9522! (BM—type of *S. mariae*).
ALGERIA. Oran, *Munby* 78! (E, BM). Mers-el-Kebir, *Balansa* 445! (E, K). Beni Saf to Honain, *Davis* 51510! (E). Djebel Bessam near Martimprey-du-Kiss, *Faure* s.n.! (E).

A distinct oligomorphic annual with a limited geographical range; closely related to *S. mouretii*.

59. S. mouretii Battandier & Pitard in Pitard, Contrib. l'étude Fl. du Maroc 29 (1918).
Syn.: *S. marocana* Battandier & Pitard, l.c. 30 (1918).
Type. Morocco, W: Senhadj, Sidi Barca, Khemisset, 3 vi 1912, *Pitard* 1666! (MPU, K).
Ref.: Bull. Soc. Hist. Nat. Afr. Nord 20: 34 (1929); Jahandiez & Maire, Cat. Pl. Maroc. 3: 642 (1934); Bull. Soc. Hist. Nat. Afr. Nord 26: 223 (1935); Emberger & Maire, Cat. Pl. Maroc 4:1114 (1941).

Annual or biennial (?) *Stems* up to 60 cm, branched above, at base lanate with multicellular eglandular hairs, above with short eglandular and capitate glandular hairs. *Leaves* simple, ovate to broad oblong, variable in size, crenate, above and below with scattered short eglandular hairs and oil globules; basal leaves with petioles up to 2·5 cm; cauline leaves sessile. *Verticils* up to c. 10, 3–6-flowered, lowermost 2–6 cm apart, slightly approximating above. *Floral leaves* ovate, acuminate; bracts present. *Pedicels* erect-spreading, up to 7 mm. *Calyx* tubular-campanulate, 7–10 mm, expanding to 14 mm in fruit, 13–14-veined, with short simple eglandular hairs, short capitate glands and oil globules; upper lip single-lobed with three closely connivent teeth; lower lip with two narrow lanceolate-acuminate teeth, c. 2·2(–4) mm. *Corolla* with a lilac-white hood and white or lilac lower lip, 10–24 mm, upper lip falcate; lower lip much shorter than upper; tube broadening above, glabrous within. *Staminal connectives* up to 20 mm; filaments c. 4 mm; lower thecae sterile, dolabriform, cohering. *Nutlets* ± round, c. 2·2 × 1·7 mm. mucilaginous on wetting. 2n = 44 (Delestaing, 1954). *Fl.* Apr.–June.
Fields, pastures, grassy banks; 150–600 m.
Morocco, NW.
MOROCCO. Fez, 27 v 1887, *Grant* s.n.! (MPU). Zaer, Narchand, *Jahandiez* 1927:21! (E). Ghafsai, *Jahandiez* 1929:218! (E). Near Ain Defali, S of Ouezzane, *Davis* 51183! (E). Chaouia, near Boucheron, *Gattefossé* s.n.! (K). El Araix, *Font Quer* 1930:569! (BM—distributed as *S. haematodes* L. var. *atlantica* Pau & Font Quer—nomen).

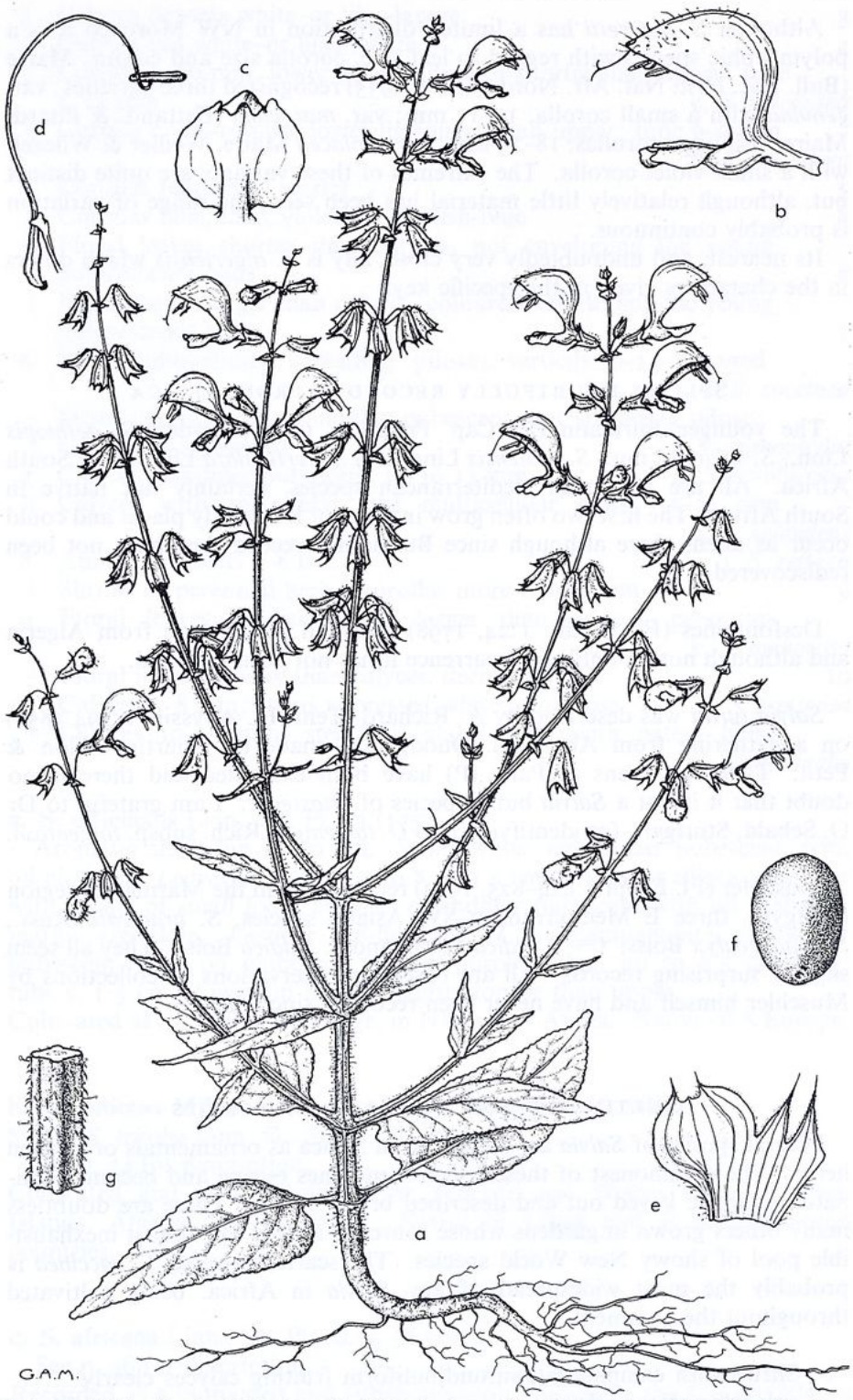

FIG. 25. *Salvia algeriensis* Desf.: a, habit × $\frac{2}{3}$; b, corolla × $1\frac{1}{3}$; c, lower lip of corolla × 2; d, stamen × 2; e, fruiting calyx opened out × $1\frac{2}{3}$; f, nutlet × 6; g, part of stem × c.3. (*Faure* s.n. Algeria 1937).

Although *S. mouretii* has a limited distribution in NW Morocco it is a polymorphic species with regard to leaf size, corolla size and colour. Maire (Bull. Soc. Hist. Nat. Afr. Nord 26:223, 1935) recognized three varieties: var. *genuina* with a small corolla, 10–15 mm; var. *marocana* (Battand. & Pitard) Maire with large corollas, 18–23 mm; var. *violacea* Maire, Weiller & Wilczek with a small violet corolla. The extremes of these variants are quite distinct but, although relatively little material has been seen, the range of variation is probably continuous.

Its nearest, and undoubtedly very close, ally is *S. algeriensis* which differs in the characters given in the specific key.

Species doubtfully recorded from Africa

The younger Burmann (Fl. Cap. Prodr. 1, 1768) recorded *S. aethiopis* Linn., *S. sclarea* Linn., *S. pratensis* Linn. and *S. verticillata* Linn. from South Africa. All are European-Mediterranean species, certainly not native in South Africa. The first two often grow in more or less weedy places and could occur as aliens there although since Burmann's record they have not been rediscovered.

Desfontaines (Fl. Atlant. 1:24, 1798) recorded *S. aethiopis* from Algeria and although not an unlikely occurrence it has not been re-found.

Salvia turdii was described by A. Richard (Tent. Fl. Abyssin. 2:194 1851) on a gathering from Abyssinia, Ouodgerate, made by Quartin Dillon & Petit. Type specimens at Paris (P) have been examined and there is no doubt that it is not a *Salvia* but a species of *Otostegia*; I am grateful to Dr O. Sebald, Stuttgart, for identifying it as *O. tomentosa* Rich. subsp. *tomentosa*.

Muschler (Fl. Egypt 2:824–825, 1912) recorded from the Marmarica region of Egypt, three E Mediterranean–SW Asiatic species, *S. bracteata* Russ., *S. brachycalyx* Boiss. (= *S. indica* Linn.) and *S. judaica* Boiss. They all seem slightly surprising records. All are based on observations or collections by Muschler himself and have never been recorded since then.

Cultivated and naturalised species

Several species of *Salvia* are cultivated in Africa as ornamentals or kitchen herbs. The commonest of these which sometimes escape and become semi-naturalised are keyed out and described briefly below. There are doubtless many others grown in gardens whose source is mostly the almost inexhaustible pool of showy New World species. The scarlet-flowered *S. coccinea* is probably the most widespread of any *Salvia* in Africa, being cultivated throughout the continent.

1 Shrub with campanulate-infundibuliform fruiting calyces clearly enlarging after anthesis . . . . . c, *S. africana*

\+ Shrubs, perennial or annual herbs with calyces not as above . 2

2 Calyces densely white–or lilac-lanate 3
+ Calyces not white–or lilac-lanate 4
3 Corolla c. 20 mm, lower lip equalling or shorter than upper; tube c. 13 mm . . . . . e, *S. leucantha*
+ Corolla c. 10–15 mm, lower lip longer than upper; tube 6–9 mm d, *S. farinacea*
4 Corollas reddish to scarlet 5
+ Corollas blue, lilac, violet or purplish-blue 8
5 Floral leaves shorter than calyces, not enveloping the young inflorescence buds 6
+ Floral leaves larger than calyces, coloured, enveloping the young inflorescence buds 7
6 Stem indumentum spreading pilose; verticils 6–14-flowered f, *S. coccinea*
+ Stem indumentum eglandular–pubescent, not spreading pilose; verticils 2–4-flowered . . . . . i, *S. microphylla*
7 Calyces glandular pubescent, up to 13 mm . . g, *S. involucrata*
+ Calyces with eglandular, red multicellular hairs, 15–22 mm h, *S. splendens*
8 Annual; corollas 6–8 mm . . . . . j, *S. reflexa*
+ Shrubs or perennial herbs; corollas more than 9 mm . . 9
9 Floral leaves reddish-purple, larger than calyces, persistent k, *S. nemorosa*
+ Floral leaves shorter than calyces, deciduous 10
10 Calyces 5–8 mm; stems adpressed white-tomentose . b, *S. fruticosa*
+ Calyces 10–15 mm; stems ± glabrous or with patent hairs a, *S. officinalis*

a. S. officinalis Linn., Sp. Pl. 23 (1753).

Aromatic shrub up to 60 cm. *Stems* white, eglandular pubescent, with oil globules. *Leaves* petiolate, up to 8 × 2·5 cm, oblong or elliptic, entire or with a pair of small lobes at base, eglandular pubescent with oil globules; margin crenulate. *Verticils* 4–8-flowered. *Calyx* campanulate, eglandular pubescent, with oil globules. *Corolla* purplish-blue, up to 2·5 cm long; tube c. 1·5 cm.; lower lip broad, slightly longer than upper.

Cultivated as a kitchen herb, sage, in NW and S Africa. Native of S Europe.

b. S. fruticosa Miller, Gard. Dict. ed. 8, Salvia no. 5 (1768).

Syn.: *S. triloba* Linn. fil., Suppl. Pl. 88 (1781).

See p. 24 for description.

Cultivated and semi-naturalised in Tenerife and Hierro in the Canary Islands, Algeria and Morocco. Native of Libya and E Mediterranean countries.

c. S. africana Linn., Sp. Pl. ed. 2, 38 (1762).

See p. 46 for description.

Recorded as a cultivated and subspontaneous species in the Canary Islands at Santa Cruz on Palma. Native of S Africa, Cape.

d. S. farinacea Benth., Labiat. 274 (1833).

Perennial herb up to 120 cm. *Stems* eglandular-pubescent or puberulous below, densely pubescent, to lanate, rarely glandular-pubescent above, with oil globules above and below. *Leaves* ovate to narrow linear-elliptic, up to 8 × 2 cm, often clustered at the nodes, rounded or acute at apex, attenuate at base; eglandular-pubescent, with numerous oil globules. *Verticils* 10–16-flowered. *Floral leaves* inconspicuous, deciduous. *Calyx* shortly tubular, 5–8 mm long, densely white- or lilac-lanate. *Corolla* white, lavender, blue, purple or lilac, 10–15 mm; tube 6–9 mm; lower lip longer than upper.
Cultivated in tropical and subtropical Africa and occasionally adventive. Native of Mexico and Texas.

According to Mr B. L. Burtt, this plant is immensely popular with Africans, and may be seen frequently in the Transkei and elsewhere in Southern Africa.

e. S. leucantha Cav., Icones 1:16, t.24 (1791).

Perennial herb or subshrub up to 90 cm. *Stems* white-lanate below, densely violet-lanate above. *Leaves* shortly petiolate, oblong-lanceolate, up to 11 × 2 cm, acute at apex, rounded at base, margin serrulate; above with a sparse eglandular, rarely glandular, indumentum; below white-lanate with oil globules. *Verticils* c. 8-flowered. *Floral leaves* small, thickly white-lanate below, glabrous above, deciduous. *Calyx* tubular-campanulate, 8–12 mm long, densely violet-lanate, rarely white. *Corolla* white, c. 20 mm long, tubular, with a white-lanate indumentum and oil globules; tube c. 13 mm. lower lip equalling or shorter than upper.
Cultivated and occasionally escapes in the Canary Islands and tropical Africa. Native of Mexico.

Some of the records of *S. eriocalyx* Bert. ex Roem. & Schultes, a Jamaican species with purple-lanate calyces and rose-purple corollas with tubes c .8 mm long, may be misidentifications of this species. *S. eriocalyx* has been recorded as cultivated in the Canary Islands, Madeira and the Cape Verde Islands (Sunding 17, 1973).

f. S. coccinea Etlinger, Salvia 23 (1777).
Syn.: *S. pseudococcinea* Jacq., Coll. 2:302 (1786).

Annual, perennial herb or shrub up to 30(–150) cm. *Stem* eglandular-pubescent with long, spreading eglandular hairs, rarely glandular-pubescent. *Leaves* simple, ± triangular, petiolate, usually cordate at the base, up to 4 × 3 cm, almost glabrous to densely glandular-pubescent, occasionally also with oil globules. *Verticils* 6–10(–14)-flowered. *Calyx* tubular, c. 10 mm, glandular-pubescent. *Corolla* scarlet, rarely yellow, pink or white, up to 24 mm long; upper lip fairly short, ± straight; lower lip broad, longer than upper; tube c. ⅔ of corolla. *Stamens and style* clearly exserted.
Commonly cultivated and sometimes naturalised in almost all tropical and subtropical regions of Africa. Native of tropical America, probably Brazil.

g. S. involucrata Cav., Icones 2:3, t.105 (1793).

Shrubby herb up to 150 cm. *Stems* minutely puberulous below, glandular-pubescent or with long, shining multicellular eglandular hairs above. *Leaves* petiolate, ovate, up to 14 × 7 cm, rounded or cordate at the base, attenuate or acuminate at the apex; margin serrulate, ± glabrous or minutely puberulous, usually with short eglandular hairs round margin, and always with oil globules. *Verticils* 6(–10)-flowered. *Floral leaves* large, pink-red, surrounding the verticils in bud, deciduous as the flowers open. *Calyx* tubular-campanulate, coloured, up to c. 13 mm, glandular-pubescent. *Corolla* rosy-pink to reddish-purple, tubular, c. 35 mm; tube c. 2·8 cm, clearly invaginated; lower lip ± equalling upper; with long, multicellular, eglandular, coloured hairs present on both lips, especially upper, and on style.
Cultivated in east and west tropical Africa and occasionally adventive. Native of Mexico.

h. S. splendens Sellow ex Roem. & Schultes, Syst. Mant. 1:185 (1822).

Herbaceous perennial, woody at the base, up to 120 cm. *Stems* puberulous. *Leaves* petiolate, ovate, attenuate at apex, margin serrulate to crenate, with oil globules, puberulous or not. *Verticils* 2(–5)-flowered. *Floral leaves* larger than calyces, coloured, deciduous. *Calyx* tubular-campanulate, red, up to 22 mm, with red multicellular eglandular hairs, also present on pedicels. *Corolla* tubular, red to scarlet, 40–50 mm long; tube c. 35 mm, not invaginated; lower lip shorter than upper, minutely pubescent. *Stamens and style* ± exserted.
Widely cultivated, with many cultivars, in tropical Africa, especially in the west. Native of Brazil.

i. S. microphylla Kunth in Humboldt & Bonpland, Voy. Nov. Gen. & Sp. 2:294 (1817).
Syn.: *S. grahamii* Benth., Bot. Reg. t.1370 (1830).

Herbaceous perennial, woody at the base, up to 120 cm. *Stems* eglandular pubescent with oil globules, rarely glandular pubescent. *Leaves* petiolate, up to 5·5 × 3·8 cm, elliptic to ± triangular-ovate, truncate, cordate or attenuate at base, sometimes attenuate at apex, margin ± entire to crenulate or serrulate, ± glabrous or eglandular-pubescent, always with oil globules. *Verticils* 2(–4)-flowered. *Floral leaves* coloured, soon deciduous. *Calyx* tubular campanulate, 10–13 mm long, tinged purple, glandular pubescent. *Corolla* pale pink to deep red, c. 30 mm long; tube c. 20 mm; lower lip broad, usually longer than upper; fairly dense, coloured, multicellular hairs on upper lip, the rest usually glabrous.
Cultivated in east tropical Africa, and NW Africa.

In its natural habitat in Mexico, the leaves are usually much smaller (c. 2 × 1 cm) than described here.

j. S. reflexa Hornem., Enum. Pl. Hort. Hafn. 1, 34:(1807).

Erect, branching, annual herb, up to 75 cm. *Stems* with short, retrorse, eglandular hairs. *Leaves* up to 8 × 1·2 cm, linear-elliptic, rarely elliptic, attenuate at base, margin ± entire to irregularly serrate; indumentum of

scattered short eglandular hairs and sessile oil globules. *Verticils* 2(–6)-flowered. *Floral leaves* small. *Calyx* c. 5·6 mm, expanding in fruit, campanulate, or tubular-campanulate, sometimes slightly constricted at throat, with short antrorse, eglandular hairs, mainly on veins and scattered oil globules. *Corolla* blue or lilac, small c. 6–8 mm; tube c. 4–6 mm.
Cultivated and occasionally escapes in east tropical and southern Africa. Native of N and C America

k. S. nemorosa Linn., Sp. Pl. ed. 2, 35(1762).

Much branched perennial herb up to 100 cm. *Stems* with short spreading or retrorse hairs and oil globules. *Leaves* sessile or shortly petiolate, up to 9 × 3·5 cm, oblong-ovate, attenuate at apex, rounded or cordate at base, up to 9 × 3·5 cm, margin usually regularly crenate, puberulous with oil globules. *Inflorescence* branched, with many verticils. *Verticils* 2–6-flowered. *Floral leaves* larger than calyces, reddish-purple, persistent. *Calyx* campanulate, slightly narrowed at throat, c. 6–7 mm, eglandular pubescent with oil globules. *Corolla* violet-blue, rarely pink or white, 9–14 mm; tube c. 5–7 mm; upper lip falcate; lower lip shorter than upper.
Adventive around Oran in Algeria (Quezel & Santa, Nouv. Fl. Algér. 2:796, 1963, as *S. silvestris* Linn.). Native of SE Europe and SW Asia.

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References

(In some cases, the page-numbers given below refer only to the pertinent Salvia reference).

Afzal, Z. (1971). Contribution à l'étude cytotaxonomique des Salvia de Turquie. *Bull. Soc. Bot. France* 118: 69–76.

Afzal-Rafii, Z. (1972). Op. cit. II. *l.c.* 119: 167–176.

Andrews, F. W. (1956). *Flowering plants of the Anglo-Egyptian Sudan* 3: 224.

Benoist, E. (1937). Recherches caryologiques sur quelques espèces du genre Salvia. *Rev. Cyt. et Cytophys. Vég.* 2: 415–439.

Bentham, G. (1833). *Labiatarum Genera et Species* 190–312.

—(1848). In De Candolle, *Prodromus*, 12: 262–358.

Bonnet, E. & Barratte, G. (1896). *Catalogue raisoné des plantes vasculaires de la Tunisie* 332–334.

Briquet, J. (1895). In Engler, A. & Prantl, K. *Die natürlichen Pflanzenfamilien IV*, 3b: 270–286.

Britten, J. (1920). Some early Cape botanists and collectors. *Journ. Linn. Soc. Bot.* 45: 29–51.

Cherneva, O. V. (1972). The new species of Salvia from N Africa. *Bot. Zhurn.* 57, 1:101.

CHEVALIER, A. (1935). Les Iles du Cap Vert. *Revue Bot. Appl. Agr. Trop.* 15: 733.

CORTI (1942). *Flora e vegetazione del Fezzan & della regione di Gat* 226.

CUFODONTIS, G. (1962). Enumeratio plantarum Aethiopiae, Spermatophyta. *Bull. Jard. Bot. Brux.* 32: 818–820.

DAVIS, P. H. & HEDGE, I. C. (1971). Floristic links between NW Africa and SW Asia. *Ann. Naturhist. Mus. Wien.* 75: 43–57.

DELESTAING, N. (1954). Contribution à l'étude cytologique du genre Salvia. *Rev. Cytol. et Biol. Vég.* 15, 3: 195–236.

EPLING, C. (1938–39). A revision of Salvia, subgenus Calosphace. *Fedde Rep. Beih.* 110: 1–383.

ETIENNE, R. (1930). Contribution à l'étude structurale des Labiées endemiques des Iles Canaries. *Faculté de Pharmacie, Université de Paris* 16: 40–47.

ETLINGER, A. E. (1777). *Commentatio Botanico-medica de Salvia.* Erlangen.

GLOVER, P. E. (1947). *A provisional check-list of British & Italian Somaliland Trees, Shrubs & Herbs* 172.

GUINEA, E. (1949). Estudio razonado de las especies vegetales del Sahara Español in *El Sahara Español* by Hernandez-Pacheco, E. et al. 780.

HEDBERG, O. (1957). Afroalpine vascular plants, a taxonomic revision. *Symb. Bot. Ups.* 15, 1: 159–160.

HEDGE, I. C. (1970). Observations on the mucilage of Salvia fruits. *Notes R.B.G. Edinb.* 30: 79–95.

—(1972). Salvia in Madagascar. *l.c.* 32: 1–11.

HENDERSON, D. M., PRENTICE, H. & HEDGE, I. C. (1968). Pollen morphology of Salvia and some related genera. *Grana Palynologica* 81, 1: 70–85.

HRUBY, K. (1935–36). In Tischler G., Pflanzliche Chromosomenzahlen. *Tabulae Biol.* 11: 281–304; *l.c.* 12: 57–115.

JAHANDIEZ, E. & MAIRE, R. (1934). Catalogue des Plantes de Maroc 3: 640–644.

KHATTAB, A. & EL-HADIDI, M. (1971). Results of a Botanic Expedition to Arabia in 1944–45. *Publ. Cairo Univ. Herb.* 4: 63–64.

LACAITA, C. C. (1927). Salvia controversa Ten. *Journ. Bot.* 65: 320.

LARSEN, K. (1960). Cytological and experimental studies on the flowering plants of the Canary Islands. *Biol. Skr.* 11, 3: 1–60.

LEMS, K. (1960). Floristic Botany of the Canary Islands. *Sarracenia* 5: 52–53.

LID, J. (1967). Contributions to the Flora of the Canary Islands. *Skr. Norske Vidensk.-Akad. Oslo. Mat.-Naturvidensk. Kl., Ny serie* 23: 153–154.

LINDINGER, L. (1926). Beiträge zur Kenntnis von Vegetation und Flora der kanarischen Inseln. *Hamburg Univ. Abhand. Auslandskunde* 21: 1–350.

LINNERT, G. (1955). Die Struktur der Pachytanchromosomen in Euchromatin und Heterochromatin und ihre Auswirkung auf die Chiasmabildung bei Salvia-Arten. *Chromosoma* 7: 90–128.

MERXMÜLLER, H. ed. (1969). *Prodromus einer Flora von Südwestafrika.* 123, Lamiaceae by Launert, E. & Schreiber, A. 26–29.

MURBECK, S. V. (1923). Contributions à la connaissance de la Flore du Maroc II. *Lunds Univ. Arsskr.* n.f. 2, 19, 1: 29–30.

MUSCHLER, R. (1912). *A manual Flora of Egypt* 2: 823–828. Berlin.

PAMPANINI, R. (1931). *Prodromo Flora Cirenaica* 395–397.

PHILLIPS, E. P. (1951). The genera of South African flowering plants. Ed. 2. *Dept. of Agriculture, S Africa. Botanical Survey Memoir no.* 25.

POBEDIMOVA, E. (1972). Taxa nova Florae URSS, 2. *Nov. Syst. Leningrad* 9: 243–248.

PUGSLEY, H-W. (1908). The forms of Salvia verbenaca L. *Journ. Bot.* 46: 97–106, 141–151.

—(1927). The nomenclature of the group Salvia verbenaca L. *Journ. Bot.* 65: 185–195.

QUEZEL, P. & SANTA, S. (1963). *Nouvelle Flore de l'Algérie et des regions désertiques meridionales* 2:793–798.

REESE, G. (1957). Über die Polyploidiespektrum in der nordsaharischen Wüstenpflanzen. *Flora* 144: 609.

SALISBURY, R. A. (1796). *Prodromus Stirpium in Horto Chapel Allerton* 73–75.

SCHEEL, M. (1931). Karyologische Untersuchung der Gattung Salvia. *Bot. Arch.* 32: 148–208.

SCHWARTZ, O. (1939). Flora des tropischen Arabien. *Mitt. Inst. allgem. Bot. Hamburg* 10: 226–227.

SEBALD, O. (1972). Beitrag zur Floristik Aethiopiens III: Ericaceae to Campanulaceae. *Stuttgart. Beitr. Naturkunde* no. 244: 14–15.

SKAN, S. A. (1910). *Flora Capensis*, ed. Thiselton-Dyer 5, 1: 307–333.

SMITH, C. A. (1966). Common names of S African plants 602. *Dept. of Agriculture, S Africa. Botanical Survey Memoir* no. 35.

STIBAL, E. (1934). Plantae Sinenses a dre. H. Smith annis 1921–22 et 1924 lectae. XXX Labiatae—Salvia. (Nebst revision der chineschen und ostbirmanischen Arten der Gattung). *Medd. från Göteb. bot. Trädg.* 9: 101—145.

—(1936). Revision der indischen und tibetanischen Arten der Gattung Salvia. *Fedde, Rep. Sp. Nov.* 39: 173–186.

SUNDING, P. (1973). *Check-list of the vascular plants of the Cape Verde islands* 17. Oslo.

TÄCKHOLM, V. (1956). Students Flora of Egypt 145–147.

WOJCIECHOWSKA, B. (1958). Taxonomy, morphology and anatomy of fruits and seeds in the genus Salvia L. *Monograph. Bot.* (Warsaw) 6: 1–56.

YAKOVLEVA, S. V. (1933). Caryological investigations on some Salvias. *Trudy Prikl. Bot.* ser. 2, 5: 207–213.

Index of native, cultivated and recorded taxa

The numbers refer to the species number in the text; synonyms are italicised; the abbreviation 'cult'. indicates a cultivated species (see page 112).