

The *Eriosema cordatum* Complex. I. The *Eriosema populifolium* Group

C. H. STIRTON* and K. D. GORDON-GRAY†

ABSTRACT

The relationships among three species of *Eriosema* are discussed. *E. distinctum* N.E.Br. and *E. populifolium* Harv. are maintained as distinct from *E. cordatum* E. Mey. The relationships between these three species and extra-South African species of the *E. cordatum* complex are discussed in the light of new evidence.

RÉSUMÉ

LE COMPLEXE ERIOSEMA CORDATUM. I. LE GROUPE ERIOSEMA POPULIFOLIUM

On discute les relations entre trois espèces d'*Eriosema*. La distinction entre *E. cordatum* E. Mey. d'une part, et *E. distinctum* N.E.Br. et *E. populifolium* Harv. d'autre part, est maintenue. Les relations entre ces trois espèces et des espèces non sud-africaines du complexe *E. cordatum* sont discutées à la lumière d'arguments nouveaux.

INTRODUCTION

Verdcourt (1971) included seven species in the *E. cordatum* E. Mey. Complex. Five of these species occur in South Africa, namely *E. cordatum* E. Mey., *E. buchananii* Bak.f., *E. distinctum* N.E.Br., *E. nutans* Schinz and *E. populifolium* Harv. The remaining species are *E. decumbens* Hauman from Zambia and Zaire, and *E. pseudodistinctum* Verdc. from southern Tanzania.

Because of their close affinity, Verdcourt (1971) suggested that a field study should be carried out to elucidate the relationships among *E. cordatum*, *E. populifolium* and *E. distinctum*. This paper reports the results of such a study. It does not deal, however, with the identity of *E. cordatum*, nor with the relationships of this species to *E. nutans* and *E. buchananii*. These aspects will be dealt with in subsequent papers in this series.

FIELD STUDY

A field study (Stirton, 1975) has revealed that *E. cordatum*, *E. distinctum* and *E. populifolium* are morphologically different and that they may be distinguished on three main characters, namely the type of underground system, the vestiture of the plant and the shape and size of the flowers. Of these, the last is probably the most significant but all three should be considered collectively.

Underground system

Plants of all three species develop perennial underground organs. *E. cordatum* has a simple, vertical, daucate rootstock (Fig. 1), whereas in *E. distinctum* and *E. populifolium* the underground systems are more complex. There is some difficulty in accurately interpreting these organs since without anatomical and developmental studies, it is sometimes unclear where root gives place to stem.

In *E. distinctum* there is usually an erect rootstock (Fig. 2.1) similar to that of *E. cordatum*, but in addition a number of rhizomes arise from the stylopodial region (Fig. 2.2). These grow horizontally (Fig. 2.3), branching periodically at acute angles, (Fig. 2.4) and ultimately extend over considerable areas. Leaves are produced at intervals (Fig. 2.5) and rootlets develop from the main rootstock and the lateral rhizomes. Near Balgowan in the Natal Mide-

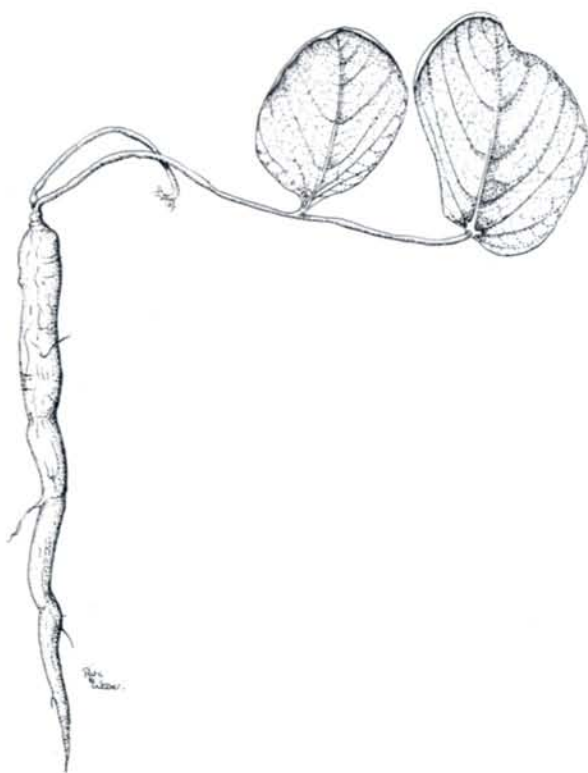


FIG. 1.—*Eriosema cordatum* E. Mey. Vertical daucate rootstock.

lands, plants of this species are densely spread over areas as extensive as one hectare. Each colony consists of probably no more than ten plants. If more plants are represented this seems to result from fragmentation of the rhizomes. This feature has also been noted in *Argyrolobium speciosum* Eckl. & Zeyh. in the south-eastern Transvaal.

No erect rootstocks have been found in *E. populifolium*. Here the underground system appears to consist of a thin, horizontal rootstock (Fig. 3.1) from which arise stumpy right-angled branches (Fig. 3.2) that terminate in rootlets (Fig. 3.3). The horizontal rootstock also produces short rhizomes that branch repeatedly, often reaching the surface where they develop leaves (Fig. 3.4). These horizontal rootstocks cover extensive areas. One plant in the Kununata area of southern Natal had a rhizome system that was unearthed intact for over forty metres. (This was distressing since the first author had spent the previous

* Botanical Research Institute, Department of Agricultural Technical Services, Private Bag X101, Pretoria.

† Bews Botanical Laboratories, University of Natal, P.O. Box 375, Pietermaritzburg.

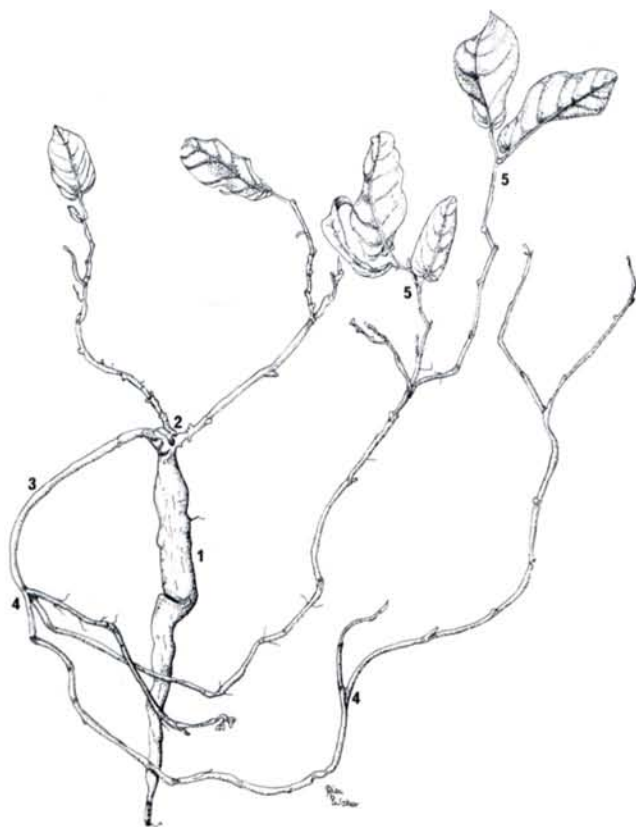


FIG. 2.—*Eriosema distinctum* N.E.Br. 1, Erect perennial rootstock; 2, three rhizomes arising from short stylopodium at apex of rootstock; 3, horizontal rhizome; 4, acute-angled dichotomous branching of rhizome; 5, new leaf growth arising from bud on rhizome.

day sampling transects in this large Kununata colony. The interplant data collected was suddenly transformed to intraplant data by this finding). In all subsequent population studies cognisance was taken of clonal propensity before sampling was carried out.

All three species produce root nodules. Grobbelaar, Van Beyma and Todd (1967) and Corby (1974) both reported root nodule formation in *E. cordatum*. This was verified by Stirton (1975), who also reported for the first time nodule formation in *E. distinctum* and *E. populifolium*.

Vesture

The vesture of young unexpanded leaflets is a useful distinguishing character. In *E. cordatum* the young leaflets are densely glandular with red, foxy or white hairs. *E. distinctum* is also densely gland encrusted and has a short yellow pubescence between the raised veins that are covered with long silver appressed hairs. Glands are not obvious on the young leaflets of *E. populifolium* which are silky and yellow or creamy white. The young freshly unfolded leaflets of this species have a characteristic shiny, silvery-grey pubescence.

The vesture of old leaves is characteristic of each species. In *E. cordatum* there is a scattered patent pubescence on the adaxial surface. *E. distinctum* is finely pubescent with appressed hairs on both surfaces. The leaves of *E. populifolium*, however, are densely covered with appressed silvery-grey hairs, with or without pale yellow hairs along the margins or mixed with the grey above.

Some colonies in *E. distinctum* are characterized by the presence of very distinct, short, yellow bulbous-



FIG. 3.—*Eriosema populifolium* Harv. 1, Horizontal perennial rootstock; 2, short right-angled branch from lateral rootstock; 3, terminal roots or rootlets at end of lateral side-branch; 4, rhizome produced from rootstock and terminating in leaves above the ground.

based hairs on the calyx and sometimes on the stems, leaves and petioles. These plants (Story 635; Oliver 46, 496; Goossens 276; Mogg 2116, 2336 and Trauseld 97) appear to be only a minor segregate within *E. distinctum*. No similar hairs have been found in the remaining species of the genus *Eriosema* in South Africa. They are known, however, in *Rhynchosia villosa* (Meisn.) Druce and *Eriosema rogersii* Schinz, now a *Rhynchosia*, both of which have some affinity with *E. distinctum* and *E. populifolium*. Despite this glandular similarity, there is no question that respective generic placing might be incorrect.

Flowers

The three species are separated by flower colour, flower size and by the different shapes of the corolla parts. *E. distinctum* and *E. populifolium* have the largest flowers known within the genus in South Africa.

The exertion of the stigma from the anthers is a useful field character which separates *E. distinctum* and *E. populifolium* from all other South African species of *Eriosema*. It has been seldom considered by taxonomists. But during routine naming the first author found that, where it occurred, it was a useful diagnostic character in nearly all tribes of South African papilionates.

GEOGRAPHICAL DISTRIBUTION

The three species under consideration are all eastern southern African in distribution. *E. cordatum* is the most widespread. *E. distinctum* is sympatric with *E. cordatum* in Natal, but has two outliers, one in the Transvaal and one in the eastern Cape. Closer study of these distributions shows that *E. cordatum* is frequent along the Natal coast whereas *E. distinctum* occurs mainly in the midlands and uplands, extending along high ground to northern and southern Natal. Where coast grades into midlands the species are sympatric but occupy different ecological niches.

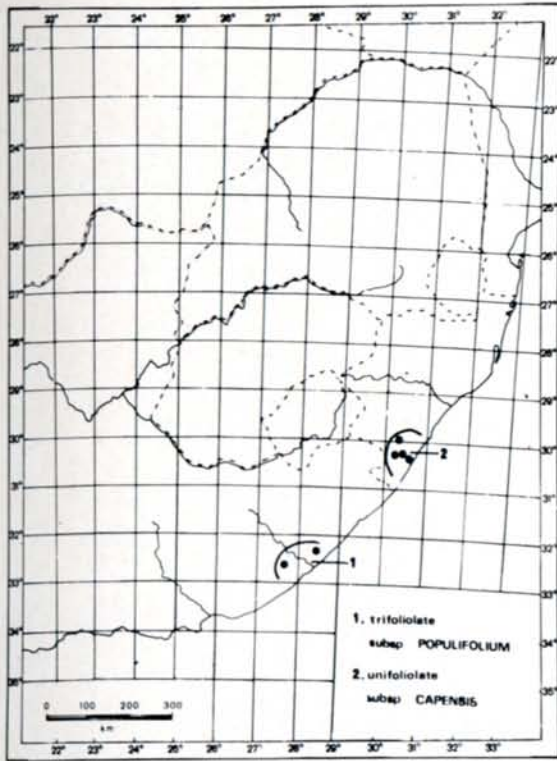


FIG. 4.—*Eriosema populifolium* Harv. Known distribution in South Africa.

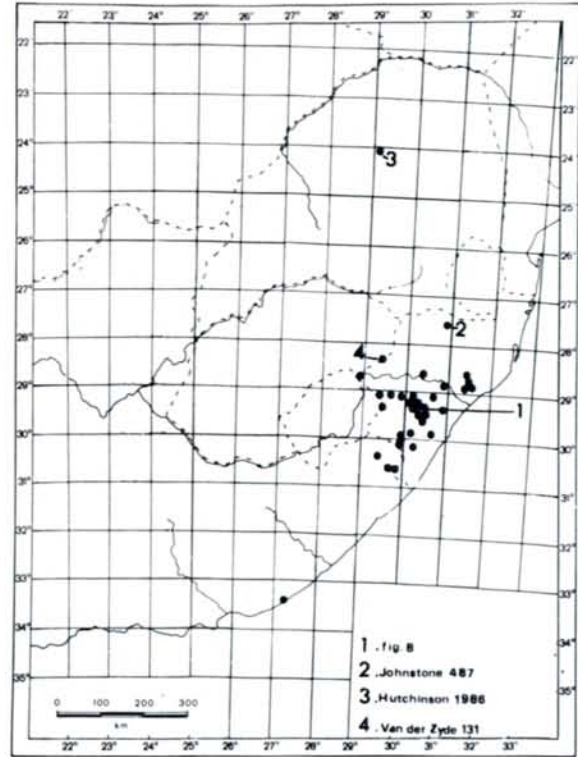


FIG. 6.—*Eriosema distinctum* N.E.Br. Known distribution in South Africa.

E. populifolium is much more restricted. The typical subspecies with unifoliolate leaves occurs in southern Natal, where it is sympatric with *E. cordatum*, but allopatric with *E. distinctum* which occurs further inland. Subsp. *capensis*, with trifoliolate leaves, is known from further south than *E. cordatum*, but is more or less sympatric with the most southerly record of *E. distinctum*.

TAXONOMY

While *E. cordatum sensu lato* is easily separated from the *E. populifolium* group comprising *E. populifolium* and *E. distinctum*, it is nevertheless a complex assemblage of plants with four distinct nodes of variation linked by numerous intermediates (Stirton 1975). As this complex is still under investigation only the *E. populifolium* group is treated taxonomically in this paper.

1. *Eriosema distinctum* N.E.Br. in Kew Bull. 4: 103 (1906); Medley Wood, Handbook Fl. Natal: 43 (1907); Bews in Ann. Natal Mus. 2: 505 (1913); Bews, Fl. Natal Zululand: 113 (1921); Verdc. in Kew Bull. 25: 118 (1971); Ross. Fl. Natal: 208 (1972). Lectotype: South Africa, Natal, without precise locality, Wood 6357 (K).

Perennial herb 7–30 cm tall with 1–10 stems from vertical underground rootstock or subsurface acutely branching rhizomes, clonal. Stems shortly erect or decumbent, villous with tawny hairs interspersed with short deflexed white hairs, or with scant tawny hairs only. Leaves trifoliolate, basal leaves always unifoliolate; leaflets variable, oblong, elliptic or oblanceolate, acute, mucronate, base cuneate or obtuse, 5.0–11.5 (–15.5) cm long, 3–6 (–8) cm wide; laterals asymmetrical with oblique bases smaller than symmetrical terminal leaflet, both surface green, finely pubescent with appressed hairs; young leaves densely glandular

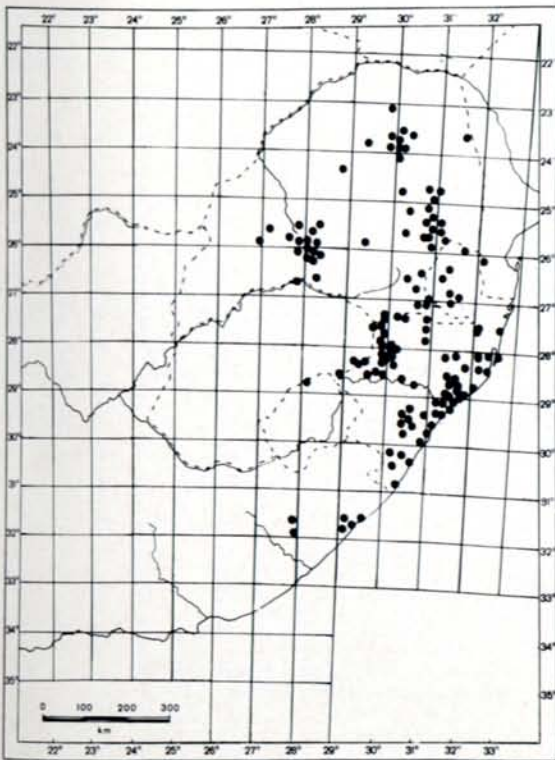


FIG. 5.—*Eriosema cordatum* E. Mey. Known distribution in South Africa.

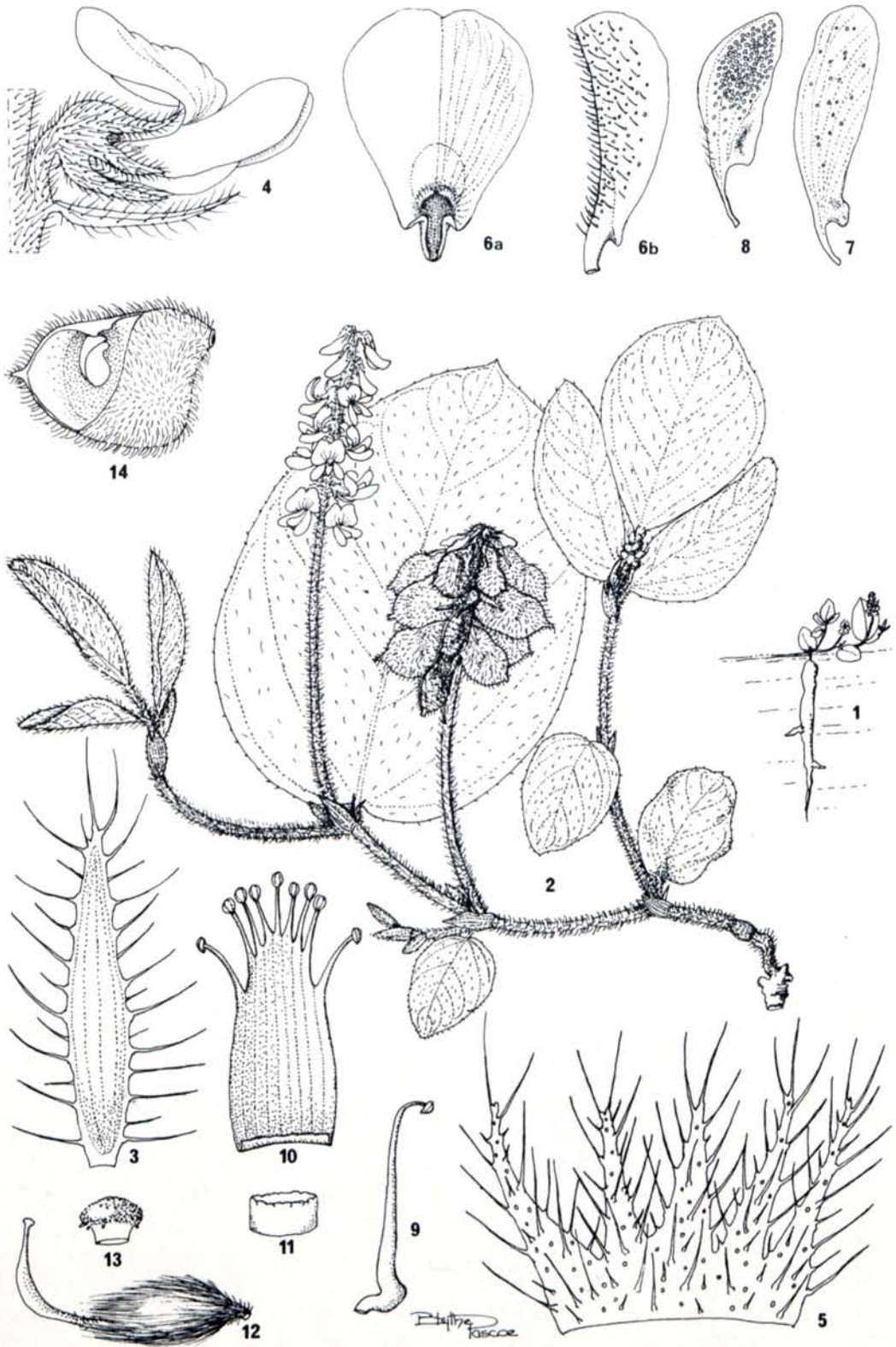


FIG. 7.—*Eriosema cordatum*. 1, Habit; 2, stem with fruits and flowers, $\times \frac{1}{2}$; 3, flower bract, $\times 7\frac{1}{2}$; 4, flower, $\times 3\frac{3}{4}$; 5, calyx opened out, $\times 3\frac{3}{4}$; 6a, standard opened out, $\times 3\frac{3}{4}$; 6b, standard closed, $\times 3\frac{3}{4}$; 7, wing, $\times 3\frac{3}{4}$; 8, keel, $\times 3\frac{3}{4}$; 9, vexillar stamen, $\times 5\frac{1}{2}$; 10, staminal sheath, $\times 5\frac{1}{2}$; 11, discoid floral nectary, $\times 15$; 12, gynoeceum, $\times 5\frac{1}{2}$; 13, stigma, $\times 33$; 14, fruit pod with cut away to show attachment of seed, $\times 1\frac{7}{10}$.

Key to Species

- Plants solitary; rootstocks vertical without horizontal rhizomes; flowers yellow or red and yellow; keel blade 6,8–8,0 mm long, 3,0–4,6 mm wide; staminal sheath 5,0–7,2 mm long; gynoeceum 5,0–7,5 mm long, vertical height of style 2–3 mm, stigma hidden by stamens; fruits 15–17 mm long. *E. cordatum* (Fig. 7).
- Plants clonal; rootstocks horizontal or if vertical then with horizontal rhizomes; flowers carmine, or orange and yellow; keel blade 10,0–16,5 mm long, 5–9 mm wide; staminal sheath 9,0–13,5 mm long; gynoeceum 10–16 mm long, vertical height of style 4–7 mm; stigma exerted beyond stamens; fruit 19–22 mm long. 2
- Branching of rhizomes acute; leaves trifoliolate, upper leaflet 3–8 cm wide, stipels present; young leaflets densely glandular and shortly yellow pubescent between the raised veins which are covered with long appressed silver hairs; stipules mostly straight, length-breadth ratio ca. 2,5; flower bract 7–9 mm long, lanceolate. 1. *E. distinctum*
- Branching of rhizomes right-angled; leaves unifoliolate, rarely trifoliolate (E. Cape), solitary leaflet or upper leaflet 11–16 cm wide, stipels absent; young leaflets silky, yellow to creamy white when closed but characteristically very shiny silvery-grey when unfolded, glands hidden; stipules falcate, length-breadth ratio ca. 1,7; flower bract 10–15 mm long, deeply boat-shaped. 2. *E. populifolium*
- Leaves unifoliolate (Natal). subsp. *populifolium*
- Leaves trifoliolate (E. Cape). subsp. *capensis*

and shortly villous, pubescent between raised veins which are covered with longer appressed silver hairs. *Stipules* semi-connate, often splitting, 5–22 mm long, 3–10 mm wide, lanceolate, acuminate, striate, overall tawny outside with short white hairs on ridges, glabrous inside. *Rachis* 1,5–2,2 (–3,0) mm long with two persistent acrorachial stipels up to 0,6 mm long. *Racemes* 7–28-flowered, peduncle long, rachis 3,0–7,5 (–9,5) cm long. *Flowers* carmine or orange with yellow, (12–) 16–17 (–20) mm long, 6,5–8,0 mm wide, reflexed but hooded at apex, bract 7–9 mm long, 1,5–2,0 mm wide, lanceolate. *Calyx* (5–) 6–7 (–9) mm long, either equally lobed with fine white pubescence, or unequally lobed with long yellow hairs (with or without short white hairs interspersed) puberulous inside, glandular outside; tube 2,4–3,3 (–4,0) mm long; lobes lanceolate when unequal, triangular when equal, 5–10 mm long. *Standard* (12–) 14–17 (–19) mm long, 9,0–14,0 (–17,5) mm wide, obovate to widely obovate, back tomentose, glandular; appendages form large upcurled flaps free of auricles. *Wings* orange, 11–17 mm long, 4–9 mm wide at maximum, longer than keel blades, eglandular. *Keel blades* 11,5–16,5 mm long, 5,5–9,0 mm wide at maximum, mostly eglandular. *Staminal sheath* 11–16 mm long; free stamen 9–13,5 mm long. *Gynoeceum* (10–) 13–16 mm long; ovary 3,0–4,0 (–6,5) mm long with 0,8–2,0 mm long gynophore, clothed with long stiff hairs to end of ovary; end of style inflexed; curvature of style 5–7 mm high; stigma slightly flattened on inner face, exerted beyond stamens. *Nectary* 0,4–0,6 mm high, margin repand. *Fruit* 19–23 mm long, 12–13 mm wide, oblique, softly tawny and interspersed with short white hairs and glands. *Seed* 7,6–8,0 mm long, 4,0–4,5 mm wide, deep purple black with white aril. (See Fig. 8).

Eriosema distinctum is distributed mainly in the midlands and uplands of Natal, extending along the lower Drakensberg to southern Natal and the eastern Cape Province. A few specimens have been collected along the Natal-Orange Free State border, but only one has been recorded from the Transvaal (Fig. 6).

TRANSVAAL.—2429 (Zebediela): Between Potgietersrust and Pietersburg (–AA), Hutchinson 1986 (PRE).

NATAL.—2730 (Vryheid): Hlobane (–DB), Johnstone 487 (PRE). 2828 (Bethlehem): Royal Natal National Park (–DD), Trauseld 97 (PRE). 2829 (Harrismith): Van Reenen (–AD), Medley-Wood 7627 (NH). 2830 (Dundee): Nkonyeni (–CB), Hilliard 3001 (PRE); 7 km from Greytown to Tugela Ferry (–DC), Stirton 1319 (PRE); Kranskop (–DD), Stirton 5202 (PRE). 2831 (Nkandla): Katzo Post Office (–CB), Acocks 11785 (NH, PRE); Eshowe (–CD), Gerstner 2607 (NH), 2929 (Underberg) Cathkin Peak (–AB), Henrici 3523 (PRE); Griffen's Hill (–BB), Acocks 13870 (PRE); Dargle, Impendhle and Nottingham Road Junction (–BD), Stirton 789 (PRE); Lundy's Hill (–DD), Stirton 1142 (PRE). 2930 (Pietermaritzburg): Estcourt (–AA), Werdermann & Oberdieck 1217 (PRE); Lidgetton (–AC), Moss 890 (PRE); Karkloof (–AD), Wylie com. Wood 10 007 (NH); Greytown (–BA), Wylie s.n. (PRE); 19 km from Greytown to Pietermaritzburg (–BC), Stirton 5214

(PRE); Cedara (–CA), Phillips 3448 (PRE); Pietermaritzburg (–CB), Ross 425 (NH, NU); 8 km from Richmond to Hela Hela (–CC), Stirton 708 (PRE); Baynesfield (–CD), Stirton 707 (PRE); 2 km from Thornville to Richmond (–DB), Stirton 1214 (PRE); Botha's Hill (–DC), Stirton 1079 (PRE); Pinetown (–DD), Rogers 28103 (GRA), 3029 (Kokstad); Creighton (–BB), Shirley s.n. (NU); Harding (–DB), Oliver 46 (NH); Ngeli Mountain (–DA), Burt & Hilliard 3480 (NU).

CAPE.—3029 (Kokstad): Mount Currie (–AD), Goossens 276 (PRE). 3227 (Stutterheim): Frankfort (–CB), Sim 4056 (GRA).

Eriosema distinctum has been commonly confused with *E. cordatum* E. Mey. It is readily distinguished from this species by its rhizomatous underground system, the presence of persistent acrorachial stipels, the general shape of the flower parts, the length of the fruits and the exerted stigma.

Three broad nodes of variation were found in *E. distinctum*. These nodes occurred in the north-east, the centre and the south of the range. Roughly in a north to south direction there was, throughout the range, a decrease in plant size, flower size and general pubescence.

Plants from semi-isolated north-eastern populations near Ntumeni and Eshowe differed from those constituting the bulk of the species in their larger leaves, denser patent indumentum, larger stipules and in the white pubescence of their unfolding leaflets (Acocks 11785, Haygarth s.n. Oct. 1915, Hilliard 1937, Lawn 931, Stirton 1024). Although very distinctive in the field they were difficult to assess taxonomically as a number of other specimens (Edwards 2220, Gerstner 2607, Hilliard 3001) possessed features of both the Ntumeni–Eshowe populations and the most typical midlands taxon. Acocks 11785 (PRE) is a mixed sheet which carries two specimens that grade into typical *E. distinctum*.

The central populations of the species comprise true *E. distinctum*. Clones are, nevertheless, very variable in the field, differing markedly in size and habit. The method of producing a vast, underground network of shallow acutely-angled branching rhizomes has probably accounted for the successful spread of this entity along roads after roadbuilding operations.

Southern populations comprise characteristically smaller plants, with smaller stipules, flowers and flower bracts. These occur in southern Natal and East Griqualand and tend to hug the higher foothills of the Drakensberg (Henrici 3523, Hutchinson 1837, Grice s.n., Crewe 21, Burt & Hilliard 3480, Hilliard 1289, Tyson 1698, Shirley, s.n., and perhaps Acocks 13870). Grading into these populations is a minor segregate, variable in habit but which is characterised by the presence of very distinct, short yellow bulbous-based hairs on the calyx and less often on the stem and petioles (Story 635, Oliver 46, 496, Goossens 276, Mogg 2116, 2336, Trauseld 97).

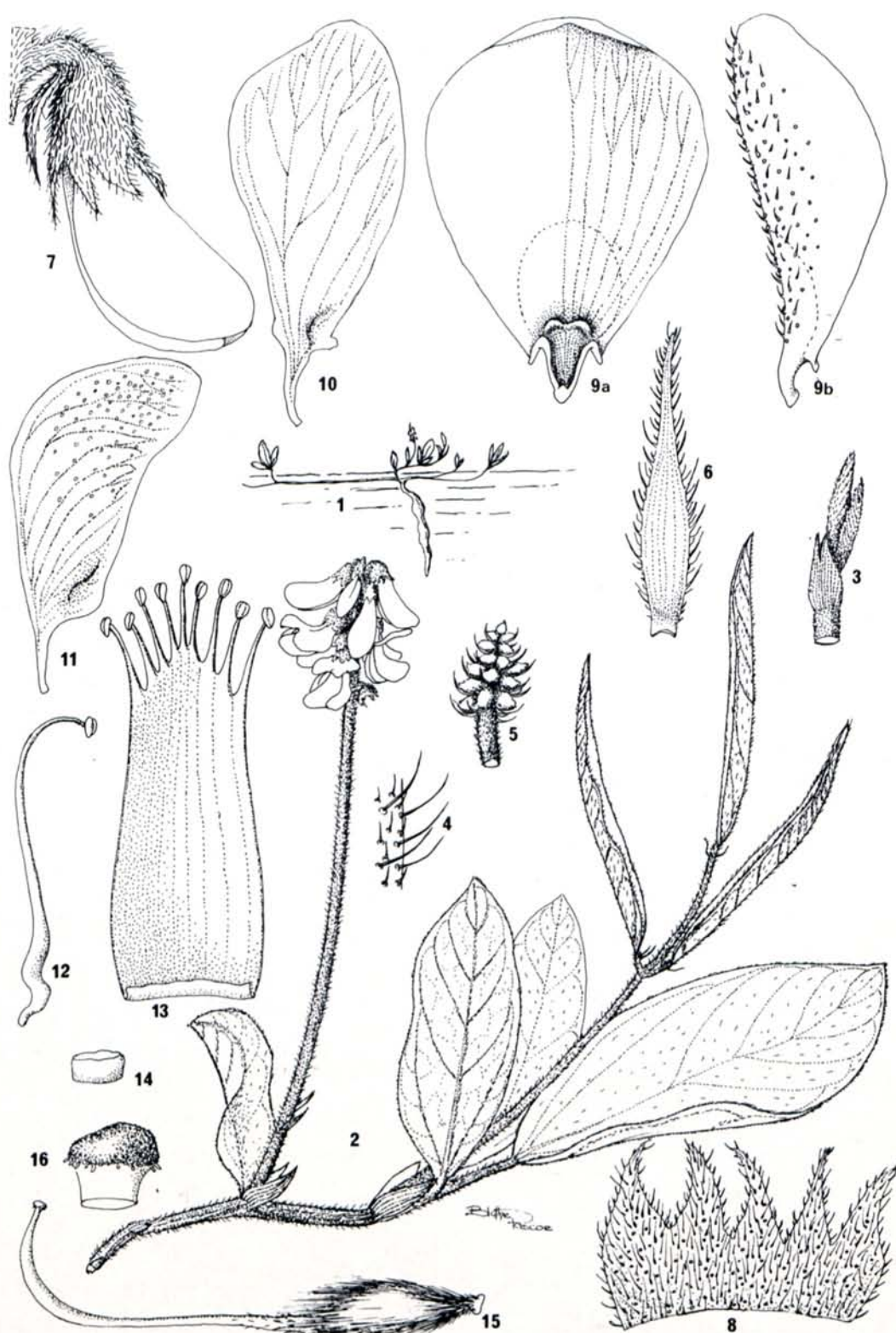


FIG. 8.—*Eriosema distinctum*. 1, Habit; 2, stem with flowers, $\times \frac{1}{2}$, arrow indicates stipels; 3, connate stipules with emerging leaflets, $\times 1\frac{1}{2}$; 4, peduncle vestiture, $\times 1\frac{1}{2}$; 5, inflorescence in bud stage, $\times 2$; 6, flower bract, $\times 7\frac{1}{2}$; 7, flower, $\times 3\frac{1}{2}$; 8, calyx opened out, $\times 3\frac{1}{2}$; 9a, standard, opened out, $\times 3\frac{1}{2}$; 9b, standard closed, $\times 3\frac{1}{2}$; 10, wing, $\times 3\frac{1}{2}$; 11, keel, $\times 3\frac{1}{2}$; 12, vexillar stamen $\times 7\frac{1}{2}$; 13, staminal sheath, $\times 7\frac{1}{2}$; 14, discoid floral nectary, $\times 15$; 15, gynoeceium, $\times 7\frac{1}{2}$; 16, stigma, $\times 33$.

The poorly collected southern and northern populations might prove worthy of ranking after further gatherings have been made. The presence of a pure yellow-flowered taxon in the southern populations needs verification.

Attention must be drawn to a number of atypical specimens. *Johnstone* 487 from Hlobane (2730-DB) is definitely linked to the north-eastern populations and, with these populations, gives an impression of a close relationship with *E. populifolium*. This specimen is very distinctive and has the longest stipules recorded so far. It differs from typical *E. distinctum* in the long, grey pilose calyx lobes. *Van der Zeyde* 131/73 (2829-AD) has the largest flowers recorded in the species. It is a very robust plant and shows some resemblance to *Hutchinson* 1986 (2429-AA), the only known record of the species in the Transvaal. These three collections are retained in *E. distinctum* somewhat tentatively, as on present information it is inopportune to give them any formal recognition.

The clonal nature of *E. distinctum*, its extremely poor seed set, and its great morphological variability has led us to suspect that the species may have had a hybrid origin. We are therefore loathe to designate infraspecific rankings when the entities recognized might prove to be nothing more than clones. Likewise we consider it an unsatisfactory practice to give formal recognition to single collections when these belong to the periphery of a large variable group.

Flowering in the species occurs from late August to December and reaches a peak during November, followed by a later flush between February and April. Northern populations tend to flower earlier and for a shorter duration than southern populations. This bimodal flowering behaviour coupled with a N-S direction time cline has also been found in *E. psoraleoides* (Lam.) G. Don and apparently occurs in a number of papilionaceous genera in South Africa.

2. *Eriosema populifolium* Harv. in Fl. Cap. 2: 259 (1862); Burt Davy, Fl. Transv. 2: 404 (1932); Verdc. in Kew Bull. 25: 118 (1971); Ross, Fl. Natal: 208, (1972). Type: Transvaal (?), without locality, *Sanderson* s.n. (K, hol.; PRE, photo.).

Perennial herb 10–25 cm tall with one to many stems arising from horizontal subsurface rhizomes, clonal. Stems decumbent, densely clothed with long, slightly appressed yellow or silvery grey hairs interspersed with very short, soft, curly, silver hairs, often hoary. Leaves unifoliate, rarely trifoliate; leaflets ovate to very broadly ovate and cordate, apex subacute, rounded or obtuse, base cordate to lobate, densely covered with appressed silvery grey hairs, with or without pale yellow hairs on the margins or mixed with the grey hairs of above, young leaves silky, yellow to creamy white when closed, characteristically very shiny, silver grey when unfolded. Stipules connate, 1.0–3.5 cm long, 0.5–2.0 cm wide, incurved, scarious, prominently striate, grey pubescent silky outside, glabrous inside except at apex. Racemes 10–30-flowered, longer than leaves. Flowers 14.0–17.5 mm long, 6.0–9.2 mm wide; bracts 10–15 mm long, 2.5–3.0 mm wide, deep boat-shaped, thinly pilose. Calyx 6.0–9.0 mm long, tube 3.0–4.7 mm long, horn lobes (see Fig. 12.5) semi-connate above tube, lobes triangular or lanceolate, acuminate. Standard carmine, 13.5–16.2 mm long, 10–15 mm wide, obovate, eglandular, hooded when flower reflexes, appendages curled flaps extending to base of auricles. Wings orange, 11.6–15.3 mm long, 5.0–7.5 mm wide at maximum. Keel blades yellow green, pink flushed, 10.0–14.3 mm long, 5.0–8.2 mm wide at maximum, falcate. Staminal sheath 12.0–13.5 mm long, free stamen 12.0–13.5 mm long. Gynoecium 11.5–14.0

mm long; ovary 3.0–4.2 mm long with gynophore 1.0–1.5 mm long, clothed with long soft hairs not exceeding quarter the length of the style, curvature 4.4–5.7 mm high; stigma globose, exerted beyond stamens. Fruit and seeds unknown.

Apart from the two collections in the eastern Cape and a single uncertain collection from the Transvaal, the bulk of the specimens has been collected in southern Natal.

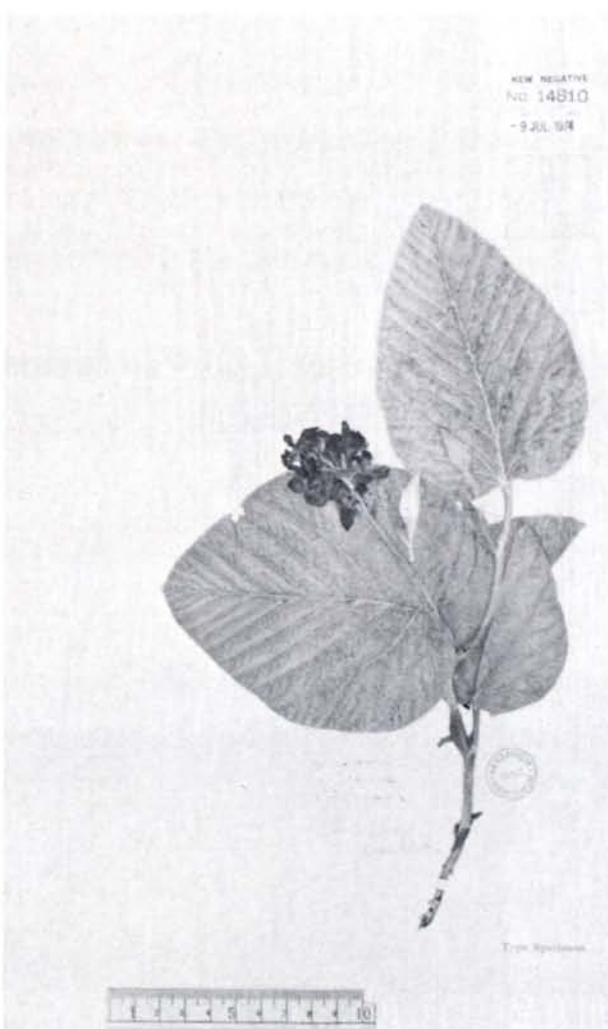


FIG. 9.—*Sanderson* s.n. Holotype of *Eriosema populifolium* subsp. *populifolium*.

Eriosema populifolium, was originally based on a single collection by Sanderson from the Transvaal. There appears to be some doubt as to the veracity of this locality. In referring to the type housed in the Kew Herbarium, Burt Davy (1932) noted that the addendum "Natal" given in the *Flora Capensis* by Harvey (1862) did not appear on the sheet in the Hooker Herbarium. The inscription on the type is "Transvaal, S. Africa, Sanderson" (Fig. 9). Since no further collections have been made in the Transvaal and because the ecological preferences and the distribution of extant populations argue against its occurrence in the Transvaal, it could be concluded that Sanderson's specimen was mislabelled.

Of interest, therefore, are two nameless specimens from the M. E. Barber Herbarium (at GRA). One of these sheets has the legend "Vaal Heights" (Vaal Hoogte). We wonder whether these closely matched specimens have any connection? According to Gunn (1974) there is no doubt that Sanderson collected in the southern Transvaal. She informed us that: "In 1851–2 John Sanderson travelled from Durban via the

Orange Free State to the Magaliesberg in the Transvaal. From this collecting trip he sent plant material to Kew and also to Harvey at Trinity College, Dublin." For example, in PRE there is a photocopy of *Clematis stanleyi*=*Clematopsis stanleyi* (DC). Hutch. captioned "159 Witwatersrand, Transvaal state, 7 000-8 000 ft. Feb-March 1852. J. S. (=John Sanderson). Type in Trinity, Dublin". At least three interpretations arise. Firstly some Sanderson duplicates found their way into the M. E. Barber Herbarium. This would account for the Vaal Heights legend and the very close match of all three sheets. It does not answer the question as to whether both collections were made in the Transvaal. Secondly, "Vaalheights" is a farm or other locality name in Natal and was mistaken for the Vaal Heights area of the Transvaal. No record of such a name in Natal has yet been traced. Finally, Sanderson collected the plant in Natal but inadvertently mixed his labels. This last explanation seems the most plausible at present.

Field studies support Verdcourt's (1971) retention of specific rank for this taxon. However, apart from the superficial resemblance given by its large cordate leaves, this species does not have much in common with *E. cordatum*. It is clearly very close to *E. distinctum*, however, particularly to plants of the north-eastern populations near Eshowe, Ntonjaneni, Ntumeni and Melmoth.

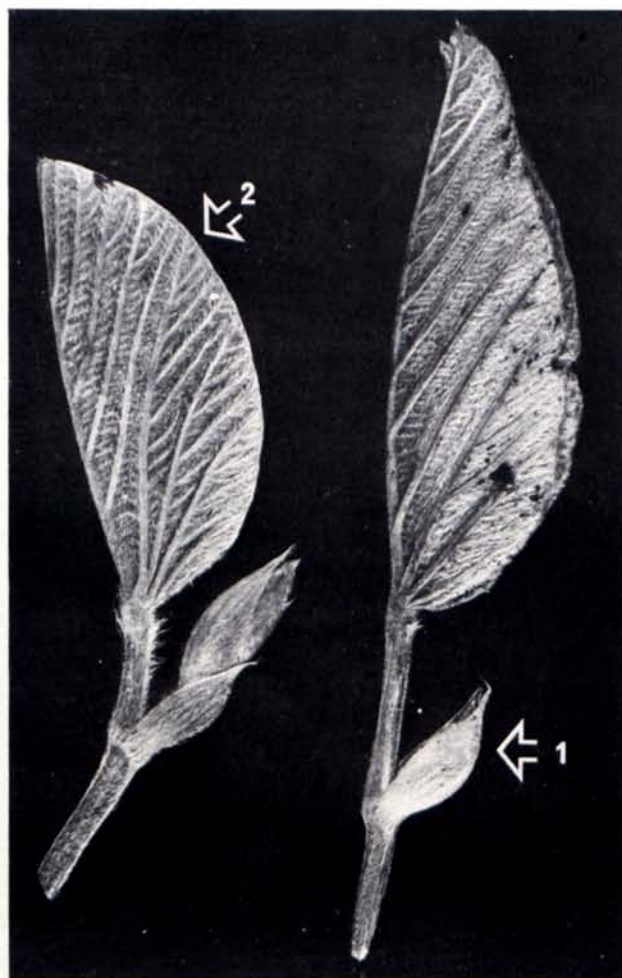


FIG. 10.—Stirton 1200. Young leaflets of *Eriosema populifolium* subsp. *populifolium* showing: 1, -connate incurved stipules, 2, -dense, shiny, silvery-grey pubescence.

Eriosema populifolium has been much confused with the names *Rhynchosia villosa* (Meisn.) Druce, *R. sigmodes* Benth., *Eriosema distinctum* N.E.Br., and *E. cordatum* E. Mey. It can be separated from all these taxa by its large incurved connate stipules (Fig. 10.1), together with the shiny, silvery grey pubescence on the surfaces of the leaves (Fig. 10.2) and the persistent deep boat-shaped flower bract.



FIG. 11.—Pegler 183. Holotype of *Eriosema populifolium* subsp. *capensis*.

This species has been found to include both unifoliate (Fig. 9) and trifoliate (Fig. 11) leaved plants and so its concept has had to be widened. The Cape specimens *Flanagan* 2369 and *Pegler* 683 are predominantly trifoliate-leaved specimens with the basal leaves unifoliate and the general dimensions overall being remarkably smaller than those of any Natal plants. These two collections, named above, are noteworthy for their smaller flowers, shorter racemes and trifoliate leaves. They seem worthy of separate rank and are described as subspecies *capensis*.

Key to subspecies

Leaves unifoliate (Natal).....subsp. *populifolium*
Leaves trifoliate (E. Cape).....subsp. *capensis*

subsp. *populifolium*.

Eriosema populifolium Harv. in Fl. Cap. 2: 259 (1862); Burt Davy, Fl. Transv. 2: 404 (1932); Verdc. in Kew Bull. 25: 118 (1971); Ross, Fl. Natal: 208 (1972).

The leaf blade of the terminal leaflet is larger (11-16 cm long, 11-16 cm wide) and the flowers longer (15-17 cm) than in subsp. *capensis* (Fig. 12).

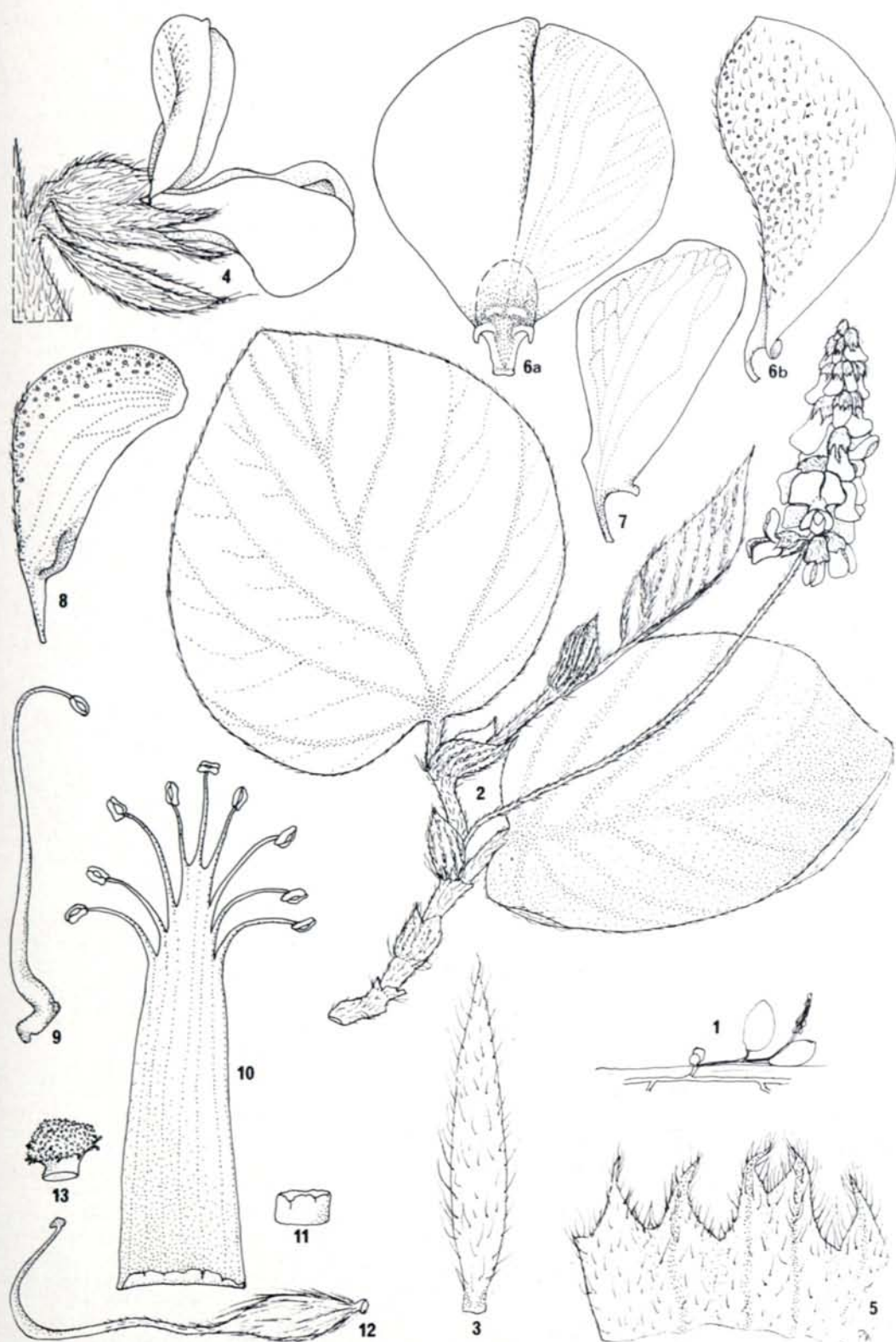


FIG. 12.—*Eriosema populifolium*. 1, Habit; 2, stem with flowers, $\times \frac{1}{2}$; 3, flower bract, $\times 3$; 4, flower, $\times 3$; 5, calyx opened out, $\times 3\frac{1}{2}$; 6a, standard opened out, $\times 3$; 6b, standard closed, $\times 3$; 7, wing, $\times 3$; 8, keel, $\times 3$; 9, vexillar stamen, $\times 3\frac{1}{2}$; 10, staminal sheath, $\times 3\frac{1}{2}$; 11, discoid floral nectary, $\times \frac{1}{17}$; 12, gynoecium, $\times 3\frac{1}{2}$; 13, stigma, $\times 18$.

This subspecies occurs in a broad belt between Highflats and Umzinto in southern Natal (Fig. 4). It is restricted to areas with deep black soil and grows mainly in grassland although through man's activities it is becoming common along roadsides. It is restricted to altitudes between 400–650 metres.

NATAL.—2930 (Pietermaritzburg): Mid-Illovo (–DC), *Thode* 3231 (STE). 3030 (Port Shepstone): Kununata (–AC), *Strey* 4438 (NH, PRE); Hlokozi Jute Plantation, Hlokozi (–AD), *Stirton* 1208 (PRE); between Kununata and Knockagh (–BD), *Stirton* 742 (PRE); Umgayeflat (–BC), *Rudatis* 311 (STE).

E. populifolium subsp. *populifolium* flowers between October and November. Flowers abscise rapidly after opening and closing. In a three month monitor of the *Stirton* 742 and *Stirton* 1208 populations in 1974 no seed set was found. Dispersal appears to have been effected through the vegetative propagation of fragmented sections of the root systems during road-building operations, and perhaps by occasional seed set. The low pollen viability (10–65%) suggests the possibility that this subspecies represents a hybrid.

subsp. *capensis* Stirton & Gordon-Gray, subsp. nov., a subsp. *populifolium* foliis trifoliolatis, foliis minoribus 4–9 cm longis, 3–6 latis, floribus minoribus 13–14 mm longis differt. Type: 3228 (Butterworth): near Kentani (–AD), *Pegler* 183 (GRA, holo.).

Leaves trifoliolate, terminal leaflet 6–9 cm long, 5–6 cm wide; laterals smaller, 4.5–7.0 cm long, 3.0–4.0 cm wide, asymmetric. Flowers 13–14 mm long, all parts smaller than in subsp. *populifolium* (Fig. 11).

Known only from two gatherings at Komga and Kentani respectively. It has been noted before that populations in the Kentani and surrounding districts often form distinctive peripheral entities of more widespread species. For example Codd (1975) des-

cribed *Plectranthus madagascariensis* (Pers.) Benth. var. *aliciae* Codd for gatherings made in the Kentani District. These plants had smaller leaves and flowers and different flower colour. This phenomenon is being studied in more depth.

CAPE.—3227 (Stutterheim): near Komga (–AD), *Flanagan* 2369 (BOL, GRA, PRE). 3228 (Butterworth): Kentani (–AD), *Pegler* 183 (GRA, holo. BOL, PRE, iso).

RELATIONSHIPS WITH EXTRA SOUTH AFRICAN SPECIES

Verdcourt (1971) stated that the derivation of *E. decumbens* Hauman from *E. cordatum* was manifest. However, apart from a superficial resemblance in habit and leaf shape (that is, to some of the narrow-leaved Transvaal specimens), these two species have more differences than similarities. *E. decumbens* differs in its underground system, free stipules, yellow flowers, size of flower parts, narrow obovate standard, shape of keel blades and height of style curvature.

E. decumbens is close, however, to *E. pseudostolzii* Verdc. Examination of an isotype of the latter (*Polhill & Paulo* 1915, PRE) showed similarities in these two taxa in their free stipules, the colour and shape of their flowers and the form of their pistils. They differed in their general pubescence, shape of wings and in the position of the stigma in relation to the stamens. The shape of the wings and of the pistil of *E. pseudostolzii* was very close to that of *E. pseudodistinctum* Verdc., which is itself closely related to *E. distinctum* and to a lesser extent to *E. populifolium*. The relationship between *E. distinctum* and *E. pseudodistinctum* needs further study.

E. decumbens, *E. distinctum*, *E. pseudodistinctum* and *E. populifolium* seem to form a group with many features in common. They may be separated as follows:

Underground systems rhizomatous; stipules semi-connate or connate; flowers bright orange or carmine with patches of yellow above the auricles; standard hooded; stigma globose, exerted above anthers (South Africa—Natal, E. Cape).

Leaves with stipules.....*E. distinctum*

Leaves without stipules.....*E. populifolium*

Underground systems a simple daucate rootstock, or of several fusiform components; stipules free; flowers yellow; standard not hooded; stigma inserted, or if exerted than minute, capitate (Zaire, Zambia, Tanzania).

Standard with appendages, stigma hidden by stamens.....*E. decumbens*

Standard without appendages, stigma exerted beyond stamens.....*E. pseudodistinctum*

In connection with this study the following questions still need to be answered:

1. Does a yellow-flowered taxon of *E. distinctum* occur in southern Natal?
2. Does *E. populifolium* set fruit and seed?
3. Is the *E. populifolium* group of hybrid origin?
4. Do *E. populifolium* and *E. distinctum* occur in the Transvaal?

ACKNOWLEDGEMENTS

The authors wish to thank the following: The curators of the herbaria of The Royal Botanic Gardens, Kew (K); the Botanical Research Institute, Pretoria (PRE); the Natal Herbarium, Durban (NH); the Albany Museum, Grahamstown (GRA); the State Herbarium, Stellenbosch (STE); the Bolus Herbarium, Cape Town (BOL); the Compton Herbarium, Kirstenbosch (NBG) and the Natal University Herbarium, Pietermaritzburg (NU), for the loan of much valuable material; the C.S.I.R. and the Department of Agricultural Technical Services for financial assistance.

UITTREKSEL

Die verwantskappe tussen drie spesies van Eriosema word bespreek. Eriosema distinctum N. E. Br. en *E.*

populifolium Harv. word as verskillend van *E. cordatum* E. Mey. beskou. Die verwantskap tussen die drie spesies en uitheemse Suid-Afrikaanse spesies van die *E. cordatum* kompleks word bespreek in die lig van nuwe inligting.

REFERENCES

- BURTT DAVY, J., 1932. *A manual of the flowering plants and ferns of the Transvaal with Swaziland*. 2. London: Longmans Green.
- CODD, L. E., 1975. *Plectranthus* (Labiatae) and allied genera in southern Africa. *Bothalia* 11, 4: 371–442.
- CORBY, H. D. L., 1974. Systematic implications of nodulation among Rhodesian legumes. *Kirkia*, 9, 2: 301–329.
- GROBBELAAR, N., VAN BEYMA, M. C., & TODD, C. M., 1967. *A qualitative study of the nodulating ability of legume species*. List 1. Publ. Univ. Pretoria. New Ser. 38.9 pp.
- GUNN, M. D., 1974. Personal communication.
- HARVEY, W. H., 1862. *Eriosema* DC. In W. Harvey & O. Sonder, *Flora Capensis* 2: 258–262.
- STIRTON, C. H., 1975. *A contribution to knowledge of the genus Eriosema (Leguminosae, Lotoideae) in Southern Africa (excluding Mocambique and Rhodesia)*. M.Sc. thesis, Univ. of Natal, Pietermaritzburg, 182 pp. (unpublished).
- VERDCOURT, B., 1971. Studies in the Leguminosae-Papilionoideae for the Flora of Tropical East Africa. *Kew Bull.* 25: 65–169.