

The *Eriosema cordatum* complex. II. The *Eriosema cordatum* and *E. nutans* groups

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ABSTRACT

The *Eriosema cordatum* E. Mey. complex is segregated into a number of species. *E. cordatum* E. Mey. is retained as a polymorphic species and two allied species, *E. lucipetum* C. H. Stirton and *E. zuluense* C. H. Stirton are described as new. Four additional species *E. buchananii* Bak. f., *E. nutans* Schinz, *E. psoraleoides* (Lam.) G. Don and *E. parviflorum* E. Mey. are revised and excluded from the *E. cordatum* group.

RÉSUMÉ

LE COMPLEXE ERIOSEMA CORDATUM. II LES GROUPES ERIOSEMA CORDATUM ET E. NUTANS

Le complexe *Eriosema cordatum* E. Mey. est divisé en un certain nombre d'espèces. *E. cordatum* E. Mey. est retenu comme une espèce polymorphique et deux espèces, alliées *E. lucipetum* C. H. Stirton et *E. zuluense* C. H. Stirton sont décrites comme nouvelles. Quatre espèces additionnelles *E. buchananii* Bak f., *E. nutans* Schinz, *E. psoraleoides* (Lam.) G. Don et *E. parviflorum* E. Mey. sont révisées et exclues du groupe *E. cordatum*.

INTRODUCTION

Verdcourt (1971a) included seven species in the *Eriosema cordatum* E. Mey. complex. The identity of two of these species, *E. populifolium* Harv. and *E. distinctum* N.E.Br., has already been clarified (Stirton, 1978). This paper deals with the remaining species of the complex: *E. cordatum* E. Mey., *E. nutans* Schinz, *E. buchananii* Bak. f., *E. parviflorum* E. Mey. and *E. psoraleoides* (Lam.) G. Don.

In 1975 Stirton concluded that *E. cordatum* could be segregated into five taxa which, pending further study, he named A to E. Taxon A is retained as a polymorphic species. Taxon B and taxon C are united into a new species *E. lucipetum*. Taxon D is described new as *E. zuluense*. Taxon E has already been described as *E. gunniae* C. H. Stirton (Stirton, 1981), so will not be dealt with further. The remaining species are correctly identified as *E. buchananii*, *E. nutans*, *E. parviflorum* and *E. psoraleoides*.

GROSS MORPHOLOGY OF THE SPECIES

Vegetative parts

Habit. This complex comprises perennial herbs, suffrutices and shrubs. *E. psoraleoides* is the only true shrub and often grows up to 1,5 m high. The suffrutices are low growing woody plants with annually regenerated growth points; *E. nutans*, *E. buchananii*, and *E. parviflorum*. The remaining taxa all die back completely during the winter months to regenerate aerial parts each spring. Growth form may be erect, ascending, decumbent or prostrate.

Rootstocks. All species develop perennial rootstocks which, being quite variable in form, provide excellent key characters for fieldwork, especially in the absence of flowers and fruits. *E. cordatum* is readily separated from all other species by its distinctive daucate rootstock (Fig. 1). *E. psoraleoides* has the most robust and branched rootstock (Fig. 2). There is usually a short pseudo-stylopodium at the apex of the rootstock. Root nodulation occurs in all the species treated in this paper (Grobbelaar, Van Beyma & Todd, 1967; Grobbelaar & Clarke, 1972; Stirton, 1975). Freshly exposed rootstocks, with roots and nodules still intact, will, if left in water for

24 hours, produce a pungent mustard-like odour. The nodules swell considerably.

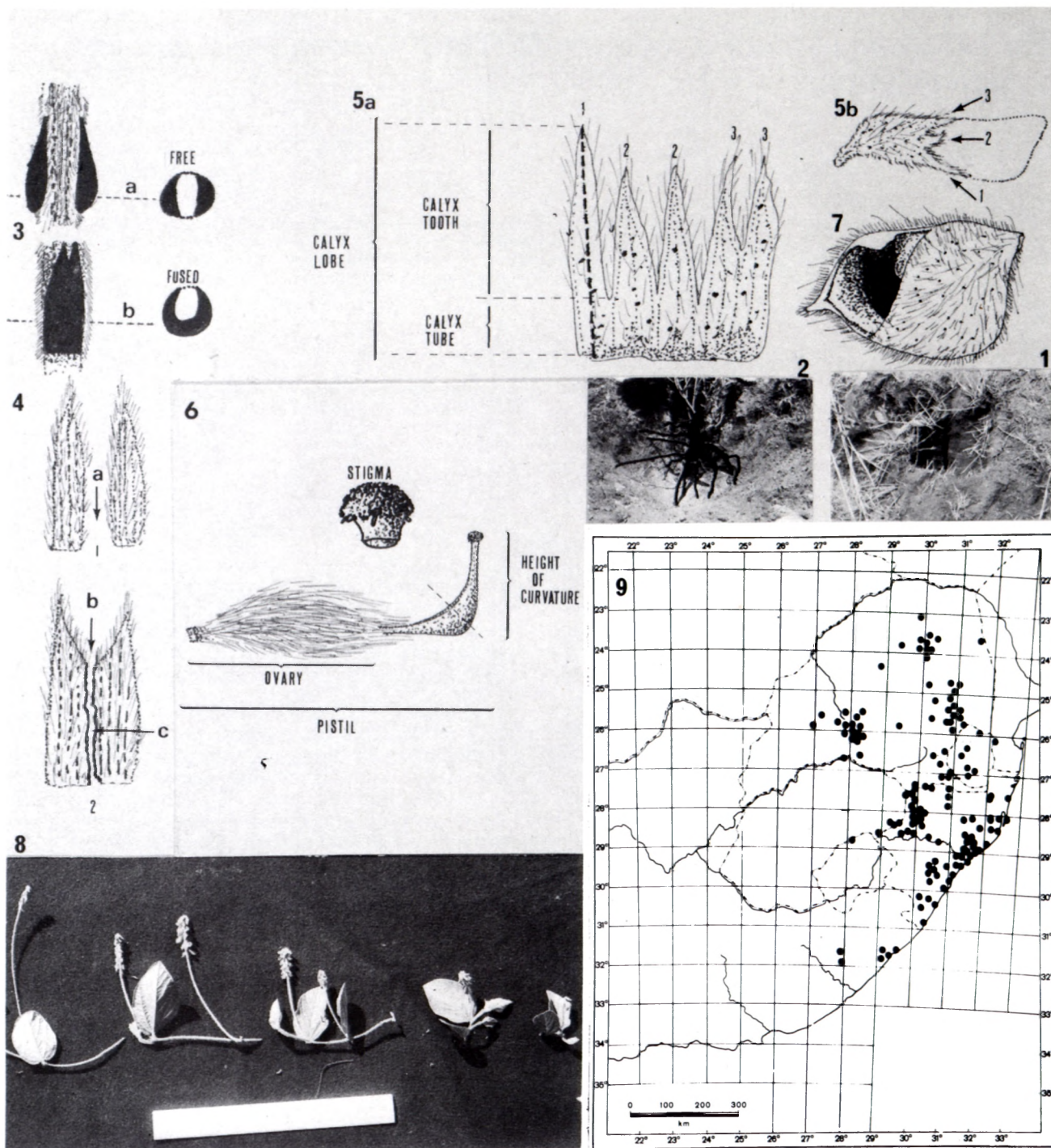
Stems. The perennial herbs have strict stems that are either terete or angular. Up to fifteen stems may arise from the short pseudo-stylopodium at the apex of the perennial rootstock. Complex branching is common in the suffrutices and in the shrub *E. psoraleoides*. Two species are worth describing in detail.

The main stem in *E. parviflorum* is very short. This results from the suppression of the leader concomitantly with the production of lateral branches. The lateral branches grow out perpendicularly to the main stem and are produced close to the ground. Their growth begins once the leader has reached approximately 50 cm in height. The side branches grow very quickly. If the leader dies back the plant assumes the shape of a low bowl. The characteristic low spreading nature of this suffrutex is possibly attributable to the sudden retardation of growth in the leader stem.

In contrast to that of *E. parviflorum* the stem of *E. psoraleoides* is erect and continues to lengthen once branching begins. However, if the leader is damaged, the lateral branches soon compete to lead. This results in the production of a short rounded shrub in contrast to the usual tall, erect, somewhat spreading shrub. Short rounded shrubs are commonly found in Kwazulu and on closer investigation the leader will be found to have been damaged by a borer insect. *E. psoraleoides* also produces tall, densely branched shrubs, with a compact appearance. This form results from the production of numerous watershoots that arise directly from the pseudo-stylopodium and this form can be expected to be found in areas subject to burning.

Vesture. The nature of the hair covering is determined by the length, direction, form, and quantity of the hairs considered collectively. As Stearn (1973) indicated, these characters should be stated individually as there are more types of vesture than there are terms to designate them. It is most unfortunate that there is no standard hair terminology for, as Roe (1971) pointed out, this would enhance the taxonomic value of hairs. As vesture forms a useful character in the characterization of taxa in the present study, I have decided to follow Grear's (1970) treatment of the American species of *Eriosema* by adopting Lawrence's (1960) definitions of hair types.

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FIGS 1-9. — 1, *Eriosema cordatum*, daucate rootstock, side branches absent. 2, *E. psoraleoides*, multibranching rootstock. 3, basic types of stipules found in the genus *Eriosema*: a, side view of free stipules with petiole in plane of paper, and T/S of stem at point indicated by dotted line showing how stipules flank petiole; b, side view of fused stipules clasping stem with petiole lying in the plane of the paper, and T/S of stem showing how stipules are fused and lie opposite the petiole. 4, marginal hair line in stipules of *Eriosema*: 1, free stipules; a, hair line extending to base of stipules, 2, fused stipules showing a split down the middle; b, end of hair line; c, uneven edge showing direction of rupture. 5a, diagrammatic representation of an *Eriosema* calyx showing component parts; b, side view of an *Eriosema* flower showing the relative position of the three types of lobes: 1, keel lobe; 2, lateral lobes; 3, vexillar lobes. 6, diagrammatic representation of an *Eriosema* gynoecium. 7, *E. cordatum*, fruit cut away showing seed attachment to valves. 8, *E. cordatum*, plants showing a range of variation in length of inflorescence (5 plants collected from one population at the Scottsville Race Course, Pietermaritzburg). 9, known distribution of the *E. cordatum* complex in South Africa.

In *Eriosema* all hairs are simple. Both glandular and non-glandular hairs are represented. There are two types of glandular hairs: firstly, very short stalked globose glands (white, yellow, orange or red) that vary considerably in size among the different species; secondly, uniseriate hairs with bulbous bases. The non-glandular hairs are uniseriate and vary in colour from hyaline to white, grey, tawny or ferruginous.

Leaves. Trifoliolate leaves are more common than unifoliolate leaves. Occasional tetrafoliolate leaves occur in *E. psoraleoides*. Cotyledons are always unifoliolate. In all taxa the first two leaves of each stem are nearly always unifoliolate. Subsequent leaves may be unifoliolate or trifoliolate. Grear (1970) reported a similar situation in America. He mentioned that the 'first-formed leaves in trifoliolate species, even in strong shoots of old plants, are

always unifoliolate, even up to a fifth or higher node'. The South African species commonly referred to as unifoliolate are now known to include trifoliolate-leaved plants as well. Since many herbarium collections are made before the fourth internode has elongated, it is often difficult to decide whether the first formed three unifoliolate leaves are the basal leaves of a unifoliolate or a trifoliolate species. Similarly, it commonly happens that the basal leaves have abscised by the time the fourth and higher internodes have elongated. Such plants are often referred to as trifoliolate-leaved plants. These so-called trifoliolate-leaved species may include unifoliolate-leaved plants, but less rarely so than the so-called unifoliolate-leaved species including trifoliolate-leaved plants. For these reasons the use of leaf structure as used by previous authors has been dropped as a key character for the delimitation of taxa in the *E. cordatum* complex.

The size, shape, vesture and texture of the leaves have been found to be useful definitive characters. However, as will be indicated later, both size, shape and vesture exhibit a remarkable variation under different environmental conditions. An appreciation of this variation alone will do much to help in the understanding of the anomalies encountered in the keys of Harvey (1862) and Burt Davy (1932), both of whom relied heavily on the shape, foliolation and vesture of leaves as diagnostic criteria.

The shapes of leaves seen in this complex have been classified according to Hickey's (1973) 'Classification of dicotyledonous leaves' (see also Dilcher, 1974). As this system is not readily available, a length-breadth ratio is sometimes provided in brackets after the description of each shape. This allows for a rapid conversion of Hickey's terms to the equivalents of any other system. All the leaf measurements given are those of mature terminal leaflets, or if there are no trifoliolate leaves, then of the mature unifoliolate leaf.

Petioles. Petioles are either subsessile or elongated. Most are channelled and ridged on the adaxial surface. Length has been found to be a useful character in some instances, but in others this parameter shows marked plasticity.

Stipules. Stipules are a key character in *Eriosema*. They may be free and laterally positioned in relation to the petiole, that is, if the petiole was held tightly against the stem the stipules would flank it (Fig. 3a); or they are connate and opposite the petiole, that is, would not flank the petiole if it was held tightly against the stem (Fig. 3b).

The use of the stipule as a key character requires careful observation as in some species the connate stipules are wont to split to the base, and may therefore be mistaken for a pair of free stipules. This disadvantage is readily overcome however by a careful inspection of the hair line along the margin of the stipule (Fig. 4). It can be seen that in free stipules the hair line extends uninterruptedly to the base (Fig. 4.1a) whereas in connate stipules that have split, the hair lines end abruptly (Fig. 4.2b). The split margin is also uneven (Fig. 4.2c). Connate stipules usually split as a result of the expansion of nodal tissue.

The stipules are either tightly clasped to the stem, patent, or recurved. In some taxa the stipules persist but senesce rapidly almost before the young leaflets expand, whereas in other taxa the stipules persist but remain green until almost the end of flowering. In *E. psoraleoides* the stipules are often caducous. These are valuable field characters.

Reproductive parts

Inflorescences. In all taxa the inflorescence is an axillary raceme bearing (1–)50 flowers. Flower number is too variable to be of much diagnostic significance. The length of the peduncle is useful in diagnosing *E. psoraleoides* as in this species it is always less than one third of the length of the raceme. Flower bracts are either caducous (*E. psoraleoides*) or persistent (all other spp.); shorter (*E. nutans*), or equal to (*E. cordatum*) the calyx. Bract vesture may be sericeous, pilose, pubescent or stiff patently hairy.

Flowers. The component parts of the flower vary considerably in shape, colour, pubescence, gland encrustment and dimensions. Flower colour has proved to be a useful distinguishing character. Flowers are consistently either pure yellow, or red and yellow, or pale pink with purple stripes, or red, yellow and orange, or orange and yellow. Herbarium collections of all but the yellow-flowered taxa turn purple on drying: yellow flowers retain their colouration. Flowers usually hang downwards before they open. As they open they tend to rise into the horizontal plane but return to their former position when they close.

(a) **Calyx.** All taxa have a five-lobed campanulate calyx with distinct triangular or lanceolate teeth (Fig. 5a). Three parts of the calyx are referred to in this study: calyx lobes, calyx teeth and calyx tube. The fused portion of the calyx is called the calyx tube (Fig. 5a) whereas the unfused portions are called the calyx teeth (Fig. 5b). The fused and unfused portion of each segment together is called a calyx lobe. The lobes are measured from the apex of each tooth to the base of the tube directly beneath each tooth. Other authors use the term lobe instead of tooth. Three types of calyx lobes have been distinguished.

1. **Keel lobe** (Fig. 5a.1) This lobe lies directly beneath the keel and is thus abaxial (Fig. 5.1).
2. **Lateral lobe** (Fig. 5a.2). There are two lateral lobes. These lobes are situated one on each side of the flower (Fig. 5b.2). They are always equal in length and upcurved towards the vexillar lobes.
3. **Vexillar lobe** (Fig. 5a.3). There are two vexillar lobes. These lobes are situated on the upper (adaxial) part of the flower. The vexillar lobes may be markedly connate or free and this is a useful character in some taxa.

The calyx teeth may be triangular (*E. parviflorum*) or lanceolate (*E. cordatum*); and shorter (*E. parviflorum*), or longer than, or equal to the calyx tube (*E. nutans*). The calyx lobes may be shorter than half the length of the flower (*E. psoraleoides*, *E. parviflorum* and *E. cordatum*) or equal (*E. nutans*) or longer. Vesture on the calyx ranges from shortly pubescent (*E. parviflorum*) to stiff long ferruginous-haired (*E. cordatum*).

The length, pubescence and degree of fusion of the calyx lobes; the shape and length (in relation to calyx tube) of the calyx teeth; and finally the length of the calyx lobes (in relation to the length of the flower) are all useful diagnostic criteria.

(b) **Standard.** The standard varies in colour, size, shape and structure. Hickey's (1973) classification has been used to determine shapes. Length-breadth (l/b) ratios are given as was done for leaves. Shape varies from narrow obovate (2:1) to wide obovate (1.2:1, *E. psoraleoides*), or oblong (2:1, *E. buchananii*). The apex may be rounded, emarginate or hooded.

Auricles vary in size, and range from prominent inflexed flaps (*E. buchananii*) to small slightly inflexed flaps (*E. cordatum*). The appendages of the standard are important diagnostically. These are situated on the inner surface just above the auricles (*E. cordatum*), well above auricles but less than half-way up the blade (*E. zuluense*), or high up and above the middle of the blade (*E. buchananii*). The appendages may be free (*E. buchananii*), partly connate at base (*E. parviflorum*) or connate (*E. nutans*). *E. psoraleoides* and *E. lucipetum* (anomalous population *Stirton* 1340) are both characterized by the absence of any appendages.

The back of the standard is nearly always pubescent and glandular. In *E. psoraleoides* it may also be glabrate. Two unusual specimens *Strey* 5048 and *Vahrmeijer* 1121, which have been included in *E. cordatum* also have glabrate or glabrous standards.

The colour of the standard varies but it is constant within the species under study. It is yellow in *E. cordatum*, *E. lucipetum*, *E. zuluense*, *E. nutans*, *E. parviflorum* and *E. psoraleoides*. In *E. buchananii* it is pale pink lined with purple. *E. cordatum* has a dull red outer surface with the inner surface orange or yellow and distinctly purple-veined.

A characteristic of all taxa is the presence of a semi-circular patch of intense yellow situated just above the appendages. This patch is noticeable even in the yellow flowered taxa where it tends to be a more intense yellow. It is referred to as a 'nectar guide' in this study.

(c) *Wings*. At first glance the wings appear to be uniform. Their infrequent use as a diagnostic character has probably been due to the difficulty encountered in describing them. The wing consists of a lamina which may be cultrate (*E. nutans*), cultriform (*E. cordatum*), or narrow oblong (*E. psoraleoides*). The single auricle may be straight (*E. psoraleoides*), or forward sloping (*E. nutans*). The claw is either attenuate (*E. nutans*) or strongly recurved (*E. zuluense*).

The wings may be shorter, equal to or longer than the keel blades. Colour varies from yellow, yellow with flushes of pink, to orange.

(d) *Keel blades*. The keel blades show various degrees of fusion. The shape is difficult to describe but ranges from narrow oblong narrowing towards the claw (3:1, *E. psoraleoides*) to variously curved to almost falcate abaxially. The apex may be obtuse, falcate or rostrate. The auricle is less defined than in the wings. It may be recurved, vertical or forward sloping. The claw is attenuate. The keel blades are usually wider than the wings. The keel blades may be equal to (*E. psoraleoides*), shorter than (most species) or longer than (*E. parviflorum*) the wings. The lamina may be sparsely or densely encrusted with glands. The base line of the keel blade may be glabrous or hairy. The keel blade is generally greenish white in colour.

(e) *Androecium*. The stamens are diadelphous with the vexillar stamen free. The vexillar stamen has a knee-like thickening near the base. The thickness of this knee is usually proportional to the depth of the claw of the standard. The fused stamens are collectively referred to as the staminal sheath. The anthers form two whorls when the sheath is closed as alternate filaments are unequal in length. Anthers are uniform, dehiscing longitudinally.

(f) *Gynoecium*. The length of the gynoecium and the variation in its components are important characters.

The ovary may be stalked, subsessile or sessile. It is biovulate (rarely triovulate in *E. psoraleoides*) with two campylotropous ovules. The type and degree of vestiture on the ovary wall is a useful character. The hairs may extend less than half the length of the valves. The style is glabrous, or minutely hairy and glandular, or eglandular. It is variously thickened at, or beyond, the point of curvature. The height of curvature is a useful character and is calculated as the vertical distance from the base line of the style to the level of the stigma (Fig. 6). The erect portion of the style may be straight or incurved. The stigma is capitate, inserted.

(g) *Discoid floral nectary*. Whilst floral nectaries have been frequently reported in papilionoid legumes, particularly in the tribe Phaseoleae (Waddle & Lersten, 1974), their presence in the genus *Eriosema* is poorly documented. This is probably owing to their small size and also to the difficulties involved in the interpretation of their structure. Phillips (1951) mentioned that the ovary in *Eriosema* is 'usually surrounded by a small cupular disc'. The only other report found was Waddle *et al.*'s (1974) report of the presence of a discoid floral nectary in *Eriosema rufum* Don. There are no reports on the presence of floral nectaries in the American species (Gear, 1970). Discoid floral nectaries have been found in all the species studied in the present work.

The ontogeny of discoid floral nectaries remains obscure. Moore (1936) thought that they resembled a staminal sheath and were more closely associated with the staminal whorl than with the gynoecium. Waddle (1968) suggested alternatively that the disc nectary was not a reduced whorl but an outgrowth of the receptacle. The solution to this puzzle of morphological interpretation will involve, as Waddle *et al.* (1974) pointed out, a careful ontogenetic study. The discoid floral nectaries in all the taxa studied here were securely adnate to the base of the staminal sheath. In view of the lack of ontogenic evidence the discoid floral nectary has been considered in the description of species as an independent structure.

The sizes and shapes of the floral nectaries are variable. The apical margin may be wavy, erose, smooth, finely dentate or revolute. The type of margin appears to be correlated with the quantity of nectar secreted. Nectaries with irregular margins were seen, in the field, to produce more nectar at one time than the smooth margin nectaries. Frey-Wyssling (1955) has reported that the relative proportions of xylem and phloem in nectaries affects the type of secretion. Nectaries which are supplied mostly by phloem tissue tend to secrete nectar with a high sugar concentration. It is difficult to interpret the meaning of the lack of vascular tissue reported in the nectary of *Eriosema rufum* Don (Waddle *et al.*, 1974). A study is needed to correlate types of vascular tissue with nectar secretion in *Eriosema* and then to correlate the nectaries with pollination mechanisms. A useful study could be made of the structure, morphology, stomatal distribution and ontogeny of nectaries in papilionoid legumes. I am not aware that such a survey has been made for the family as a whole.

Fruits. The fruits are compressed 2-valved, 2-seeded dry dehiscent pods. The valves are obliquely beaked, oblong (2:1) to wide oblong (1, 5:1), or trapeziform. The valves are smooth and shiny inside, and usually sericeous, velutinous, pilose hairy or shortly pubescent outside. The valves dehisce along upper and lower sutures until they remain attached

only at the base. Most of the South African species dehisce with an explosive action. This may be due to an environmental influence as pods of the same species have been seen to dehisce very slowly during cloudy overcast conditions. The separated valves coil very tightly once the seed has been shed.

Seeds. Mature seeds are smooth, dull or shiny, compressed, transverse or oblique. Shape may be oblong, reniform or somewhat mango-shaped. Seed colour varies from black or deep purple to chestnut brown to khaki, with or without speckles and mottles. Polymorphic seeds are commonly produced in a species but although both types are never found on the same plant they may occur in the same population. In *E. parviflorum* the black seeds are thicker and narrower than the speckled khaki seeds (see under Insect infestation).

The hilum of the *Eriosema* seed is linear and extends almost the whole length of the seed. The subhorizontal funicle is attached at the inner extremity. The thick bilabiate flange flanking the hilum is referred to as a strophiole (after Grear, 1970). The attachment of the seed of the valve wall can be seen in Fig. 7.

Seeds swell to almost double their size when they imbibe water. This effect is also seen in the unripe pod. When the pod is green and fully developed the two seeds almost fill it, but as the pod blackens and dries out the seeds shrink to almost half their previous size.

ECOLOGY

Throughout this study field observations have been aimed primarily at assessing the range of variation within the taxa under study. If the field observer repeatedly meets a particular phenomenon, or range of variation, in the individuals or populations under study and this is frequently associated with a particular set of environmental or local habitat conditions, there is some justification for associating these where either one, or the other, is encountered in new field situations. Therefore a field observer experienced in the study of a particular group of plants, should be able to draw upon his experience when meeting new plants of the same genus in new localities. Under these conditions his intuitive assessment of variation in relation to general habitat conditions should be reasonably accurate, despite his inability to relate a particular feature of variation to a particular environmental factor.

If, in the consideration of variation within the species in this study, an environmental factor, or plexus of factors, are suggested as being related to some particular morphological form, or feature of it, this is the outcome of field observation and is regarded as a reference point to be kept under consideration, rather than as a factual statement of cause and effect.

This section collates various field observations that have been useful in understanding the species under study. Selected examples of infraspecific variation are presented in order to provide as broad a picture of the species as possible. Fortunately most of the examples presented are indicative of the types of variation, and phenomena, to be found in the whole *E. cordatum* complex. Where relevant more detailed accounts are given under each species.

Field observations

Plants growing in full sun tended to be shorter and more compact than plants of the same species grow-

ing under different intensities of shade. Similarly plants that grew in burnt veld had a more stunted form than did plants of the same species which grew in adjacent unburnt veld. These phenomena, which apply to all species in the *E. cordatum* complex, were fully discussed in a previous paper (Stirton, 1977).

E. cordatum was observed to exhibit a markedly greater variability than any other species in the complex. Plants that grew in the same population showed a variation in the size, shape and foliolation of the leaves, degree of compactness of flowers on the inflorescence, length and thickness of the peduncle, shape and senescence of the flower bract and finally the size of the standard. Fig. 8 shows the variation which can occur in the length of the inflorescence within the same population.

It was found that plants of *E. cordatum* that grew in tall grass had bigger leaves, longer internodes, shorter inflorescences and smaller standards, than those plants that grew in short grass in more open areas. In other populations the peduncle was very long in tall grass and short in short grass.

Allsopp (1947) wrote that plants of *E. cordatum* become suppressed if the veld remains unburned, or is heavily grazed and trampled. This information appears to have been based only on the inspection of field sites.

The combined influence of wind and sun appear to affect *Eriosema* plants. In prolonged hot windy weather these plants tended to die back from the growing points and to shed their basal leaves. This observation is important since the first dichotomy of the available keys differentiates between unifoliolate and trifoliolate leaves. It is now known that many species, *E. cordatum* in particular, produce their first trifoliolate leaf at the fifth or higher node. Such a plant, if collected before the trifoliolate leaves had been produced, would be difficult to key out. Similarly for a trifoliolate-leaved plant that had already shed its basal leaves. The loss of unifoliolate leaves by a predominantly trifoliolate-leaved plant may of course be due to natural ageing.

Hot windy days have also been observed to wither flowers. Two populations of *E. cordatum* were observed to have failed to set seed for an entire season because the flowers withered just as the corollas emerged from the calyx.

Insect infestation

Insect larvae, particularly Agromyzidae, cause extensive damage to various plant parts. Eleven different types of larvae have been collected and await identification and I am indebted to Dr B. R. Stuckenberg of the Natal Museum for his advice. He informed me that most species of Agromyzid flies lay their eggs in particular plants and are host specific to those plants. The observation that some larvae of these insects are found only in certain species has been a useful field guide for the field identification of species. These studies when pursued promise to be most rewarding. The different Agromyzid larvae form distinctive patterns (mines) beneath the cuticle or epidermis. Such patterns are often most noticeable on herbarium specimens.

Further studies are also needed on the insects which cause extensive damage to seeds. In *E. parviflorum* both laboratory and field observations revealed that the production of polymorphic seeds was closely associated with the infestation of insects in fruit pods. Pods with black seeds were rarely affected, whereas in pods with speckled, greenish

yellow seeds, the seeds rarely reached maturity because of heavy insect damage. These seeds should be analysed comparatively for chemicals that inhibit predation.

GEOGRAPHICAL DISTRIBUTION

The geographical distribution maps presented are based mainly on the author's field collections and available herbarium material. This commonly used approach to the compilation of distribution maps has certain pitfalls that should be recognized. Firstly the distribution map is not necessarily a reflection of the taxon's extant distribution. It stands to reason that the compilation of a distribution map is an act based on an a priori hypothesis that the map will provide the basis for some deductive argument. If this is so, then a map compiled from herbarium collections spanning a century or more is indeed a shaky base for any type of interpretation. This awareness of a space-time relationship is seldom considered in the compilation and interpretation of distribution maps. The use of unchecked specimen citations gathered from the literature hardly needs any comment. The second pitfall is that a map compiled from all the available herbarium material is open to severe criticism if, as White (1971) so testily states, its interpretation concerns unwarranted speculations as to its inclusive variation. The reason is that the known complexity of genetic systems, including hybridization, polyploidy and apomixis, is such that any particular expression of a phenotypic character could be theoretically possible over any interval of time and at any particular point of a taxon's range. Such expression may have little or no significance in an understanding of the taxon's origin or distribution pattern. The chances of this situation occurring are greater the older are the specimens used. The third pitfall concerns the frequent attempts by botanists to discover variables of ecological significance by a reference to distribution maps. Although not known as such, this phytocartogeographic approach has an equivalent in

the zoocartogeographic approach of zoologists. An example of the problem and the confusion that may develop is shown in the critical assessment by Stuckenberg (1969) and Van Dijk (1971) of Poynton's (1964a, 1964b) faunal study of amphibia in southern Africa. The final pitfall is obvious and common to most approaches. It concerns the correct delimitation of taxa. Even one incorrectly named specimen in a distribution map can lead to incorrect interpretations.

The known distributional ranges of all the species studied in this complex is given in Fig. 9. This complex occurs mainly in the Transvaal, Swaziland, Natal and the eastern Cape Province. Very few collections are known from Lesotho, Botswana and the Orange Free State. No representatives of the complex occur in South West Africa/Namibia or the western and northern Cape Province.

Eriosema cordatum and *E. psoraleoides*, have the most widespread distribution of the group in southern Africa, whereas *E. nutans* is less widely dispersed. The only really restricted distributions are those of *E. buchananii*, *E. zuluense*, and *E. lucipetum*. Four species of the complex extend beyond southern Africa. These are *E. buchananii*, *E. nutans*, *E. parviflorum* and *E. psoraleoides*.

TAXONOMY

The descriptions of *Eriosema* species that follow are based on the author's examination of herbarium material and of populations in the field in South Africa.

A selected citation of representative specimens of each species recognized in this study is given in the enumeration of species. This was prepared by the selection of a single voucher specimen from amongst all specimens studied to serve as a record of each quarter degree square through which the taxon was naturally distributed.

KEY TO SPECIES

- Stipules connate:
 Calyx teeth triangular, shorter (rarely equal to) than calyx tube; pubescent or tomentose, rarely with few scattered longer hairs; appendage of standard situated well above auricles; flowers yellow 1. *E. zuluense*
 Calyx teeth lanceolate, always longer than calyx tube, stiffly shaggy or pilose; appendage of standard situated low down or just above auricles or if higher then extending to auricles; flowers red and yellow .. 2. *E. cordatum*
- Stipules free:
 Perennial herbs; calyx teeth lanceolate, longer than calyx tube 3. *E. lucipetum*
 Shrubs or suffrutices; calyx teeth shortly triangular, mostly equal to or less than calyx tube:
 Plants erect shrubs; stipules minute < 5 mm long; appendages absent on standard; peduncle of inflorescence < 1/3 length of inflorescence 4. *E. psoraleoides*
 Plants ascending, decumbent or erect suffrutices; stipules > 5 mm long; appendages present on standard; peduncle of inflorescence > 1/3 length of inflorescence:
 Stipules 10–16 mm long, 2.5–4.0 mm wide, oblong-lanceolate, base narrower than middle; flowers pale pink lined with purple; appendages of standard high up above middle; free, shallow ridged, half moon shaped, vertical to axis of standard 5. *E. buchananii*
 Stipules 5–8 (10) mm long, 1–2 mm wide, linear lanceolate or triangular, base wider than middle; flowers yellow; appendages of standard situated low down just above the auricles, connate, upcurled flaps, horizontal to axis of standard:
 Stipules mostly erect, clasping stem; petiole 3.1–7.0 mm long; leaf rachis (7) 8–11 (12) mm long; flowers 7.5–10.0 mm long; flower bracts lanceolate; calyx (3.0) 3.5–4.3 (4.5) mm long; standard oblong; wings longer than keel blades. Leaves not photonastic. (Transvaal.) 6. *E. nutans*
 Stipules recurved and spreading when old; petiole 1.0–2.2 (3.0) mm long; leaf rachis 2–6 mm long; flowers 5–6 mm long, flower bracts shortly triangular; calyx 2–3 mm long; standard wide obovate; wings shorter than keel blades. Leaves photonastic. (Natal, one record from N. E. Transvaal) 7. *E. parviflorum*



FIG. 10. — *Eriosema zuluense*. 1, habit; 2, stem with fruits and flowers, $\times 1,2$; 3, flower bract, $\times 9$; 4, flower, $\times 3,8$; 5, calyx opened out, $\times 9$; 6a, standard opened out, $\times 4,6$; 6b, standard closed $\times 4,6$; 7, wing, $\times 4,6$; 8, keel, $\times 4,6$; 9, vexillar stamen, $\times 6,4$; 10, staminal sheath, $\times 6,4$; 11, discoid floral nectary, $\times 18$; 12, gynoecium, $\times 6,4$; 13, stigma, $\times 40$.

1. *Eriosema zuluense* C. H. Stirton, sp. nov., *E. cordato* E. Mey. affinis, sed dentibus calycinis triangularibus, tubo brevioribus (raro eum aequantibus), floribus luteis, appendiculo interno vexillari manifeste supra auriculos sito distinctam.

Herbae perennes, prostrati vel repentes vel decumbentes, 10–12 cm altae. *Folia* 1-foliolata, raro infima 3-foliolata, 4,0–5,5 cm longa et lata, late ovata, apice obtusa cum apiculo, basi cordata, utrinque praesertim secus venas sparse sericea, parce glandulosa, margine revoluto. *Stipulae* connatae. *Racemi* axillares, 20–30-flori, folia excedentes. *Flores* lutei, 10–12 mm longi, bractis dimidio longitudinis florum, cito caducis. *Calycis lobi* aequilongi, dentibus triangularibus, tubo brevioribus, molliter pubescentibus. *Vexillum* alis aequilongum, omnibus carinam valde glandulosam excedentibus. *Fructus* 12×10 mm, oblongus, prominentes rostratus, sericeus, tenuiter pubescens.

TYPE.—Natal, 2831 (Nkandla): Ntambanana (–DA), *Acocks* 12980 (K, holo.!; PRE).

Perennial herb, 10–12 cm tall, flowering in spring. *Stems* trailing, prostrate or decumbent, finely pubescent with reflexed yellowish hairs. *Leaves* 1-foliolate, rarely the lowest leaves 3-foliolate, 4,0–5,5 cm long and wide, broadly ovate, apex blunt with a point, base cordate, both sides sparingly sericeous especially along the veins, sparsely glandular, margin revoluted. *Stipules* 5–7 (10 mm long, lanceolate, connate but occasionally splitting when old, sericeous. *Petioles* 2–4 mm long. *Racemes* axillary, (10) 20–30-flowered, exceeding the foliage, peduncle 5–6 cm long. *Flowers* yellow, 10–12 mm long, bracts ± half the length of the flower, rapidly caducous. *Calyx* 4 mm long, lobes equal in length; teeth triangular, shorter than (rarely equalling) the tube, softly pubescent and sparingly glandular. *Standard* ± 12 mm long, 5 mm wide, oblong, equal in length to the wing petals but always exceeding the keel; appendages slightly fused, free from auricles. *Wings* 12 mm long, 3 mm wide, oblong, auriculate, pouched, longer than the keel. *Keel* 8 mm long, 3 mm wide, strongly glandular, sparingly pubescent along base, pocket present. *Staminal sheath* 7 mm long, free stamen geniculate; anthers uniform, alternately long-basifixed and short-medifixed. *Gynoeceium* 7 mm long; ovary 4 mm long with 1 mm long gynophore, densely sericeous, curvature of style 3 mm high; stigma capitate. *Nectary* present, high as gynophore; margin erose. *Fruit* 12 mm long, 10 mm wide, oblong with a prominent 3 mm long beak, sericeous and finely pubescent. Seed not seen. Fig. 10.

Eriosema zuluense is endemic to Zululand and stretches from Josini Dam and Hluhluwe in the north to Mhlabatini, Hlabisa, Melmoth, Eshowe and Ngyoe Forest in the south (Fig. 11).

NATAL.—2732 (Ubombo): Hilltops on main road to Josini (–CA), *Pooley* 276; 6 km from Ubombo (–CA), *Stirton* 505; Ubombo Mountain Summit (–CA), *Venter* 1768, 4308. 2831 (Nkandla): Mhlabatini (–AB), *Gerstner* 4185, 4232; Nkweleni (–BA), *Lawn* 1548; 8 km south of Hlabisa (–BB), *Codd* 2004 and *Acocks* 13067; 25 km south-east of Melmoth (–CB), *Codd* 1838; Eshowe (–CD), *Lawn* 1164; between Nkweleni and Eshowe (–DA), *Stirton* 426; 9 km west of Ntambanana (–DA), *Codd* 1885; 8 km north-west of Ntambanana (–DA), *Acocks* 12980; Ngyoe Forest Reserve (–DD), *Venter* 406. 2832 (Mtubatuba): Hluhluwe Game Reserve (–AA), *Ward* 1548. Without precise locality: *Gerstner* 4656. This is a mixed sheet which also has a specimen of *E. cordatum*.

This species is somewhat variable and additional collecting is needed. It is best exemplified by *Acocks* 12980, *Codd* 1885, *Codd* 2004, *Ward* 13067 and *Ward* 1548. *E. zuluense* is characterized by its

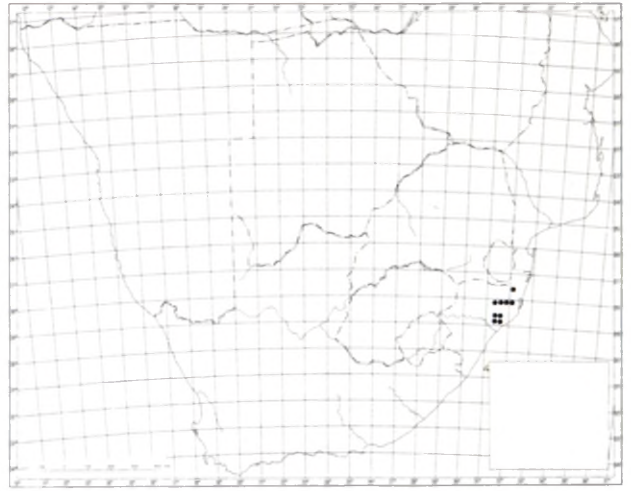


FIG. 11. — Known distribution of *Eriosema zuluense* in South Africa.

vesture, habit, branching and its triangular calyx teeth shorter than the calyx tube. *Acocks* 13067 is unusual in that the stipules are rapidly caducous and the leaflets narrower.

The plants grow in dense grassland on rocky hillsides, particularly dolerite outcrops, between 300–400 m. Flowering occurs between October and December.

The specific epithet *zuluense* refers to the region throughout which they are distributed.

2. *Eriosema cordatum* E. Mey., *Comm.* 128 (1836); Meisn. in *J. Bot.*, Lond. 2: 80 (1843); Harv. in *Fl. Cap.* 2: 259 (1862); Burt Davy, *Fl. Transv.* 2: 413 (1932); Verdc. in *Kew Bull.* 25: 118 (1971); Ross, *Fl. Natal*, 208 (1972). Type: Natal, between Gekau and Basche, in grassland (V, b, 22) *Drège* s.n. (PRE; K, iso.).

E. guenzii Sond. in *Linnaea* 23:34 (1840); Drège, *Zwei Pfl. Doc.* 145 (1843); A. Dietr., *Fl. universalis* II: 187 (1861), icon. Syntypes: South Africa, Natal, Port Natal, *Guenzius* 27, 634. (PRE; K, isosyn.).

E. cordatum E. Mey. var. *guenzii* (Sond.) Harv. in *Fl. Cap.* 2: 259 (1862); Burt Davy, *Fl. Transv.*, 2: 413 (1932); Verdc. in *Kew Bull.* 25: 118 (1971).

Perennial herb 5–60 cm tall with 1–20 stems from short stylopodium of underground rootstock. *Woody rootstock* vertical, daucate, up to 50 cm deep. *Stems* prostrate, decumbent to semi-erect; terete or trigonous; variously ribbed; vesture hispid, hirsute, velutinous or pilose; hairs red, white or tawny; if glandular then orange, red or yellow glanded. *Leaves* unifoliolate, or trifoliolate with basal leaves unifoliolate; *stipules* (4,0) 5,0–15 (23) mm long, 3–8 (12) mm wide; narrow ovate (2:1) to lanceolate (3:1), often falcate; semi-connate, either splitting or tightly clasping stem; glabrescent or hairy. *Petiole* (2) 4–7 (20) mm long. *Leaflets* 6–10 (14) cm long, (2,5) 3,0–5,0 (9,2) cm wide, laterals smaller; base cordate or obtuse; apex obtuse, rounded or acute; terminal leaflet symmetrical, ovate (1,5:1) to very wide ovate (1:1 or less), elliptic (2:1) to suborbiculate (1, 2:1), laterals asymmetrical, oblique, oblong, (2:1) to narrow oblong (3:1), to ovate (1,5:1) to narrow ovate (2:1); vesture strigose, sericeous, hirsute, pilose or velutinous, erect or appressed. *Young leaflets* either densely glandular or eglandular, with red foxy or white hairs. *Petiolules* 2–4 mm long. *Rachis* (9) 10–15 (23) mm long, rarely with two persistent acrorachial stipules. *Racemes* 3–27

flowered; *peduncle* 5–12 (21) cm long; *rachis* 2–5 cm long; *flowers* 8–10 (13) mm long, 3–5 mm wide; reflexed vertical or with apex recurved until touching calyx; red and yellow, or red, yellow and orange; bracts lanceolate, persistent or deciduous. *Calyx* (3,0) 4,0–6,0 (7,8) mm long, half length of flower, teeth equal or unequal, longer than tube; lanceolate; stiffly shaggy or pilose; glabrous or finely hairy inside; glandular; tube (1,5) 2,0–4,5 (5,0) mm long; vexillar lobes (3,8) 4,0–6,0 (7,8) mm long; lateral lobes (3,0) 4,0–5,5 (6,5) mm long; keel lobe (3,8) 4,0–6,0 (7,5) mm long often thinner or incrassated. *Standard* (8,0) 10,0–11,0 (12,3) mm long; 4,4–7,0 (9,0) mm wide; oblanceolate (3,1) to wide obovate (1,2:1), narrowed towards auricles; apex obtuse, retuse or emarginate; usually densely white pubescent and glandular on back, but occasionally glabrescent; claw 2–3 mm long; auricles inflexed, prominent; appendages bifurcate, between or just above auricles, either low ridges or large upcurled flaps, (3,2) 3,8–4,0 (4,8) mm from base of claw. *Wings* (7,8) 9,0–11,5 mm long, 2,1–3,5 (4,0) mm wide at maximum; longer than keel blades; claw 1,2–2,0 mm long; auricles 1,2–2,0 mm high. *Keel blades* (6,2) 6,8–8,0 (8,5) mm long, 3,0–4,6 wide at maximum; yellow, white or orange glanded; claw 1,2–2,8 mm long; auricles 1,2–2,8 mm high. *Staminal sheath* 6,0–7,2 mm long, 2,5–4,0 mm wide at maximum, vexillar stamen 5,0–7,2 mm long. *Gynoecium* (5,0) 6,5–7,0 (7,5) mm long, ovary 2,5–4,0 mm long; with

stalk 0,3–1,0 mm long, hairs extending to half length of pistil; style incrassated at or above point of flexure, curvature 2–3 mm high; stigma level with anthers, capitate. *Discoïd floral nectary* smooth slightly rippled or erose irregular. *Fruits* (11) 15–16 (17) mm long, 9–11 mm wide, wide oblong (1,5:1), strongly compressed; beak straight, downward or upward pointing; with scattered golden brown hairs mostly patent but appressed on margins and often glabrate on sides, apex oblique. *Seeds* 3,0–5,2 mm long, 1,7–2,4 mm wide, chestnut brown or khaki, with or without speckles, hilum white or brown. (See Fig. 7, Stirton, 1978.)

Eriosema cordatum is common and widespread in Swaziland and eastern parts of South Africa. It occurs less commonly in Zimbabwe, Mozambique and Lesotho.

This difficult species has long been the dumping ground for many specimens of *Eriosema* in South African herbaria. The two factors which have probably contributed most to this confusion are the occurrence of marked phenotypic plasticity within the taxon and the occurrence of extensive hybridization (Stirton, 1981) of this species with other species.

E. cordatum remains the most heterogenous group in the *E. cordatum* complex and includes within its range of variation the previous varieties *cordatum* and *guenzii*. This taxon is the most widespread *Eriosema* in southern Africa (Fig. 12). Preliminary

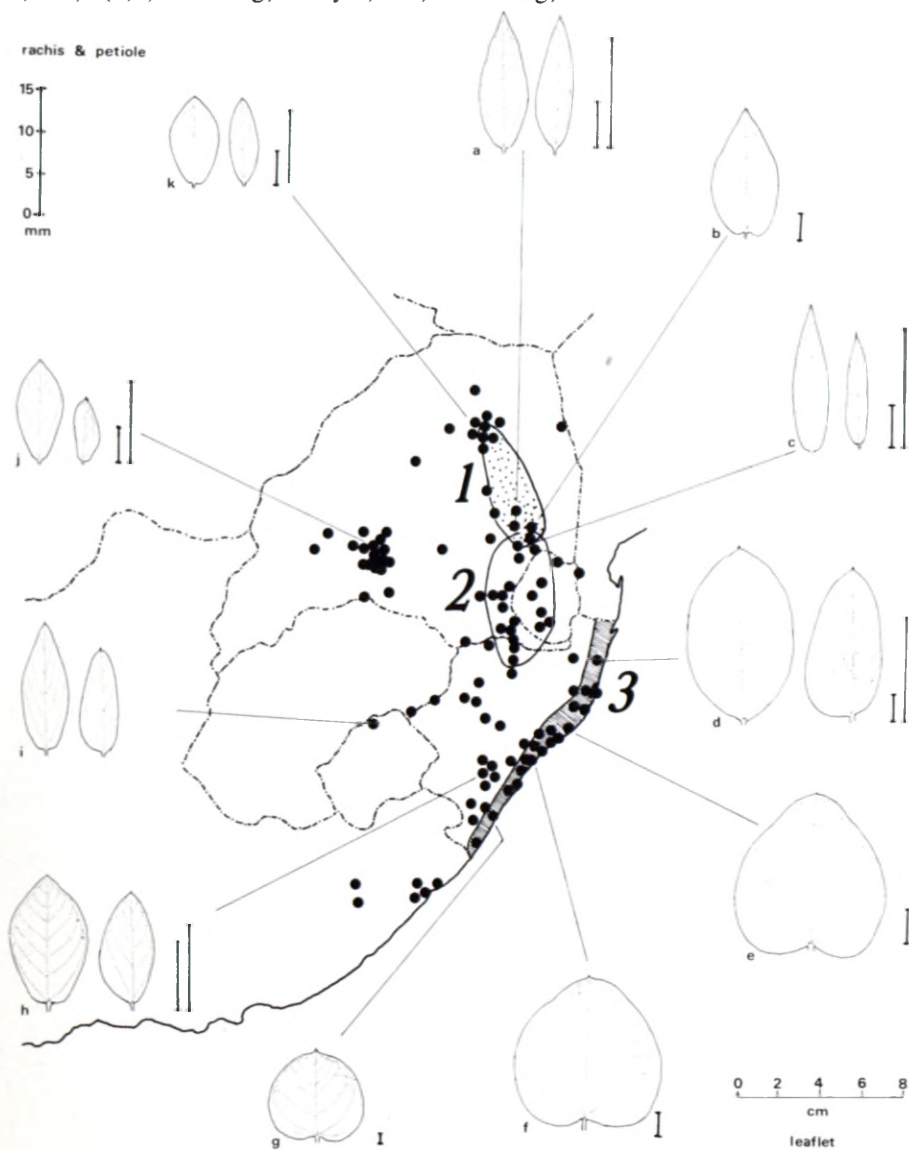


FIG. 12. — *Eriosema cordatum*. Pictorialized distribution map showing variation in leaflet shape and size, length of petiole and length of rachis. a, Galpin 1031; b, Stirton 1468; c, Stirton 1462; d, Strey 5048; e, Stirton 1620; f, Baijnath 419; g, Weeks s.n.; h, Huntley 90; i, Schelpe 1755; j, Mogg 15756; k, Scheepers 487. Where two leaflets are shown, the first is the terminal leaflet of a trifoliolate leaf and the second leaflet is one of the laterals of the same leaf. If single leaves are shown, only unifoliolate leaves occur. The left hand bar refers to length of petiole and the right hand bar refers to length of leaf rachis. Area 1, area in which unifoliolate leaved plants are likely to occur in the Transvaal; 2, area where erect plants are likely to occur; 3, area where unifoliolate cordate leaved plants grow in Natal.

fieldwork has enabled me to outline some of its complex variation. Fig. 12 is a pictorialized distribution map showing variation in leaf shape and size, relative lengths of leaf petiole and leaf rachis, stem vesture and shape of calyx lobes (Fig. 13). The areas 1–3 shown in Figs 12 & 13 are merely the known ranges of certain types of variation and do not necessarily include all the collections found within them.

Plants tended to be decumbent and predominantly unifoliolate along the coastal areas (3). There was a general increase in size of the leaves from south to north. Coastal plants growing south of Port Edward were both unifoliolate and trifoliolate. In the Mpangazi area in northern Zululand there were a few collections which were notable for their larger flowered and sparsely haired, unifoliolate condition. This area requires further investigation. Inland from the Natal coast plants became smaller and predominantly trifoliolate. More stems were produced. Area 2 is an approximation of the area in which erect trifoliolate leaved plants can be expected to occur [for example, *Stirton* 1462 (Fig. 14)]. Area 1 is the range of small semi-erect unifoliolate leaved plants which differed from the coastal unifoliolate-leaved plants in their pubescence, leaf shape and habit. These plants, for example *Stirton* 1465 & 1468 were restricted to the high altitude areas of the

eastern Transvaal. They appeared to have a close affinity to *E. gunniae* C. H. Stirton. Although included here, their identity remains open. They warrant further investigation.

Transvaal plants were predominantly decumbent, trifoliolate, and small-leaved. Leaflet apices were more acute than in the Natal populations. Lateral leaflets were narrower, more asymmetrical and more oblique than lateral leaflets of Natal plants. As exceptions occurred randomly throughout the area no safe conclusions could be drawn from this data.

Stem vesture was too variable to be reliable but, considered as a whole, it was noted that the majority of plants had either tawny or ferruginous, upward or downward pointing hairs. This was a feature which, considered with the presence of a daucate rootstock, connate stipules (invariably splitting), strongly reflexed red and yellow flowers, stiff haired calyx and flower bract, and with the wing greatly exceeding the rostrate keel, could be used to separate this species from all other *Eriosemas* in southern Africa.

The morphological diversity of this species has been discussed in some detail elsewhere (Stirton, 1981) and in the section on Ecology. In summary it may be said that no useful purpose will be served at present if it is divided into a number of sub-groups.

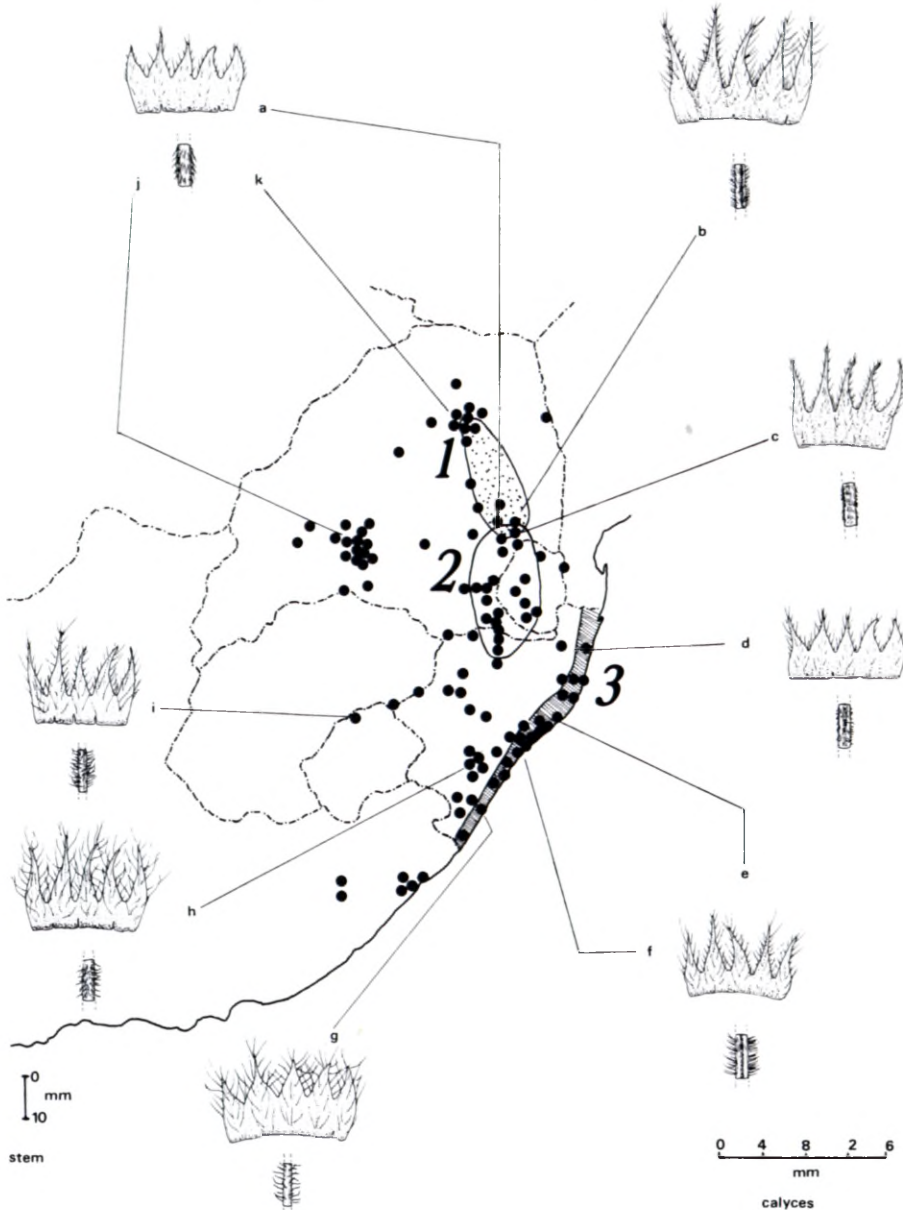


FIG. 13. — *Eriosema cordatum*. Pictorialized distribution map showing variation in shape and size of calyx, and stem pubescence. The specimens illustrated and areas demarcated are as indicated for Fig. 12.



FIG. 14.—*Eriosema cordatum*. Erect plant growing along roadside between Mbabane and Malkerns Agricultural Research Station.

If it is recognized that the species is polymorphic and if future field studies are aimed at understanding patterns within the variation encountered, much will have been done towards understanding the complex as a whole.

TRANSVAAL.—2329 (Pietersburg): Louis Trichardt (—BB), Breyer 24203; Pigeon Hole (—CD), McCallum PRE 32658; Woodbush (—DB), Jenkins PRE 32656; Haenertsburg (—DD), Stirton 1424. 2330 (Tzaneen): Westfalia Railway Siding (—CA), Stirton 1429; Modjadjes (—CB), Rogers 18019; New Agatha (—CC), McCallum s.n. 2331 (Phalaborwa): Letaba (—DA), Swiertstra 4384. 2428 (Nylstroom): Palala (—BC), Breyer PRE 18124. 2430 (Pilgrims Rest): The Downs (—AA), Moss & Rogers 252, 412, 850. 2431 (Acornhoek): 9 km from Bushbuckridge to Nelspruit (—CC), Stirton 1453. 2526 (Zeerust): Koster (—DD), Burrill Davy 7178. 2527 (Rustenburg): Rustenburg Nature Reserve (—CA), Jacobsen 1626; Bokfontein (—DB), Jenkins 7536; Masgaliesburg (—DC), Story & Innes 1397; Uitkomst (—DD), Coetzee 466. 2528 (Pretoria): Groenkloof (—CA), Barker 10096; Irene (—CC), Smith 5155. 2529 (Witbank): Loskop Dam (—AD), Theron 2111. 2530 (Lydenburg): Lydenburg (—AB), Wilms 5856; 35 km from Nelspruit to Sabie (—BB), Stirton 1478; Lowveld Botanic Garden (—BD), Stirton 1453; Waterval Onder (—CB), Young 26495; 15.8 km from Nelspruit to Kaapsche Hoop (—DB), Grobbelaar 847; Cythna Letty Nature Reserve (—DD), Muller 2254. 2531 (Komatipoort): White River (—AC), Gillett 1036; 12.3 km from Nelspruit to Barberton (—CC), Stirton 1462; Barberton (—CC) Williams 7645. 2627 (Potchefstroom): Krugersdorp (—BB), Cowgill s.n. J 33026; Losberg (—CB), Theron 924; Sterkfontein Caves (—DD), Mogg 35301. 2628 (Johannesburg): Robertsham (—AA), Stirton 1300; Modder East (—AB), Louw 862; 11.3 km south of Heidelberg (—CB), Acocks 20854. 2630 (Carolina): Redhill near Oshoek (—BB), Stirton 1311; Mavriestad (—CA), Pott 5074; Athole Pasture Research Station (—CB), Norval 68; 29 km from Lothair to Amsterdam (—DA), Stirton 1352; Piet Retief (—DD), Collins 13200. 2729 (Volksrust): Volksrust (—BD), Mogg 7499. 2730 (Vryheid): Mooihoek (—BA), Devenish 70; 20 km from Paulpietersburg to Piet Retief (—BB), Stirton 1314; Wakkerstroom (—AC), Beeton 243.

SWAZILAND.—2531 (Komatipoort): Devils Bridge (—DC), Compton 31722. 2631 (Mbabane): Bremersdorp (—AD), Bolus 11850; Malkerns (—CA), Compton 26164; Kubuta (—CD), Compton 32420. 2731 (Louwsburg): Goedgegung (—AA), Compton 32409.

NATAL.—1730 (Vryheid): Farms Tweekloof and Altemooi (—AD), Thode A 185; Paulpietersburg (—BD), Stirton 1324; 18 km from Vryheid to Paulpietersburg (—DB), Stirton 1322; Vryheid (—DD), Stirton 1332. 2732 (Ubombo): Pongola Poort (—CA), Stirton 489; Mpangazi (—DA), Srey 5048. 2828 (Bethlehem): Mahai Valley (—DB), Schelpe 1755. 2829 (Harrismith): near Van Reenens Pass (—AD), Schweikerdt 909; Elandslaagte (—BD), Shirley NU 32891. 2830 (Dundee): Dundee (—AA), Shirley 246; Buyahlanga Mountain (—AC), Stirton 1362; Tugela Ferry (—CD), Stirton 1330; 12 km from Greytown to Dundee (—DC), Grobbelaar 1630. 2831 (Nkandhla): Eshowe (—CD), Lawn 1213; Ngoye Mountain (—DC),

Stirton 472; Mtunzini (—DD), Stirton 414. 2832 (Mtubatuba): Hluhluwe Game Reserve (—AA), Hitchins 599; Charters Creek area (—AB), Ward 2839; Hlabisa (—AC), Harrison 252; Dukuduku Forest (—AD), Hitchins 68; eastern shores of Lake St Lucia (—CC), Taylor 97; Enseleni Nature Reserve (—CC), Venter 6501. 2930 (Pietermaritzburg): Estcourt Pasture Research Station (—AB), Acocks 9868; Noodsburg (—BD), Hilliard 1220; Pietermaritzburg (—CB), Stirton 1235; Effingham (—CC), Oliver 558; Baynesfield (—CB), Stirton 702; Inanda (—DB), Wood 272; Chelmsford Park (—DD), Hilliard 1845. 2931 (Stanger): Thring's Post (—AA), Moll 2248; Tugela Bridge (—AB), Stirton 1268; Umhlali (—AC), Acocks 10331; Sheffield Beach (—AD), Grobbelaar 1641; Tongaat Beach (—BA), Stirton 388; Tugela Beach (—BB), Johnson 382. 3030 (Port Shepstone): near Ixopo (—AA), Hilliard 1771; Nhlavini Store (—AB), Stirton 1224; Port Shepstone (—AC), Weeks 51; Umzinto (—BC), Bajinath 419; Greenhart turnoff (—CD), Stirton 1403.

LESOTHO.—2828 (Bethlehem): Leribe (—CC), Dieterlen 221, 6845. 2927 (Maseru): Masoeling (—CB), Jacot Guillarmod 1580.

TRANSKEI.—3127 (Lady Frere): near Engcobo (—DB), Flanagan 2819; between Nuamkwe and Engcobo (—DD), Bolus 8894. 3129 (Port St. Johns): Libode (—CA), Schonland 3890; Coffee Bay (—CC), Tyson 20; Port St Johns (—DA), Baker 14164.

Vernacular names for this species include: Uqontsi (Bryant, 1909), Zulu; Leshetla — soft bone, Lesapo le letsehali — the female bone, and Setloli se sehola — the big jumper (Phillips, 1917; Jacot Guillarmod, 1971), Sesotho. Both Zulus and Sesothos are reported to use this plant for medicinal purposes. Bryant (1909) has an interesting chapter on impotency and barrenness. He wrote: 'With all primitive peoples, all that pertains to the sexual functions, involving as it does the propagation of the species and the preservation of the tribe, is a matter of paramount importance. Impotency on either side is with them more than a disgrace, it is a calamity. Should the male organs fail altogether to produce the seminal fluid, the roots of the impindisa (*Rubia cordifolia*) are boiled and drunk at bedtime, resulting in an early emission. A hot milk infusion of the roots of the Uqontsi (*Eriosema cordatum* and *E. salignum*) herb has a similar effect'.

Both Phillips (1917) and Jacot Guillarmod (1971) reported that the Sesotho mixed the Leshetla with other plants and used this as a medicine to stimulate bulls in spring. Phillips (1917) noted further that *E. cordatum* E. Mey. is less powerful a stimulant than *E. salignum* E. Mey.

Eriosema cordatum is a plant of diverse habitats and is quick to colonize disturbed habitats; areas where it readily hybridizes with other species (Stirton, 1981). Flowering occurs throughout the summer months.

3. *Eriosema lucipetum* C. H. Stirton, sp. nov., *E. cordato* E. Mey. affinis stipulis liveris et floribus luteis diversa.

Herbae perennes aut 1-foliolata erectae aut 3-foliolatae decumbentes 10–30 cm altae, prope basin ramosae. *Foliola* 8.5–11.0 cm longa, 4.5–7.0 cm lata, lateralia minora, basi cordata, apice acuta, terminalia et 1-foliolata symmetrica, anguste usque late ovata, lateralia minora, obliqua, strigosa vel sericea, pagina inferiore opaca vel nitida, glandulis pallide flavis vel rubris obsita. *Stipulae* liberae, amplexantes. *Flores* lutei, raro rosei et lutei, bracteis caducis, florum dimidio longitudinis. *Calycis lobi* aequales, dentibus triangularibus vel lanceolatis tubo longioribus ferrugineis vel sparse pubescentibus. *Vexillum et alae* carina longiores. *Fructus* 15–17 mm longus, 10–13 mm latus, oblique oblongus, pilis patentibus 1.0–2.5 mm longis vestitus. *Semina* 6–7 mm longa, 3 mm lata.

TYPE.—Natal, 2829 (Harrismith): 1 km from Fort Mistake to Ladysmith (—BB), Stirton 1417 (PRE, holo.).

Perennial herb, 10–30 cm tall, flowering in early summer. *Stems* erect or decumbent, branching near the base, tawny or ferruginous. *Leaves* mostly 1-foliolate on erect plants and 3-foliolate on decumbent plants, basal leaves always 1-foliolate. *Leaflets* 8,5–11,0 cm long, 4,5–7,0 cm wide, laterals smaller, base cordate, apex acute, terminal and 1-foliolate leaves symmetrical, narrowly to broadly ovate, laterals smaller and oblique, strigose or sericeous,

lower surface dull or shiny, covered with either light yellow or red glands. *Stipules* 10–15 mm long, 4–5 mm wide, ovate-lanceolate, oblique, free, clasping the stem, pubescent. *Petiole* 5–7 mm long. *Racemes* axillary, (10) 20–40-flowered, exceeding leaves, peduncle 5–12 cm long. *Flowers* yellow, rarely pink and yellow, bracts more than half the length of the flower, caducous. *Calyx* 6–7 mm long, lobes equal, teeth triangular or lanceolate, longer than the tube,

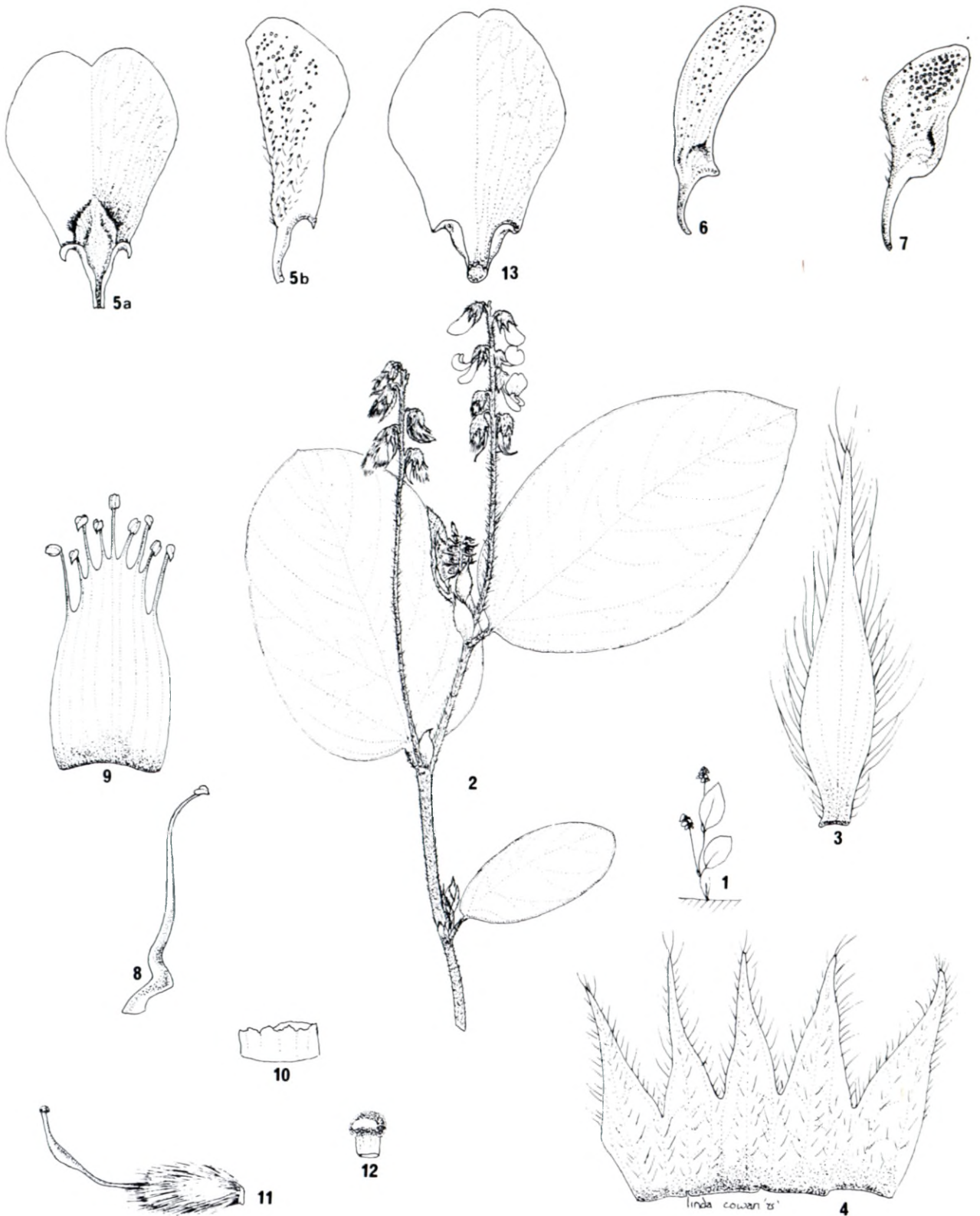


FIG. 15.—*Eriosema lucipetum*. 1, habit, 2, stem with flowers and young fruits, $\times 0,6$; 3, flower bract, $\times 9$; 4, calyx opened out, $\times 6,4$; 5a, standard opened out, $\times 4,6$; 5b, standard closed, $\times 4,6$; 6, wing, $\times 4,6$; 7, keel, $\times 4,6$; 8, vexillar stamen, $\times 6,4$; 9, staminal sheath, $\times 6,4$; 10, discoid floral nectary, $\times 18$; 11, gynoeceium, $\times 6,4$; 12, stigma, $\times 40$; 13, standard opened out, no appendage, $\times 4,6$, from anomalous populations (Stirton 1344).

ferruginous and sparsely pubescent. *Standard* (6) 8–12 mm long, 5–8 mm wide, oblong to obovate; appendages present, situated low down, free or merging into auricles, rarely absent. *Wings* 7–10 mm long, 2–3 mm wide, cultrate, auriculate, sculpturing absent but slightly indented near auricle, longer than the keel. *Keel* 6–8 mm long, 2–3 mm wide, densely glandular, hairy along base, slightly pocketed. *Staminal sheath* 6–7 mm long, free stamen geniculate; anthers uniform, alternately long basifixed and short medifixed. *Gynoeceum* 6 mm long; ovary 2–3 mm long, with 0.75 mm long gynophore, densely sericeous, curvature of style 2–3 mm high; stigma capitate. *Nectary* present, high as gynophore, margin undulating. *Fruit* 15–17 mm long, 10–13 mm wide, with a downward pointing 2 mm long beak; obliquely oblong, covered in 1–25 mm long patent hairs. *Seeds* 6–7 mm long, 3 mm wide, polymorphic, either black or light grey and speckled (only one population inspected however). Fig. 15.

Eriosema lucipetum is distributed mainly in northern Natal and northern Kwazulu but also extends as far north as Wakkerstroom in the Transvaal and westwards to Paulina and Rensburgskop in the Orange Free State (Fig. 16).

TRANSVAAL.—2730 (Vryheid): Wakkerstroom (–AC), *Beeton* 243.

NATAL.—2729 (Volksrust): 28 km from Newcastle to Volksrust (–BD), *Marsh* 69; 10 km from Newcastle to Memel (–DA), *Stirton* 1422; Ingogo (–DB), *Shirley* s.n. *NH* 30759; 5 km from Newcastle to Memel (–DB), *Stirton* 1420; 15 km from Newcastle to Ladysmith (–DB), *Stirton* 1306; Koenigsburg (–DD), *Thode* 4416. 2829 (Harrismith): Fort Mistake (–BB), *Stirton* 1417; *Elandslaagte* (–BD), *Shirley* 303; Mpaleni Kop (–DA), *Stirton* 79; 3 km from Colenso to Paulpietersburg (–DB), *Stirton* 1412. 2830 (Dundee): Kelvin Grove (–AA), *Medley Wood* 5184; 8 km from Dundee to Washbank (–AA), *Stirton* 1344; *Mpati Mountain* (–AA), *Shirley* s.n. 2930 (Pietermaritzburg): New Hanover (–BC), *Stirton* 1309.

O.F.S.—2828 (Bethlehem): Paulina (–AD), *Thode* 4422. 2829 (Harrismith): Rensburgskop (–AC), *Jacobz* 702. Without precise locality, *Thode* 3332.

This species is easily separated from *E. cordatum* by its free stipules. In areas where the two species overlap there exist plants which may be intermediates. Such plants, because they have free stipules, are included here in *E. lucipetum*. They tend to have pale pink and yellow flowers (for example *Stirton* 1416). Further studies may indicate that they are hybrids.

Eriosema lucipetum is rather variable. Plants from the westernmost part of the range are characterized by their decumbent habit, leaves with upper surface

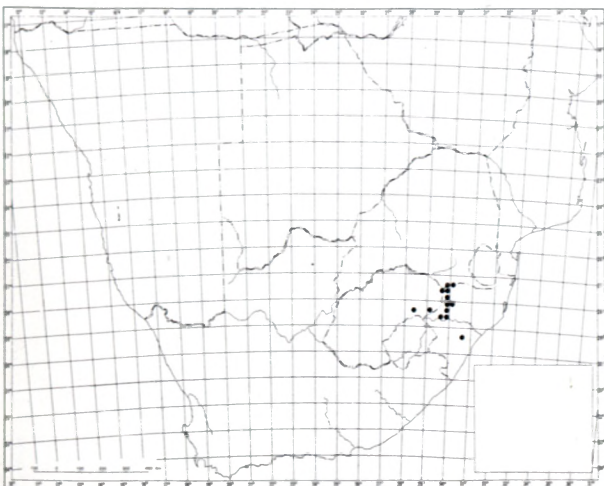


FIG. 16.—Known distribution of *Eriosema lucipetum* in South Africa.

strigose and under surface shiny with a dense covering of small reddish glands, and calyx ferruginous hispid (Fig. 17). The northern populations usually comprise erect plants with sericeous leaves, the under surface dull and variously covered in white or pale yellow glands; the calyx being white or tawny velutinous. The western plants may bear yellow, pink and yellow and very occasionally red and yellow flowers whereas northern and eastern plants are always yellow-flowered. It is the western plants which overlap in distribution with *E. cordatum*.

Stirton 1344 is a problem specimen to place in *E. lucipetum*. Its general facies is that of the erect form of the northern and eastern parts. It differs from these however in its sharply acute ovate leaves and its differently shaped standard petal that lacks appendages on the inner face. Among the erect plants of the eastern populations there is also an increasing tendency towards the decumbent habit the further east and south one goes. These areas are poorly collected however and it may be that more than one species may be involved. Collections are still needed between the range of *E. lucipetum* and that of the group of yellow-flowered specimens included temporarily under *E. zuluense*. (See under that species.) The latter specimens are included under *E. zuluense* owing to their fused stipules and shortly-triangular calyx teeth.

E. lucipetum is a plant of rocky grassveld, especially rocky banks and along roadsides, usually between 1 900–2 100 m. Flowering begins in October with a peak in November–December and then tails off during March.

The specific epithet *lucipetum* refers to the seemingly light-seeking habit of the inflorescences as they emerge from their rocky habitat.

4. *Eriosema psoraleoides* (Lam.) G. Don, Gen. Syst. 2: 348 (1832); Bak. f. & Haydon, Leg. Trop. Afr. 508 (1929); Staner & De Craene in *Annls Mus. r. Congo belge* sér 6, 1: 52 (1934); Hauman in *F.C.B.*, 6: 206 (1954); Cufod. in *Bull. Jard. bot. État Brux.*, 25 suppl: 328 (1955); Hepper in *F.W.T.A.* ed 2, 1: 557, fig. 167 (1958); White, *For. Fl. N. Rhod.* 151 (1962); Torre in *Conspectus Flor. angol.* 3: 337 (1966); Verdc. in *F.T.E.A. Legum.—Papil.*: 772 (1971); Jacques-Felix in *Adansonia*, sér 2, 11: 157 (1971); Ross, *Fl. Natal* 208 (1972). Type: Madagascar, *Commerson* (P, holo.; K, photo.).

Crotalaria psoraleoides Lam., *Encycl.* 2: 201 (1786), as 'psoraleoides'.

Rhynchosia cajanoides Guill. & Perr. in Guill., Perr. & A. Rich., *Fl. Sen.*: 215 (1832). Type: Verdcourt cites type as Gambia, near Gilfre not far from Albrede, *Leprieur* (P, holo.), but Felix gives type as Senegal, *Perrotet*, (P, holo.).

Eriosema polystachyum E. Mey., *Comm.* 130 (1836); Meisn. in *J. Bot.*, Lond. 2: 80 (1843). Type: South Africa, Caffraria, *Drège* s.n. (K, iso!).

Eriosema cajanoides (Guill. & Perr.) Hook. f. in Hook., *Niger Fl.*: 314 (1849); Baker in *F.T.A.* 2: 227 (1871); Harv. in *Fl. Cap.* 2: 261 (1862); *Medley Wood*, *Handbook Fl. Natal* 43 (1907); Harms in *Eng.*, *Pflanzenw. Afr.* 3, 1: 673 (1915); Bews, *Fl. Natal Zululand* 113 (1921); *F.W.T.A.* 1: 403 (1928); Burt Davy, *Fl. Trans.* 2: 413 (1932).

Eriosema proschii Briq. in *Annu. Conserv. Jard. bot. Genève*, 6: 4 (1902); Bak. f. & Haydon, *Leg. Trop. Afr.* 497 (1929). Type: Zambia, Barotseland, Sefula, *Prosch* 33 (E, holo.).

Perennial shrub or subshrub, 0.6–2.0 m tall. *Stems* erect or suberect, single or few arising from woody rootstock, finely pubescent. *Branches* angular, strongly ribbed; softly white pubescent or fulvocanescens, tomentose, more so on ridges, giving a cha-

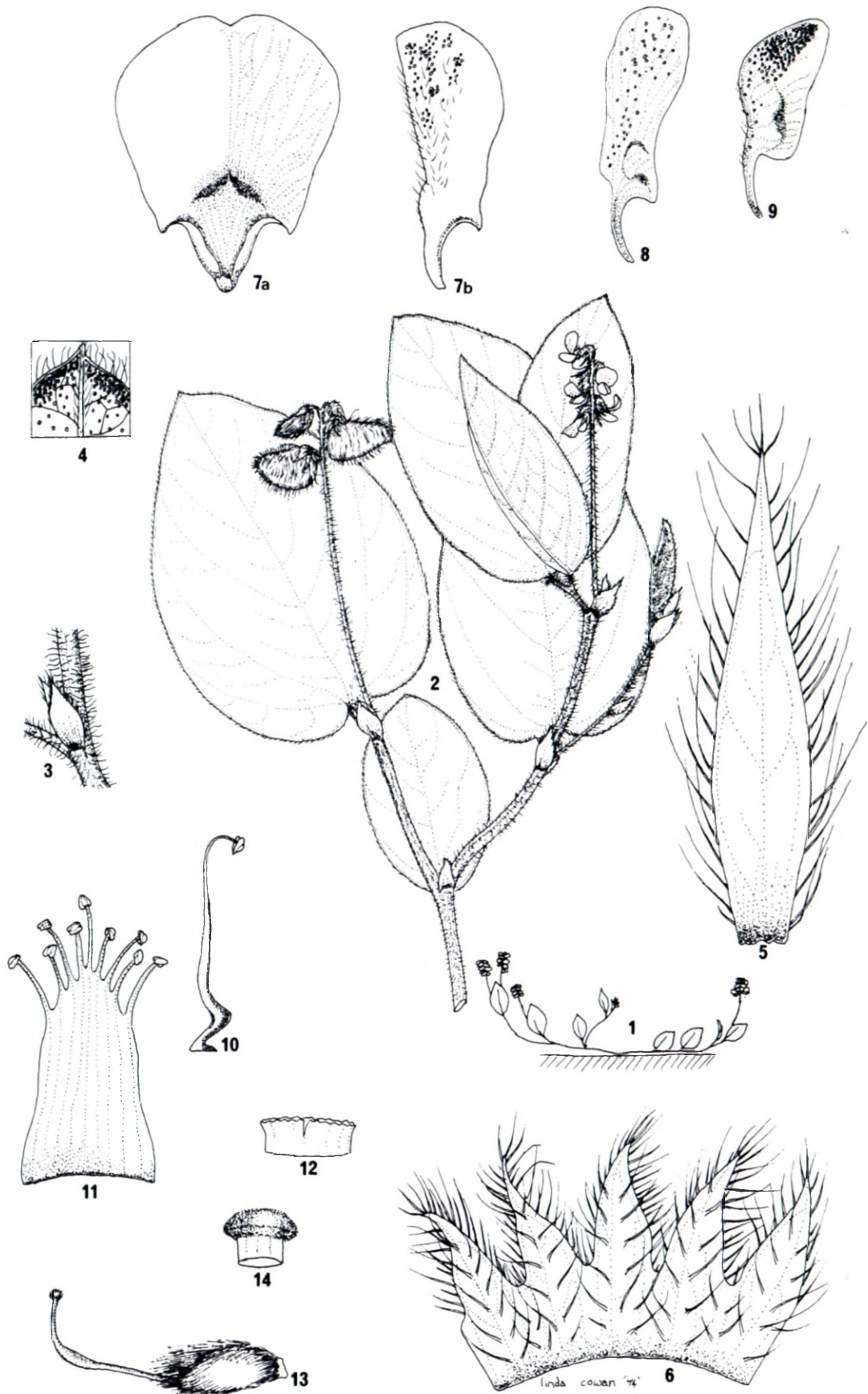


FIG. 17.—*Eriosema lucipetum* (western population). 1, habit; 2, stem with fruits and flowers, $\times 0.6$; 3, free stipules, $\times 0.9$; 4, under surface view of leaflet with glands densely packed along margin, $\times 1.2$; 5, flower bract, $\times 9$; 6, calyx opened out, $\times 6.4$; 7a, standard opened out, $\times 4.6$; 7b, standard closed, $\times 4.6$; 8, wing, $\times 4.6$; 9, keel, $\times 4.6$; 10, vexillar stamen, $\times 6.4$; 11, staminal sheath, $\times 6.4$; 12, discoid floral nectary, $\times 18$; 13, gynoeceium, $\times 6.4$; 14, stigma, $\times 40$.

racteristic zebra effect; densely or lightly intermingled with numerous small white to yellow glands, orange in older material. *Leaves* trifoliolate. *Stipules* free, up to 5 mm long, often minute, patent or sharply down-flexed, becoming scarious even before subtended leaf expands. *Petioles* 1–4 (5) mm long. *Leaflets* (3,0) 4,5–9,0 (9,5) cm long, 1,5–2,2 (2,8) cm wide, laterals smaller; subcoriaceous; narrow obovate (2:1) to narrow oblanceolate (6:1), or elliptic (2:1) to narrow elliptic (3:1), or oblong (2:1) to narrow oblong (3:1), base cuneate; margin almost revolute; apex rounded or obtuse, less often acute or emarginate; terminal leaflet symmetrical, laterals almost symmetrical, base not oblique; finely sericeous above, characteristically penninerved, discoloured, velutinous beneath giving either a very smooth silvery appearance or a buff and grey appearance; numerous orange glands present, often obscured by dense indumentum. *Young leaflets* hoary. *Petiolules* 2,0–3,0 mm long, more densely hairy than petiole or rachis, slightly swollen often glandular. *Rachis* 1–5 mm long. *Racemes* 10–50-flowered; subdistichous, usually lax; *peduncles* 2,5–4,0 cm long, nearly always less than one third of raceme, finely pubescent, *rachis* 6,0–9,5 cm long. *Flowers* yellow, 11–13 mm long, about 5 mm wide. *Pedicels* \pm 2 mm, semi-erect 30° to axis. *Pedicel bract* 2,0–5,0 mm long, deciduous at bud stage. *Calyx* 4,0–5,5 (6,0) mm long, less than half the length of flower, lobes all equal, teeth length \pm equal to tube, triangular or minaret shaped, with keel tooth sometimes narrower; puberulous inside, shortly pubescent or sericeous outside, with dense orange glands or eglandular. *Standard* 10,3–12,1 mm long, (7,7) 8,0–10,3 mm wide; wide obovate (1,2:1); apex retuse; glabrate or lightly puberulous; claw 1,9–2,0 (2,8) mm long, width between auricles 3,4–5,0 mm, auricles 0,5 mm wide, prominent; appendages absent. *Wings* 10,1–11,5 mm long, 2,1–2,7 (3,0) mm wide; oblong (2:1) to lorate (6:1), cultrate, narrower than but same length as keel blades; claw 2,0–3,0 (3,5) mm long; auricle 1,7–2,0 (3,0) mm high; heel present. *Keel blades* (9,8) 10,0–11,0 (11,4) mm long, (4,1) 4,7–5,8 mm wide; deep pocketed beneath auricle; oblong (2:1); apex subacuate to rounded; claw 2,1–3,2 mm long; auricle (1,8) 2,0–3,0 mm high; covered with numerous small orange glands, often with scattered hairs along base line. *Staminal sheath* 9,0–10,5 mm long, (2,5) 3,5–4,0 mm wide, oblong (2,1); vexillar stamen (8,8) 9,1–11,2 mm long, knee up to 2 mm long. *Gynoeceium* 9,5–11,0 mm long; ovary 3,5–4,0 mm long with 0,5–1,0 mm stalk, densely hairy and glandular but hairs hardly exceeding ovary; style very long, partly hairy on base line, incrassated at point of upward flexure; curvature 3,0–3,8 (4,0) mm high, stigma very small, semi-globose, inward angled or erect, inserted. *Discoid floral nectary* 0,5–0,9 mm high, margin smooth, slightly wavy. *Fruit* wide ovate (1,2:1) to very wide oblong (1,2:1), 13–14 mm long, (7) 9–10 mm wide, coriaceous; beak down-turned, up to 1 mm long; densely white or ferruginous villous haired, hairs erect on margins, mostly appressed on sides. *Seeds* khaki or chestnut brown, 5,4–5,9 mm long, 3,4–3,9 mm wide, 1,9–2,0 mm thick, rim-aril cream.

Eriosema psoraleoides extends from West Africa across Central Africa to Sudan, then southwards from east Africa across parts of Zambia to Angola, through Zimbabwe, Mozambique, Botswana, Swaziland into South Africa (Transvaal, Natal). It also occurs in Madagascar, the type country (Fig. 18).

TRANSVAAL.—2229 (Waterpoort): Wylies Poort (–DD), Hut-

chinson 2096. 2230 (Messina): Tate Vondo Forest Reserve (–CD), Hemm 342; Makondo (–DA), Wesphal 38; Lukandwane store, north of Sibasa (–DC), Codd 6881. 2329 (Pietersburg): 8 km above Louis Trichardt (–BB), Rodin 3991. 2330 (Tzaneen): Albasini Dam (–AA), Stephen 291; Tshakoma (–AB), Obermeyer 1054; Westfalia Estate (–CA), Scheepers 141; Tzaneen (–CC), Rogers 12588. 2427 (Thabazimbi): Kransberg (–BC), Germis-huizen 220; Rankins Pass (–DB), Acocks 23587. 2428 (Nylstroom): Near Alma (–AC), Clarke 36; 6 km south-east of Palala (–BC), Story 1662; Nylstroom (–CB), Rogers 75; 12 km from Nylstroom to Naboomspruit (–DA), Coetzer 16. 2429 (Zebediela): Lunsklip (–AA), Maguire 1362. 2430 (Pilgrims Rest): Shilouvane (–AB), Junod 766. 2431 (Acornhoek): 12,3 km from Greenvalley to Nelspruit (–CA), Stirton 1450. 2526 (Zeerust): Groot Marico (–CB), Holland 405/27. 2528 (Pretoria): Wonderboompoort (–CA), Leendertz 704; Bronkhorstspuit (–DD), Grobbelaar 499. 2529 (Witbank): between Grobbledersdal and Marble Hall (–AB), Grobbelaar 32; Loskop Dam (–AD), Mogg 17242. 2530 (Lydenburg): Sabie Valley (–BB), Galpin s.n.; Wonderkloof Nature Reserve (–BC), Elan Pullick 222; Nelspruit (–BD), Buitendag 127; Mashonamini (–DA), Gross 87. 2531 (Komatipoort): Pretoriuskop (–AA), Van der Schijff 266; Mlambane Dam (–AB), Brynard & Pienaar 4464; Plaston (–AC), Graham 27; Mala Mala (–BA), Johnson 461; Malelane (–BC), Brynard & Pienaar s.n.; Komatipoort (–BD), Rogers 428; Barberton (–CC), Rogers 28568. 2628 (Johannesburg): Modderfontein (–AA), Haagner s.n.

SWAZILAND.—2631 (Mbabane): 15 km west of Mankaiana (–CA), Compton 28662; Kubuta (–DC), Compton 28128.

NATAL.—2632 (Bela Vista): Ndumu Game Reserve (–CC), Ross 1972; Usutu Flood Plain (–CD), Tinley 532. 2730 (Vryheid): Pongola (–BC), Marguis 115; Zungwini (–DB), Shirley s.n. 2731 (Louwsburg): Itala Nature Reserve (–AC), Brown & Shapiro 423; Mbuzana River, 22 km from Magudu (–DA), Ross 1099. 2732 (Ubombo): Pongola river (–AA), Galpin s.n.; Mkuze (–CA), Galpin 1371; False Bay (–CD), Gerstner 6756; Sodwana Bay (–DA), Balsinhas 3223. 2830 (Dundee): Ingezeraan (–AB), Wood 15069; Qudeni Road to Tissiman's farm (–DA), Hilliard 1379. 2831 (Nkandla): Buxedini (–BB), Guy 90; Eshowe (–CD), Gerstner 4157; 18 km from Eshowe to Gingindlovu (–DC), Stirton 1296; near Empangeni (–DB), Codd 1882; Mtunzini (–DD), Lawn 427. 2832 (Mtubatuba): Hluhluwe Game Reserve (–AA), Ward 1903; Charters Creek (–AB), Baker 10010; Dukuduku Forest (–AC), Strey 5539; Monzi Settlement (–AD), Strey 6567; Richards Bay (–CC), Venter 5458. 2930 (Pietermaritzburg): Inanda (–DB), Wood 160; Umlaas (–DA), Wood 5659; Umlazi (–DD), Wood 11147. 2831 (Stanger): 42 km from Stanger to Mtunzini (–AB), Stirton 408; Chaka's kraal (–AD), Thode 4415; Amatikulu (–BA), Mogg 6289.

Eriosema psoraleoides is one of the most commonly collected *Eriosema* species in southern Africa. It is a very distinctive species and is easily recognized. It has been confused occasionally with *E. salignum* E. Mey., *E. burkei* Benth. and *E. nutans* Schinz, but is readily identified by its leaf shape and pubescence, minute stipules, absence of appendages on the standard, and its congested, short peduncled inflorescence.

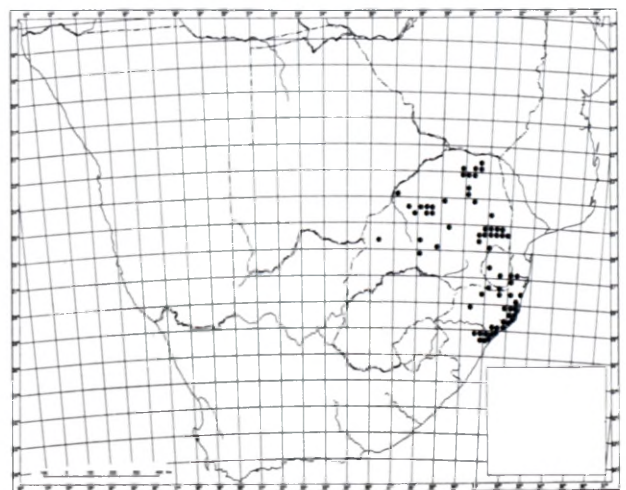


FIG. 18.—Known distribution of *Eriosema psoraleoides* in South Africa.

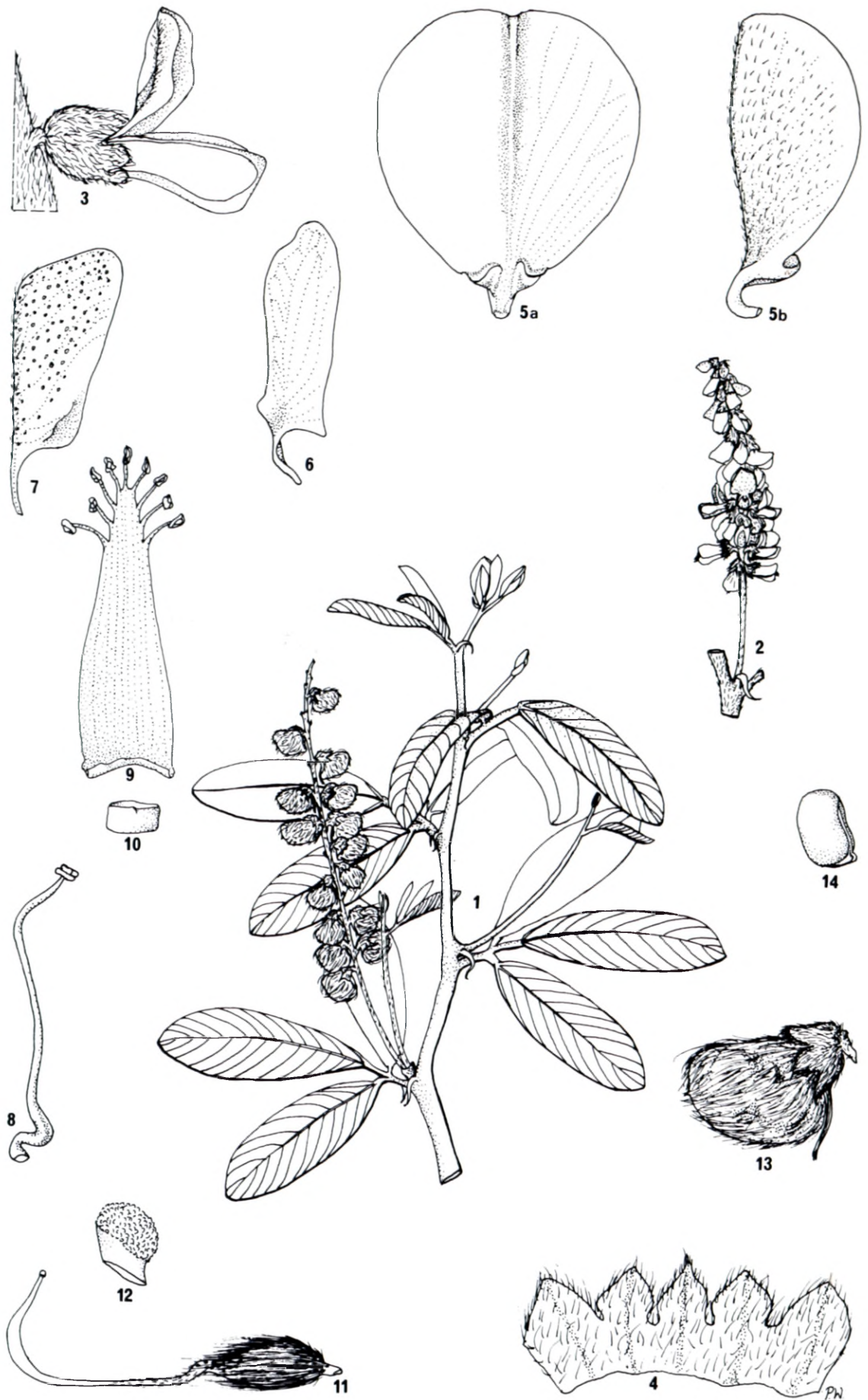


FIG. 19.—*Eriosema psoraleoides*. 1, branch with fruits, $\times 0.6$; 2, inflorescence, $\times 0.6$; 3, flower, $\times 4.6$; 4, calyx opened out, $\times 3.7$; 5a, standard opened out, no appendages, $\times 4.6$; 5b, standard closed, $\times 4.6$; 6, wing, $\times 4.6$; 7, keel, $\times 4.6$; 8, vexillary stamen, $\times 4.6$; 9, staminal sheath, $\times 4.6$; 10, discoid nectary gland, $\times 18$; 11, gynoecium, $\times 6.4$; 12, stigma, $\times 40$; 13, fruit pod, $\times 1.8$; 14, seed with strophiote showing hilum, $\times 2.7$.

The species is restricted to the lower-lying areas of Swaziland, the Transvaal and Natal. It is usually found along roadsides, disturbed crop lands and forest margins, and along coastal sandflats in coarse grassland with scattered shrubs. It has also been recorded in swampy conditions. Field studies have shown that although variable in different environments, it was nevertheless consistent in its important diagnostic characters. Following the road from the Malkerns Agricultural Research Station in Swaziland to Mbabane, I noticed a decrease in size, branching, and number of flowers per inflorescence. A similar gradient occurs between coastal and inland plants.

Eriosema psoraleoides can produce flowers all year round but its flowering is heaviest between October to May with peaks between October to December and March to May. During the period of the second peak the Natal populations, as a whole, flower much later than the Transvaal populations, reaching a peak in April as compared with March. In the first peak the Natal populations flower earlier in September as compared with October–November for the Transvaal.

On the Natal coast plants growing south of Mandini have been observed to flower at different times to those plants growing north of the Tugela River (C. J. Ward, 1975, pers. comm.).

The Venda common name for this species is mutangasiwa (*Westphal* 38, *Codd* 6881). In Afrikaans it is referred to as the geelkleurtjie, an allusion, according to Smith (1966), to their yellow flowers and general appearance to the European *Laburnum*.

Both *Gerstner* (5002) and *Moll* (5345) recorded that Tonga and Zulu tribesman cook and eat the ripe seeds. A medicinal use has been observed by *Codd* (6881) who noted that roots were used to cure internal disorders. These plants apparently are invoked by some Swazi tribesman during storms as a protector against lightning. A less obvious usefulness is the reputed efficacy of their leaves and roots when used as a remedy against venereal diseases; instances having been noted in the Congo, Zambia and Nigeria (*Watt & Breyer-Brandwijk*, 1962). The same authors also report that in West Africa peasants rub leaves on their dogs in order to control lice.

5. *Eriosema buchananii* *Bak. f.* in *J. Bot.*, Lond. 33: 145 (1895); *Bak. f. & Haydon*, *Leg. Trop. Afr.* 505 (1929); *Hauman* in *F.C.B.* 6: 211 (1954); *Verdc.* in *F.T.E.A. Legum.—Papil.*: 776 (1971); *Agnew*, *Upland Kenya Wild Flowers* 288, icon. (1974). Type: Malawi, Mt Zomba, *Buchanan* 214 (K, holo.!).

E. richardii *Bak. f. & Haydon* var. *ovatum* *Staner & De Craene* in *Rev. Zool. Bot. afr.* 24: 286 (1934). Type: Tanzania, Rungwe District, Ukinga Mountains, *Madehani*, *Stolz* 2312 (K, holo.!).

Perennial herb or subshrub up to approximately 0,6 m, with simple or sparsely branched, erect stems from a woody rootstock. Stems shallowly grooved with scattered orange to red spherical glands, densely covered with spreading ferruginous hairs, longer on the ridges and shorter, erect to appressed, in the grooves. Leaves trifoliolate, lower leaves often unifoliolate. Stipules free, 1,0–1,6 mm long, 2,5–4,0 mm wide; lanceolate, base narrower than middle, acinaciform (scimitar-shaped), often falcate; glabrous inside, ferruginous hairy outside. Petiole 2–8 mm long. Leaflets 3,2–6,8 cm long, 1,0–3,5 cm wide; laterals smaller 1,4–5,9 cm long, 1,0–2,5 cm wide; elliptic (2:1), otherwise ovate (1,5:1) to ovate lanceolate (3:1 or more) base slightly cordate, round-

ed, or truncate; apex acute, mucronate; margin entire, revolute; veins below raised, chestnut coloured and thickly appressed pilose in contrast to shorter, erect pilose areas between veins; veins above thinly appressed pilose; numerous small orange glands scattered below, occasionally above; terminal leaflet symmetrical; lateral leaflets asymmetrical, base oblique, width ratio 1:2. Young leaves ferruginous pilose on veins, intervening areas packed with orange glands and softly pubescent to pilose; petiolules 2,0–3,0 mm long, acropetal parts thickened, blackish, hairs denser. Rachis 0,5–1,5 mm long, canaliculate. Racemes up to 40-flowered; peduncle 5–23 cm long, grooved, glandular, densely covered with a mixture of long and short ferruginous hairs; rachis 2–6 cm long; pedicels erect about 60° to axis, 1,0–1,5 mm long, recurved at apex, glabrous at base just above bract abscission scar. Calyx (4,0) 4,5–5,0 (5,7) cm long; externally spreading pilose and gland dotted, with shorter hairs near the base, and longer denser hairs on the lobes and creases; internally finely hairy on lobes but restricted mainly to veins and the horn lobes; tube 2,0–3,0 mm long, being longer between the horn lobes, 2,3–3,3 mm long, circumference 5,0–5,3 mm, tissue distinctly bulged between the horn lobes when the calyx is flattened; lobes triangular unequal, horn lobes partly connate, 4,2–5,2 mm long; lateral lobes 3,9–5,0 mm long, keel lobe 4,0–5,7 mm, longest; lobes more or less equalling the tube. Standard very pale pink lined with dark purple; 7,7–10,7 mm long, 3,0–4,6 mm wide; oblong (2:1), narrowed in the middle, appendages occur above the middle and are slight ridges often difficult to see; claw 2,2–3,6 mm; auricles prominent, incurved, 3,5–4,5 mm apart. Wings 7,3–9,0 mm long, 1,8–2,0 mm wide, longer than keel, ratio 1:1,2; narrowly oblong (3:1); claw 2,5–3,5 mm, auricle 1,2–1,9 mm high. Keel blades 6,1–8,0 mm long, 2,0–2,6 wide at maximum; claw 2,0–3,0 mm long; a few hairs along baseline, glandular. Staminal sheath 5,2–6,5 mm long, 1,9–2,6 mm wide at maximum, vexillar stamen 4,5–6,2 mm long, basal knee 0,5–0,8 mm long. Gynoecium 5,0–7,2 mm long; ovary 2,0–3,0 mm long, with stalk 0,3–1,0 mm long; hairs on ovary wall up to 2,5 mm long, distinctive, wavy, not stiff; style slightly bent and thickened towards end; curvature 1,1–2,0 mm high; stigma small capitate, inserted. Discoid floral nectary 0,3–0,6 mm high, margin slightly wavy, often revolute. Fruits and seeds not seen. Fig. 20.

In South Africa this species is confined to a few localities in the northern Transvaal (Fig. 21). It appears to be restricted to the North-eastern Mountain Sourveld Veldtype. It occurs between 900 and 1 490 m. The Transvaal is the southernmost limit of distribution. It is also recorded from Kenya, Uganda, Tanzania, Zambia, Malawi and Zimbabwe.

TRANSVAAL.—2329 (Pietersburg): Haenertsburg (–DD), *Eastwood* 13 & *Pott* 4635. 2330 (Tzaneen): Duivelskloof (–CA), *Scheepers* 814; Magoebaskloof (–CA), *Papendorf* 275; Woodbush (–CC), *Mogg* 13992.

Verdcourt (1971) in his treatment of *Eriosema* for the Flora of Tropical East Africa reported that he had seen only one specimen of var. *buchananii* from South Africa. This specimen, *Scheepers* 814, has proved however to be the most atypical of the South African specimens. It has larger more distinctly ovate leaves, longer peduncles as well as a shorter lighter patent indumentum. This may be due to environmental influences as similar attributes have also been noted in field studies in other species in the *E. cordatum* complex. *Scheepers* 814 groups well with the



FIG. 20.—*Eriosema buchananii* var. *buchananii*. 1, branch with flowers, $\times 0.6$; 2, stipule, $\times 4.6$; 3, flower bract, $\times 9$; 4, calyx opened out, $\times 6.4$; 5a, standard opened out, $\times 4.6$; 5b, standard closed, $\times 4.6$; 6, wing, $\times 4.6$; 7, keel, $\times 4.6$; 8, vexillar stamen $\times 4.6$; 9, staminal sheath, $\times 4.6$; 10, discoid floral nectary, $\times 18$; 11, pistil, $\times 6.4$; 12, stigma, $\times 40$.

following specimens from outside South Africa: *Chaje* 682 (Zimbabwe); *Corby* 1430 (Zimbabwe); *Hilliard & Burt* 4139 (Malawi); *Pawek* 1564, 8046 (Malawi); *Richards* 2362/A (Tanzania); *Semsei* 1652 (Tanzania). These specimens might deserve some infraspecific ranking. Verdcourts inclusion of var. *buchananii* in the *E. cordatum* E. Mey. complex can be understood from his comments on the *Scheepers* 814 specimen. He referred to *Scheepers* 814 as being a 'small rounded shrub of upright habit with numerous ascending to suberect branches from the base, corolla very pale pink, veined with dark red purple'. In differentiating between *E. cordatum* and *E. buchananii* in South Africa, he made some relevant remarks, based as it turned out, on a specimen atypical of its range. He commented: 'This is most interesting because the same collector has collected true *E. cordatum* at Letaba [*Scheepers* 487, 3 Oct. 1958 (K; PRE)]; he described the flowers as yellow veined with dull red, the standard dull red outside. The two are strikingly similar in general appearance save that *Scheepers* 814 has much denser patent indumentum on the stem. The two are, however, equally strikingly different in their standards; not only is there the difference in the appendages already pointed out, but the shape is also quite different in each. *E. buchananii* has a distinctly rectangular standard with the auricles pronounced, above which it is very slightly narrowed; *E. cordatum* has a distinctly obovate standard, gradually narrowed into the claw, the auricles being less obvious. Moreover the claws of the other petals are much longer in *E. buchananii* than they are in *E. cordatum*'.

Scheepers (1974 pers. comm.) felt sure his Nos 487 and 814 were different — 'certainly they are very distinct in habit'. He commented on *E. buchananii*'s 'more stiffly upright habit' as opposed to *E. cordatum*'s 'characteristically laxly sprawling habit'.

These comments hold for all the other specimens of *E. buchananii* in South Africa which are clearly distinct and easily separable from *E. cordatum*. I suspect that their relationship is probably not as close as previously envisaged.

In South Africa *E. buchananii* has been confused more often with two other species rather than with *E. cordatum*. Here it has been known under the name *E. nutans* Schinz [= *E. polystachyum* (A. Rich.) Bak.] to which it has a very strong resemblance, and also to *E. montanum* Bak. f. which does not extend as far south as South Africa. *E. buchananii* may be readily separated from the rest of the complex by the

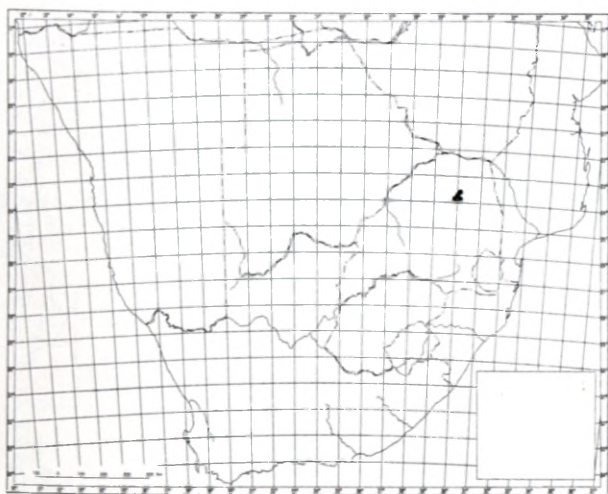


FIG. 21.—Known distribution of *Eriosema buchananii* in South Africa.

presence of an appendage situated above or at the middle of an oblong standard, the large incurved flattened auricles and the falcate stipules with the base narrower than the middle. The appendage is characteristic as it is divided into two shallow, crescentiform ridges which lie closely one on either side of the central axis of the standard. *E. nutans* is separated by its smaller auricles and its undivided appendage which occurs just above the auricles merging into them.

Apart from the comment by *Mogg* (13992) that his plant was 'common in grassland ridges of gneiss', there is very little ecological information for the species in South Africa. *Scheepers* 814 has the following note 'north facing slope, intense sunlight to misty or windy, periodically moist well drained and aerated to dry, arid shallow soil tending toward lateritic type'.

E. buchananii flowers from November to January, with a peak in December.

There is another variety in east Africa, var. *subprostratum* Verdc. This does not occur in South Africa. *Gillett* 17669 (K) from Tanzania, which has been included under var. *subprostratum* seems to me to be worthy of some rank. It has smaller flowers, lacks the typical *buchananii* stipules and has a different pubescence.

6. *Eriosema nutans* Schinz in Bull. Herb. Boissier sér 2, 8: 629 (1908); Bak. f. Leg. Trop. Afr. 1: 505 (1929); Burt Davy, Fl. Transv. 2: 15, 413 (1932); Verdc. in Kew Bull. 25: 121 (1971). Type: South Africa, Transvaal, Shilouvane, *Junod* 2165 (Z, holo.!).

E. richardii Bak. f. & Haydon, Leg. Trop. Afr. 505 (1929). Type: Ethiopia, without locality, *Schimper* 708 (K, holo.!).

E. richardii Bak. f. & Haydon forma *ellipticum* Staner & De Craene in Rev. Zool. Bot. afr. 24: 286 (1934). Type: Kenya Gishu, *Harvey* 71 (K; holo.! PRE, iso.!).

E. buchananii Bak. f. var. *richardii* (Bak. f. & Haydon) Staner forma *ellipticum* (Staner & De Craene) Staner in Kew Bull. 278 (1935).

E. polystachyum sensu auct. e.g. Bak. in F.T.A. 2: 225 (1871); Burt Davy, Fl. Transv. 2: 413 (1932); non (A. Rich.) Bak., nec E. Mey., non *Rhynchosia polystachya* A. Rich.

Perennial herb or subshrub 30–90 cm tall from underground rootstock. *Stems* erect or decumbent, branched, grooved, densely or lightly covered with ± spreading white or ferruginous hairs and shorter curly hairs on ridges, ± glabrous in troughs. *Leaves* trifoliolate; *stipules* free, 5–9 mm long, 1.0–1.5 mm wide, linear lanceolate or triangular, straight or falcate, closely veined, not recurved, appressed hairy outside, glabrous inside ± glands. *Petioles* 3–7 mm long. *Leaflets* 4–8 cm long, 1.3–2.8 cm wide, laterals much smaller; narrow ovate (2:1) to lanceolate (3:1), or elliptic (2:1); apex acute or rounded; base cuneate or truncate, margin revolute; terminal leaflet symmetrical, laterals almost symmetrical, base mostly oblique; shortly appressed pilose above, appressed pilose on raised venation beneath but sparsely erect pilose between veins; both surfaces covered with either large orange or small yellow glands or both without. *Young leaflets* shaggy white or ferruginous, ± densely packed with glands. *Petiolules* 1–2 (3) mm long. *Rachis* (0,7) 0.8–1.1 (1,2) cm long. *Racemes* axillary, 10–43-flowered; *peduncle* 4.0–12.2 cm long, densely or sparsely ferruginous or white hairy; *rachis* (3,2) 4.0–7.2 (11,1) cm long; *Flowers* yellow (7,0) 7.5–9.0 (10,0) mm long, (2,5) 3.0–3.4 mm wide, reflexed; bract 3.0–5.8 mm long, lanceolate slightly boat-shaped, caducous, hairy outside,



FIG. 22.—*Eriosema nutans*. 1, habit; 2, branch with fruits and flowers, $\times 0,6$; 3, flower bract, $\times 9$; 4, flower, $\times 4,6$; 5, calyx opened out, $\times 9$; 6a, standard opened out, $\times 4,6$; 6b, standard closed, $\times 4,6$; 7, wing, $\times 4,6$; 8, keel, $\times 4,6$; 9, vexillar stamen, $\times 9$; 10, staminal sheath, $\times 9$; 11, discoid floral nectary, $\times 18$; 12, gynoeceium, $\times 9$; 13, stigma, $\times 40$; 14, fruit pod, $\times 2,8$.

glabrous inside; calyx (3,0) 3,5–4,3 (4,5) mm long, lobes \pm equal, deltoid or triangular, \pm yellow or orange glands, shortly pilose, long hairs if present mostly at tips or along veins; tube (1,5) 2,0 (2,9) mm long, longer between horn lobes (1,9) 2,2–2,8 (3,6) mm long; lateral lobes (3,0) 3,5–4,0 (4,5) mm long; keel lobe (3,0) 3,5–4,2 (4,5) mm long, horn lobes longest (3,1) 4,0–4,3 (4,8) mm long, tips straight, occasionally incurved; basal circumference 4,0–5,0 mm. *Standard* (6,7) 7,0–9,2 (10,0) mm long, (2,5) 2,8–4,0 (4,5) mm long, mostly oblong (2:1), densely hairy on back, glands present or absent; claw (1,0) 1,5–2,0 (2,8) mm long; width between auricles (2,2) 3,0–3,3 (4,0) mm; auricles prominent; appendage situated low down and extending across auricles, bifurcate, two upcurled flaps 2,7–3,6 (4,0) mm from base of claw. *Wings* (4,2) 6,9–7,8 (8,8) mm long, (0,9) 1,0–1,1 (1,6) mm wide at maximum, about same length as keel blades, sparsely glandular and hairy on outside, claw (1,7) 2,0–2,5 (3,2) mm long; auricle 1,0–1,2 (1,6) mm high. *Keel blades* (6,0) 7,0–8,0 mm long, (0,9) 2,5–2,8 (3,3) mm wide at maximum, 2–3 times wider than wing, either densely packed with glands or eglandular, prominently hairy along base line up curvature to apex, claw 2,0–2,5 (3,0) mm long, auricle 1,2–1,5 (1,8) mm high. *Staminal sheath* (5,5) 6,0–7,0 (7,1) mm long, (1,2) 1,9–2,2 mm wide at maximum, vexillar stamen (5,2) 6,0–6,8 (7,0) mm long. *Gynoecium* (5,4) 6,0–7,2 (8,5) mm long; *ovary* (2,2) 2,8–3,0 mm long with short haired stalk, 0,2–0,5 mm long; glandular with long silky sericeous hairs reflexing at tips and extending as far as thickening in style; style filiform but thickened at point of flexure, curvature (1,5) 2,0–2,1 (2,2) mm high; stigma minutely capitate, inserted. *Discoid floral nectary* with margin crenulate. *Fruits* ovate-oblong, 10–12 mm long, 6–8 mm wide, beak oblique 0,5–1,1 mm long, covered with long soft ferruginous hairs and short hairs, longer hairs mostly at top and sides, short appressed hairs distinctive along base line as it incurves towards stem. *Seeds* 3,0–3,5 mm long, 1,6–2,0 mm wide; black, strophiole cream or white. Fig. 22.

In South Africa *E. nutans* is confined to the Transvaal and Swaziland (Fig. 23). Elsewhere it occurs in Zaire, Sudan, Ethiopia, Eritrea, Kenya, Uganda, Tanzania, Malawi, Zambia, Mozambique and Zimbabwe.

TRANSVAAL.—2329 (Pietersburg): Louis Trichardt (–BB), Breyer s.n.; Bloodriver (–CD), Hay s.n. 2330 (Tzaneen): Elim (–AA), Schlechter 4550; Westfalia Estate (–CA), Grobbelaar 426; Modjadjes Reserve near Duiwelskloof (–CB), Krige 29; New

Agatha (–CC), McCallum s.n. 2428 (Nylstroom): Tarentaalpas (–AD), Clarke 360. 2430 (Pilgrims Rest): The Downs (–AA), Junod 4354, Shilouvane (–AB), Junod 2165, 4896; Pilgrims Rest (–DD), Rogers 14510. 2528 (Pretoria): Pretoria (–CA), Repton 241. 2530 (Lydenburg): Lydenburg (–AB), Galpin 12194; Mount Anderson (–BA), Galpin 13720. 2627 (Potchefstroom): Krugersdorp (–BB), Jenkins 9228. 2628 (Johannesburg): Melville Koppies (–AA), McNae 1455; Boksburg (–AB), Murray s.n. 2629 (Bethal); Standerton (–CD), Rogers 4813.

SWAZILAND.—2631 (Mbabane): Mliwane Game Reserve (–AC), Arnold 832.

Burt Davy (1932) accepted both *E. nutans* Schinz and *E. polystachyum* (A. Rich.) Bak. He remarked that *E. nutans* Schinz 'is a close ally of *E. polystachyum* (A. Rich.), Bak. f. ms'. Under *E. polystachyum* (A. Rich.), Bak. he stressed its close affinity to *E. richardii* Benth. ex Bak. f. Later, however, he cited Rogers 14510 as *E. polystachyum* but labelled it *E. richardii*. His treatment of these various taxa can be understood and appreciated after reading a note on pp 15–16 of his flora. In this note on 'Synonyms and References' Burt Davy commented on some of the difficulties he encountered with synonymy. His example fortuitously concerned *Eriosema polystachyum*. He said: 'For the sake of space, also, only so much synonymy has been given as seemed requisite to correlate the species with the "Flora Capensis" and the "Flora of Tropical Africa", or with more recent revisions and monographs. The principle has been adopted that the same name should not be used for more than one plant, even though the first name so applied has been reduced to the rank of a synonym. This rule has much to commend it in view of the fact that differences of opinion will always exist as to the correctness of reducing a name to the status of a synonym, and the consequent liability that the plant to which it was first applied will be restored to specific rank. An example in point is that of the Tropical African *Eriosema polystachyum* (A. Rich.) Bak. (1871); *Rhynchosia polystachya* A. Rich. (1847); this is antedated by *Eriosema polystachyum* E. Mey. (1835), which is a distinct species, of the Transkei. Although Meyer's name has been reduced to a synonym of *E. cajanoides* (Guill. & Perr.) Benth. *Rhynchosia cajanoides* Guill. & Perr. (1833), it is quite possible that the Transkeian *E. polystachyum* is not conspecific with *E. cajanoides*, in which case Meyer's name would have to be restored and Richard's name would have to be changed, and with consequent confusion. Probably anticipating this, Bentham proposed in mss, the name *Eriosema richardii*, which is adopted here'. [N.B. *E. polystachyum* E. Mey. is a synonym of *E. psoraleoides* (Lam.) G. Don].

E. nutans has been interpreted differently in different parts of Africa, a not unusual result of the slow, spasmodic development of African botany. This name has been used rarely in South Africa. Here the most popular name has been *E. polystachyum* (A. Rich.) Bak. In referring to practice outside South Africa, Verdcourt (1971) made the following comment: 'During the past thirty years this (*E. nutans* Schinz) has mostly been accepted as a variety of *E. buchananii* but I am certain that the two are best kept distinct, the latter differing in large leaves, much broader stipules, different position of the standard appendages and less constancy in flower colour. The flowers of *E. nutans* are yellow but only a few plants of *E. buchananii* have been seen with yellow flowers; they are mostly cream, pink, or purple lined with purple'.

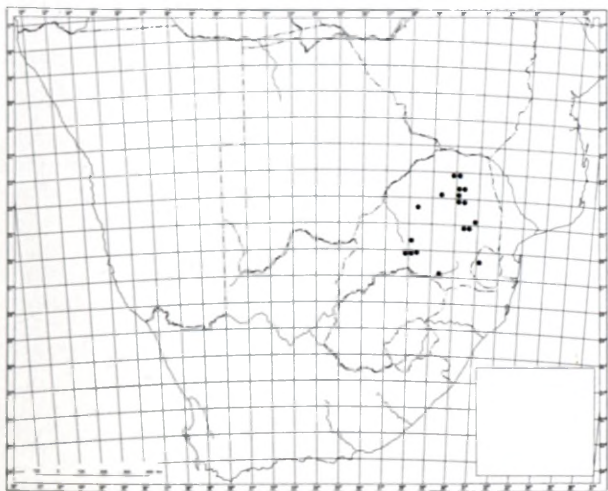


FIG. 23.—Known distribution of *Eriosema nutans* in South Africa.

As the presence of *E. buchananii* has now been firmly established in the Transvaal, I might add that Verdcourt's comments hold for South Africa, except that here plants of *E. buchananii* have not been recorded as yellow-flowered.

Over 50 specimens had been incorrectly named in the past. This material had been referred to *E. psoraleoides* (*E. cajanoides*), *E. parviflorum*, *E. zeyheri* and *E. squarrosom*. *E. psoraleoides* with its very small stipules, wide obovate standard without appendages, different keels, wings and pistil is easily separated from *E. nutans* which has an oblong standard with appendages and long lanceolate stipules. The two species differ also in that in *E. nutans* the peduncle is longer than half the length of the inflorescence. In *E. psoraleoides* the peduncle is less than one third the length of the inflorescence. *E. parviflorum* is distinguishable from *E. nutans* by its wide obovate (1,2: 1) standard, and its allopatric distribution (almost restricted to Natal in S. Africa).

The most noticeable variation which occurs in *E. nutans* is the presence or absence of glands. Two types of glands have been found; large and small red glands and yellow glands. Gland colour may be the result of ageing or an artefact of the poisoning of herbarium specimens. Glands are mostly confined to specimens from the northern Transvaal. Glandular and non-glandular plants both extend from Tanzania to the Transvaal. Calyces are quite variable ranging from sparsely short pilose and short toothed, to long toothed and densely short pilose. Leaf shape and size are most variable. Stipules range from short triangular and slightly falcate, to long linear-lanceolate and straight. This variation may be worthy of infra-specific categorization. However, in view of the numerous difficulties of synonymy which have resulted from regional demarcations of infra-specific ranks, I have left this to later workers who may see the species in a broader African perspective.

E. nutans grows mainly in the bushveld and open grasslands and has been found on south-facing hillsides, in disturbed areas such as dipping tanks, in cultivated fields and near marshy ground. It flowers from November to May with a definite peak in February to March.

The Venda name for this plant is reported by the Reverend Rogers (No. 4813) to be Mutzikedzi.

7. *Eriosema parviflorum* *E. Mey.*, *Comm.* 130 (1836); *Meisn. in J. Bot., Lond.* 2: 80 (1843) *Harv. in Fl. Cap.* 2: 260 (1862); *Bak. in F.T.A.* 2: 225 (1871); *Bak. f. in J. Bot., Lond.* 33: 142 (1893); *Wood & Evans, Natal Plants* 1: 73–74 (1899); *Harms in Warb., Kunene-Samb. Exped.*: 265 (1903); *Medley Wood, Handbook Fl. Natal* 43 (1907); *Bews, Fl. Natal Zululand* 113 (1921); *Bak. f. & Haydon in Leg. Trop. Afr.* 504 (1929); *Staner & De Craene in Annls Mus. r. Congo belge sér 6, 1: 60, fig. 9* (1934); *et in Rev. Zool. Bot. afr.* 24: 288 (1934); *Rosberg in Feddes Reprint* 33: 166 (1936); *Hauman in F.C.B.* 6: 211 (1954), *pro parte*; *Hepper in F.W.T.A. ed. 2, 1: 557* (1958), *pro parte*; *Verdc. in Kew Bull.* 25: 124–125 (1971); *Verdc. in F.T.E.A. Legum.-Papil.*: 778 (1971); *Jacques-Felix in Adansonia, sér 2, 11: 169–170* (1971); *Ross, Fl. Natal: 208* (1972). *Lectotype: South Africa, Natal, between Umzimkulu River and Umkomaas River, Drège (K!)*.

The synonymy of *Eriosema parviflorum* is puzzling. There is little agreement among the three latest studies, and as the chosen example below indicates, it is a problem the solution of which rests in a full

African study. The chosen example concerns the treatment of the name *Eriosema parviflorum* var. *sarmentosa* *Staner & De Craene*. *Keay (1973)* assigned this to *E. parviflorum* subsp. *parviflorum*, whereas *Verdcourt (1971a)* placed it under *E. parviflorum* subsp. *podostachyum* (*Hook. f.*) *J. K. Morton*. *Jacques-Felix (1971)*, however, excluded it from *E. parviflorum* completely and made it a synonym of *E. spicatum* *Hook. f.* Unlike both *Keay* and *Verdcourt*, he did not recognize infraspecific categories in *E. parviflorum*. This example forms part of a confused pattern. Rather than add to this confusion I have decided not to recognise any infraspecific categories in the region under study until the species has been studied over its entire range.

Perennial spreading suffrutex up to 60 cm high, arising from underground woody rootstock. *Stem* erect, branching near base, apical growth arrested with development of branches. *Branches* ascending or decumbent, up to 1 m long, slightly ridged; thinly white pubescent or densely shaggy with deflexed ferruginous hairs on older parts but admixed with smaller white hairs on younger; white or red glandular on younger parts. *Leaves* rarely unifoliolate (at base), trifoliolate, exhibiting nastic response. *Stipules* free, (4) 5–8 (10) mm long, 1,0–2,0 mm wide, spreading and reflexed when old turning red brown as leaflets expand; lanceolate, linear, or if tear-shaped then blackish at base. *Petiole* (1,1) 1,3–2,2 (3,0) cm long, canaliculate, vesture thickest on ridges. *Leaflets* 2,0–6,2 cm long, 1,0–3,2 cm wide, laterals smaller but 1/w ratio less, elliptic (2:1) or wide elliptic (1,5:1), occasionally tending to suborbiculate (1,2:1), narrow obovate (2:1); base rounded, if tapered then narrow truncate or narrow cordate; apex obtuse to rounded, rarely acute; margin entire; terminal leaflet symmetrical, laterals asymmetrical, base oblique; finely pubescent on both surfaces, with white or orange glands. *Young leaflets* densely pubescent, hairs longer appressed on raised veins, with densely packed red or white glands. *Petiolules* 1–2 mm long, swollen, terete, shaggy and glandular. *Rachis* 0,2–0,6 mm long. *Racemes* 5–54 flowered; peduncles elongate, (5) 7–13 (16) cm long, shortly densely spicato-racemose at summit, deflexed white or ferruginous hairy; *rachis* (1,2) 2–5 (6) cm long. *Flowers* yellow, 5–6 mm long, \pm 2,5 mm wide; *pedicels* 1,0–1,5 mm long, recurved; *bracts* 2,5–4,0 mm long, shortly triangular, caducous. *Calyx lobes* (2,0) 2,5–3,0 mm long, half length of flower; lobes equal; teeth shorter than or equalling tube, triangular with keel tooth often pinched into finger-like process, pubescent with short appressed hairs, occasionally longer haired especially near extremities, glandular. *Standard* (5) 6–7 (8) mm long, 3,0–4,2 (4,6) mm wide, wide obovate (1,2:1) occasionally narrow obovate (2:1), apex \pm rounded; 1/b ratio 1,5–1,8; glabrescent or sparsely pubescent and glandular outside; *claw* 1,9–3,1 mm; width between auricles 1,0–2,0 mm, inflexed auricles very prominent; appendage situated low down and extending across auricles, (2,0) 2,2–2,4 (2,7) mm from base of claw. *Wings* (4,9) 5,0–6,0 (6,7) mm long; 2,0–2,5 mm wide at maximum, shape variable when in position, shorter than keel blades, glabrous or pubescent, *claw* (1,0) 1,8–2,0 (2,1) mm long; *auricle* 1,0–1,1 (1,3) mm high, 'step' present. *Keel blades* 5,2–6,0 (6,6) mm long, 2,0–2,6 mm wide at maximum, obtuse slightly incurved, densely glandular; *claw* (1,1) 2,0–2,1 mm long; *auricle* 1,0–1,1 (1,5) mm high. *Staminal sheath* (4,0) 5,0–5,5 (5,8) mm long, 2,0–2,2 (2,7) mm wide at maximum, oblong (2:1); *vexillar stamen* (4,0) 5,0–5,3 (6,0) mm long. *Gynoecium*

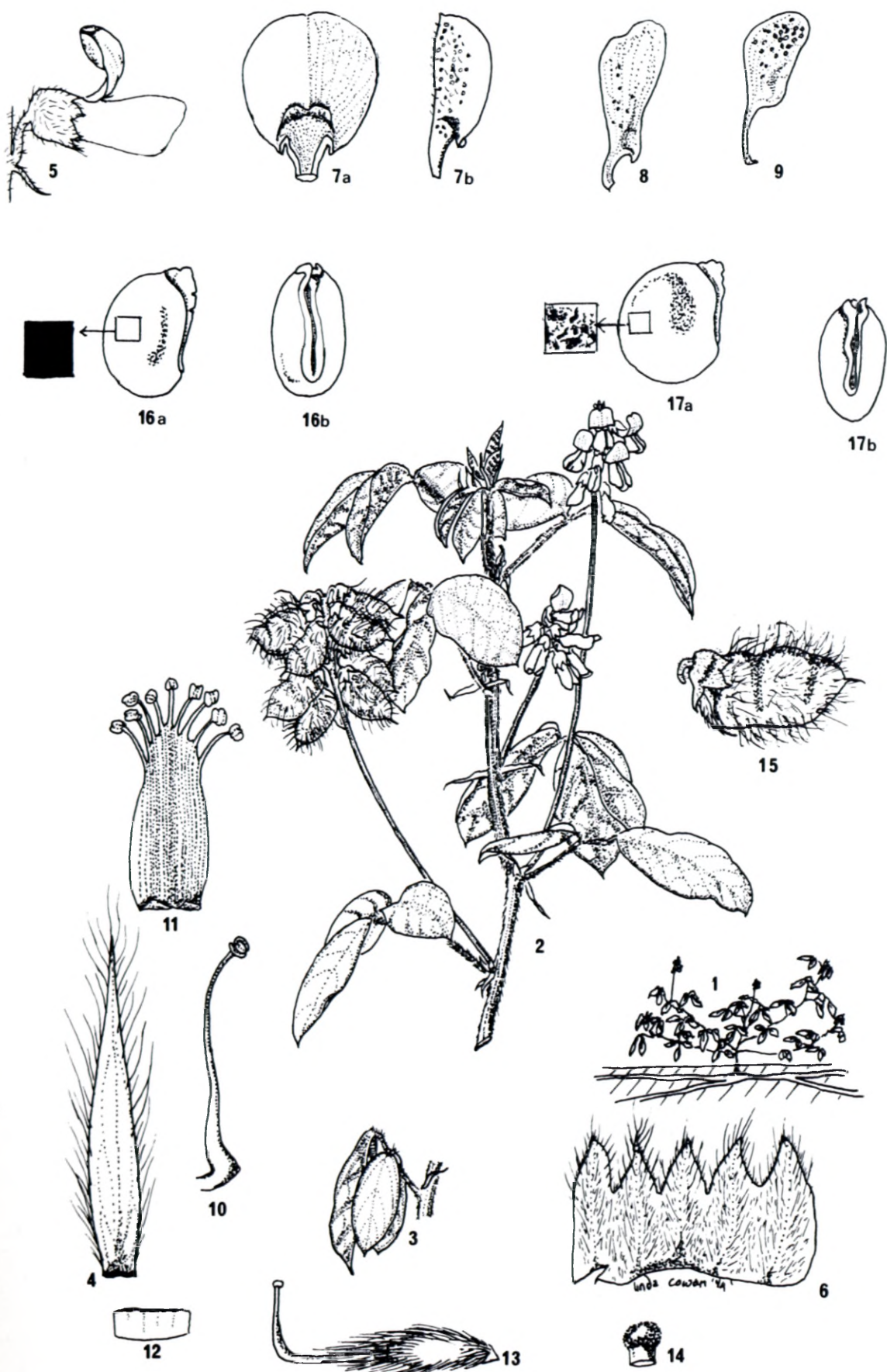


FIG. 24.—*Eriosema parviflorum*. 1, habit, 2, branch with fruits and flowers, $\times 0.6$; 3, leaves epinastic, night position, $\times 0.6$; 4, flower bract, $\times 9$; 5, flower, $\times 4.6$; 6, calyx opened out, $\times 9$; 7a, standard opened out, $\times 4.6$; 7b, standard closed, $\times 4.6$; 8, wing, $\times 4.6$; 9, keel, $\times 4.6$; 10, vexillar stamen, $\times 6.4$; 11, staminal sheath, $\times 6.4$; 12, discoid floral nectary, $\times 18$; 13, gynoecium, $\times 6.4$; 14, stigma, $\times 40$; 15, fruit, $\times 2.1$; 16a, black seed with strophiole, face view, $\times 6.4$; 16b, black seed with strophiole, marginal view showing hilum, $\times 6.4$; 17a, khaki, grey speckled seed with strophiole, face view, $\times 6.4$; 17b, khaki, grey speckled seed with strophiole, marginal view showing hilum, $\times 6.4$.

5,0–6,1 mm long; ovary (2,1)–2,6 (3,0) mm long, stalk 0,2–0,5 mm long shortly hairy but glabrous underneath; densely covered with glands and yellow or white hairs extending almost to point of curvature; style glabrous, variable in shape, aberrations common, thickened at curvature, incurved or erect, curvature (1,0) 1,4–1,8 (2,1) mm high; stigma small, capitate, sometimes incurved; inserted. *Discoid floral nectary* folded, slightly rippled. *Fruits* 0,9–1,2 cm long, 0,6–0,7 cm wide; obliquely oblong (2:1) to wide oblong (1,5:1), beak straight or slightly upturned, up to 1 mm long; strongly compressed; shaggy with foxy hairs and fine pubescence, hairs longer and wispier on sides, glandular. *Seeds* 3,5–3,7 (4,0) mm long, (2,3) 2,5–2,6 mm wide, 1,1–1,5 (2,1) mm thick, polymorphic, khaki with purple flecks and speckles, or chestnut, or black, rim aril white black seeds longer but thinner and narrower than speckled seeds. Fig. 24.

Eriosema parviflorum extends eastwards from west Africa across the Camerouns and Congo to the Sudan and east Africa, then southwards through Zambia and Mozambique into South Africa (Transvaal and Natal) (Fig. 25). It also occurs in Madagascar.

TRANSVAAL.—2230 (Messina): Sibasa, north of Pepiti (–CD), *Smuts & Gillett 3287*.

NATAL.—2632 (Bela Vista): Kosi Estuary (–DD), *Moll & Strey 3685*. 2732 (Ubombo): Sordwana Bay (–BC), *Stephen, Van Graan & Schwabe 1095*; Lake Sibayi (–DA), *Vahrmeijer & Hardy 1625*. 2831 (Nkandla): Eshowe (–CD), *Lawn 84*; Empangeni (–DB), *Venter 1894*; Ngoye Forest Reserve (–DC), *Huntley 250*; Mtunzini (–DD), *Stirton 413*. 2832 (Mtubatuba): Palm Ridge Farm (–AC), *Harrison 382*; Richard Bay (–CC), *Stirton 534*. 2930 (Pietermaritzburg): Shongweni (–CD), *Ross 778*; Inanda Mountain (–DB), *Hilliard 2043*; Isipingo Flats (–DD), *Ward 6807*. 2931 (Stanger): Between Blythedale Beach and Tugela Bridge (–AD), *Stirton 396*, 795; Berea, Durban (–CC), *Medley Wood 1448*. 3030 (Port Shepstone): 8 km from Winklespruit along Eston road (–BB), *Stirton 1123*; St Michaels-on-Sea (–CD), *Nicholson 773*; Hibberdene (–DA), *Grobbelaar 67*.

TRANSKEI.—3129 (Port St Johns): Magwa Falls (–BC), *Galpin 10985*; Port St Johns (–DA), *Hilliard 1066*, 1111. 3130 (Port Edward): Mnyameni Mouth (–AA), *Acocks 13396*.

Eriosema parviflorum E. Mey. is mostly restricted to the alluvial coastal plain of Natal. It grows in open moist grassland, coastal forest margins, damp marshland and bushy sand dunes. It seems to favour a south-west aspect and an altitude range of 5–650 m.

There is a variation in robustness and leaf size in this species. Figs 26 & 27 show the ranges possible.

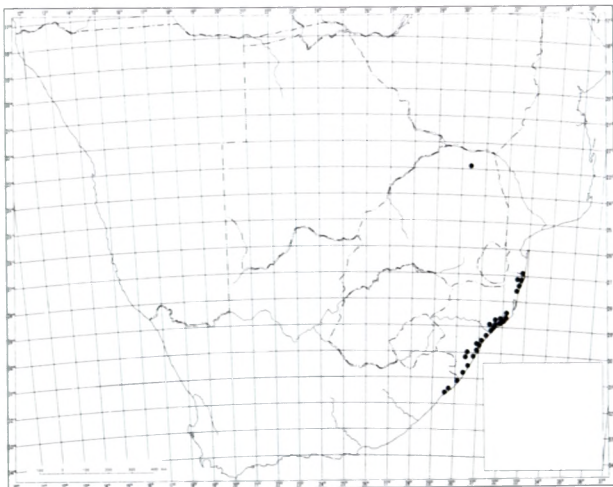


FIG. 25.—Known distribution of *Eriosema parviflorum* in South Africa.



FIG. 26.—Huntley 250, large-leaved form of *E. parviflorum* collected in the Ngoye Forest Reserve (1963–02–07).

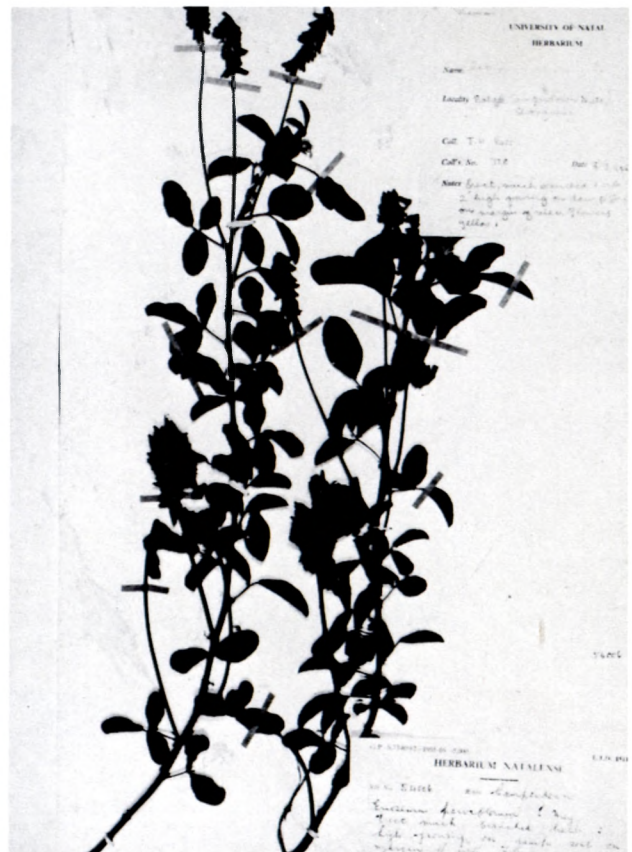


FIG. 27.—Ross 778, small-leaved form of *E. parviflorum* collected at Shongweni (1964–03–08).

The large leaved forms are rare. Stem pubescence, gland colour, size of stipules and number of flowers also vary to some extent, but apart from this the species is fairly constant throughout its range.

In Natal *E. parviflorum* has a tendency to produce floral aberrations. I have recorded and preserved an unusually large number of cases in which up to three standards were present in the same flowers. The most common aberration found was a variation in the shape of the pistil. Two forms occurred, sometimes in the same plant. The area of thickening may be at the point of flexure or above it. Beyond the point of flexure the style may be erect or strongly recurved. This may constitute an example of cleistogamy. Another common aberration is the lack of, or partial fusion of the stamens into a staminal sheath. Keel blades are often absent. This information is recorded in case difficulties are encountered in keying out the species. The wing is an unreliable character.

An unusual feature is the occurrence of 'sleep movements'. I have been unable to determine whether these are photonastic or thermonastic. They are definitely not thigmonastic. Fig. 24.2 and 24.3 shows the same plant during the day and later during the night. The leaflets expanded during the day can be seen to have closed tightly to the petioles at nightfall.

This species was recorded by Phillips (1917) for Lesotho. He based this citation on *Dieterlen* 866. A study of this specimen has revealed that it has characters intermediate between those of *E. cordatum* var. *cordatum* and *E. salignum* E. Mey. The possibility of hybridization cannot be ruled out (Stirton, 1981). Plants such as *Dieterlen* 866 were probably common since Phillips (*l.c.*) referred to it by its Lesotho name, 'Leshetla la loti', a name different from those he recorded for the putative parents. I am certain that his specimen is not *E. parviflorum* E. Mey. and that this species does not occur in Lesotho.

E. parviflorum has no close affinities in South Africa. It has often been confused with *E. nutans* Schinz, but differs from that species in the shape of the standard and the shape of the seeds.

Plants flower from early September to as late as April.

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UITTREKSEL

Die Eriosema cordatum E. Mey. kompleks word in 'n aantal spesies gesegregeer. *E. cordatum* E. Mey. word as 'n veelvormige spesies behou, en twee verwante spesies, *E. lucipetum* C. H. Stirton en *E. zuluense* C. H. Stirton word as nuut beskryf. Vier bykomende spesies *E. buchananii* Bak. f., *E. nutans* Schinz, *E. psoraleoides* (Lam.) G. Don en *E. parviflorum* E. Mey, word hersien en uitgesluit uit die *E. cordatum* groep.

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